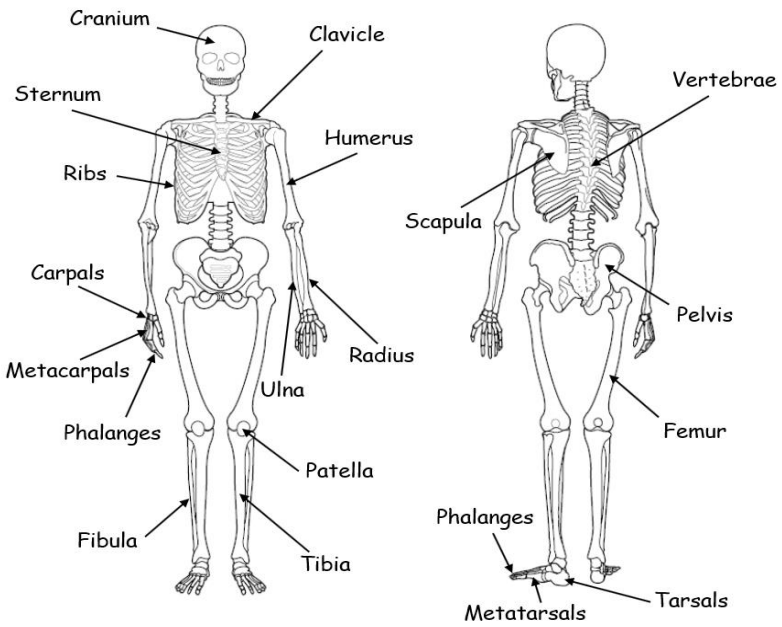
1.1.a. The structure and function of the skeletal system

Location of major bones:



Types of movement at hinge/ball & socket joints:

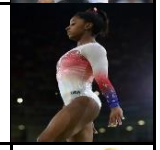
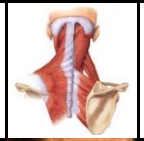
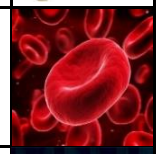
Flexion	A bending movement that decreases the angle between body parts	**Extension**	A straightening movement that increases the angle between body parts
Abduction	The movement of a bone or limb away from the midline of a joint	**Adduction**	The movement of a bone or limb towards the midline of a joint
Rotation	A rotational movement around a joint or axis	**Circumduction**	Combination of flexion & extension, abduction & adduction.

Different joints allow different movements	**Examples**	**Flexion**	**Extension**	**Abduction**	**Adduction**	**Rotation**	**Circumduction**
Ball & socket	Hip & Shoulder	✓	✓	✓	✓	✓	✓
Hinge	Knee & Elbow	✓	✓	X	X	X	X

Functions of the skeleton:

The skeleton has many functions that help your performance in sport. The functions you need to now are listed below:

- Support
- Movement
- Posture
- Blood cell production
- Protection
- Storage of minerals

Sporting Examples		The cranium **protects** the brain when heading the ball	
The ribs **protect** the vital organs such as the heart and lungs when getting tackled in rugby		The skeleton provides shape. This helps you have a good **posture**. Posture is how you hold your body.	
Bones provide anchors for **muscles to attach**. Tendons attach muscles to bones. Muscles pull on bones to create movement		Movement happens at **joints**. Bones act as levers to create **movement**. The longer the levers the greater the force	
Platelets clot blood when we are cut to stop the bleeding		**Red blood** cells carry oxygen that is delivered to the working muscles during exercise	
White blood cells fight infection so we are fit to take part in physical activity		**Calcium** and Phosphorus is stored in the bones to keep them strong	

Types of synovial joint:

Type of synovial joint		**Location**	**Articulating bones**
Hinge		**Knee**	Femur, Tibia,
		Elbow	Humerus, Radius, Ulna
Ball & socket		**Shoulder**	Scapula, Humerus,
		Hip	Pelvis, Femur

Other components of joints:

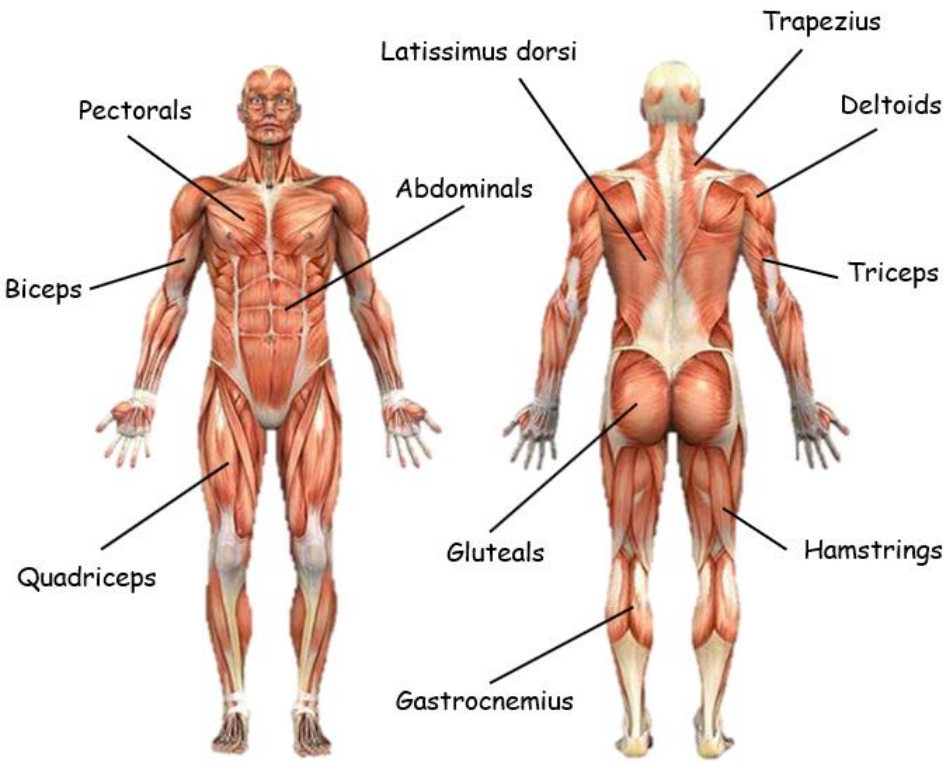
Ligaments join bone to bone an stabilise joints. Strong ligaments can prevent injuries such as dislocation

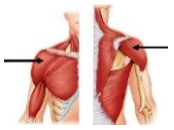
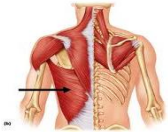
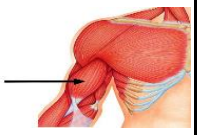
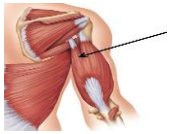
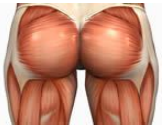
Tendons join muscle to bone. They are needed when performing actions such as kicking, jumping and throwing

Cartilage covers the ends of bones. It helps cushion the joint and helps prevent wear and tear of the bones

1.1.b. The structure and function of the muscular system

Location of major muscles:



Examples from physical activity and sport	Deltoid	Pectorals	Latissimus	Trapezius	Biceps
					
	Moves the upper arm in all directions from the shoulder e.g. bowling in cricket & front crawl swimming	Adduction and flexion of the shoulder e.g. forehand drive in tennis & a hand off in rugby	Extension, adduction or rotation at the shoulder e.g. Butterfly in swimming & a rowing stroke	Extension of neck e.g. preparing to head a ball & stabilises the neck when getting punched in boxing	Flexion at the elbow e.g. bicep curl when lifting weights & preparing to throw a javelin in athletics
Triceps	**Abdominals**	**Gluteals**	**Quadriceps**	**Hamstrings**	**Gastrocnemius**
					
Extension at the elbow e.g. a jab in boxing and throwing a javelin in athletics	Flexion at the waist/trunk e.g. performing a sit-up & bending at the waist to during a throw-in in football	Extension, adduction and rotation of the leg at the hip e.g. leg drive when sprinting & preparing to kick a ball	Extension of the knee e.g. kicking a football or rugby ball & performing a jump shot in basketball	Flexion of the knee e.g. preparing to kick a football & bending knees before jumping	Pointing the foot downwards e.g. jumping up & pointing toes during a gymnastics performance

The roles of muscles in movement:

- Muscles work together to provide movement
- When one muscle contract the other muscle relaxes
- When muscle work like this it is called antagonistic pairs
- The muscle that contracts is called the agonist
- The muscle that relaxes is called the antagonist
- Muscles that help the agonist and stabilise the joint are called **fixator muscles**
- When the biceps contract to flex the elbow, the deltoid & trapezius are fixators

The biceps and triceps

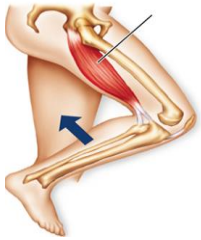
When we bend the elbow (flexion) the biceps contract and the triceps relax

Agonist = Biceps
Antagonist = Triceps

When we straighten the elbow (extension) the triceps contract and the biceps relax

Agonist = Triceps
Antagonist = Biceps

The quadriceps and hamstrings



When we bend the knee the hamstrings contract and the quadriceps relax

Agonist = Hamstrings
Antagonist = Quadriceps

When we straighten the knee the quadriceps contract and the biceps relax

Agonist = Quadriceps
Antagonist = Hamstrings

The muscles at the shoulder

Flexion of the shoulder
Agonist: Back deltoid
Antagonist: Front deltoid

Extension of the shoulder
Agonist: front deltoid
Antagonist: back deltoid

Adduction of the shoulder
Agonist: Latissimus dorsi
Antagonist: Middle deltoid

Abduction of the shoulder
Agonist: Middle deltoid
Antagonist: Latissimus dorsi

1.1.c. Movement analysis

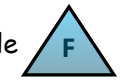
Lever Systems:

Lever systems help you to move. They can increase the amount you can lift or the speed in which you can move something. You need to be able to:

- Draw and describe the three classes of lever
- Give examples in sport

Key Words

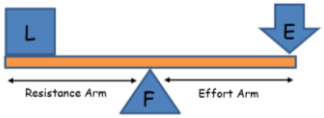
Lever: Is a bone and is shown as a straight line

Fulcrum: Is a pivot or joint and is shown as a triangle 

Effort: Is a force provided by muscles and is shown by an arrow 

Load: Is the weight of the body/object being moved, it is shown as a square 

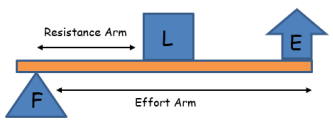
Levers:



1st Class Lever
The fulcrum is surrounded by the effort and the load

Sporting Example

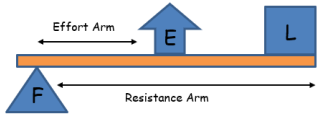
Header in football



2nd Class Lever
The load is surrounded by the fulcrum and the effort

Sporting Example

Calf raises



3rd Class Lever
The load is surrounded by the fulcrum and the effort

Sporting Example

Bicep curl

Mechanical advantages:

Lever	Advantage
1st class	Will vary depending on the distance of the load and the effort from the fulcrum
2nd class	Able to lift heavier loads owing to its large effort arm
3rd class	Provides speed and wide range of movement owing to a long resistance/weight arm

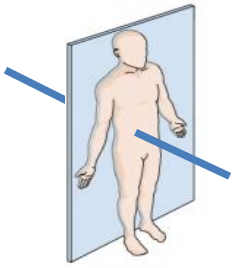
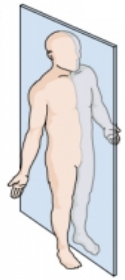
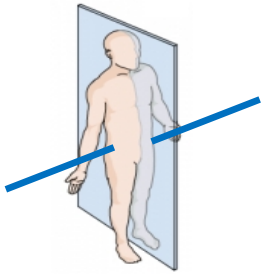
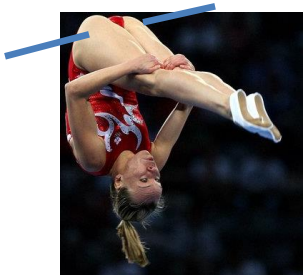
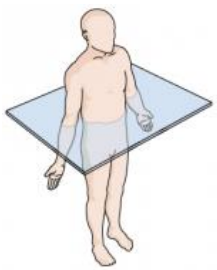
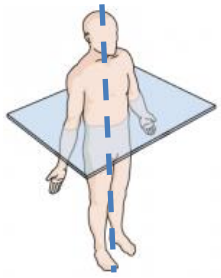
Each lever system can be identified by the component in the middle:

One	Two	Three
F	L	E
(fulcrum)	(load)	(effort)

Planes and axes of movement:

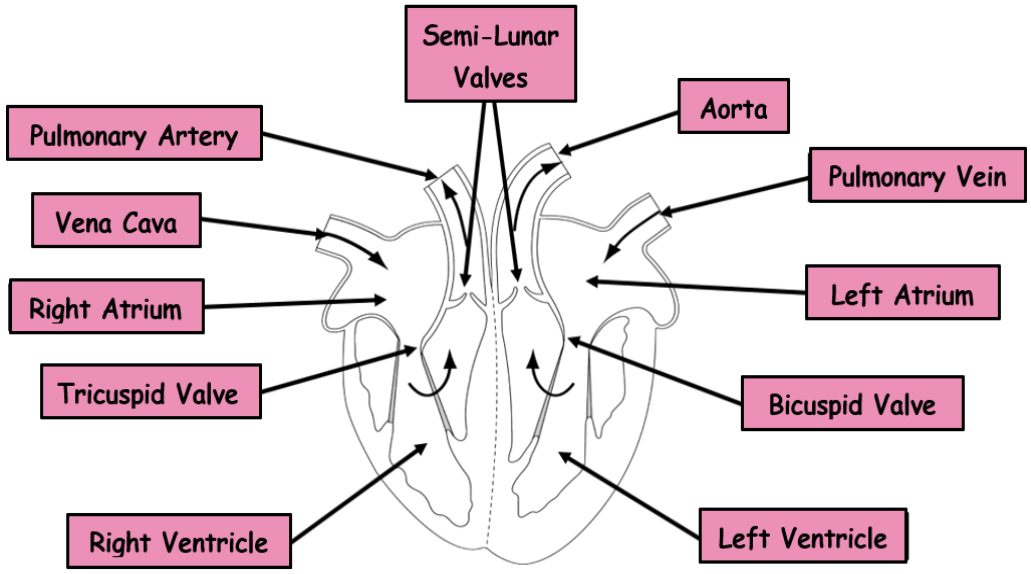
We move in planes around axes. You need to be able to identify and describe the three different body planes and axes

- A plane is an imaginary line that movement direction occurs in
- An axis is a line about which the body or body part can turn

Plane of movement	Axes of movement	Sporting example
		
Frontal plane Separates the front and the back of the body	**Sagittal axis** Goes from the front to the back of the body	**Cartwheel** The only movements are abduction and adduction
		
Sagittal plane Separates the left and the right side of the body	**Frontal axis** Does from one side to the other side of the body	**Somersault** The only movements are flexion and extension
		
Transverse plane Separates the top and the bottom of the body	**Vertical axis** Goes from the top of the body to the bottom of the body	**Full twist (diving)** The only movements are rotating and twisting

1.1.d. The cardiovascular system

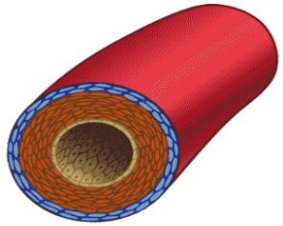
Structure and function of the cardiovascular system:



Pathway of blood:

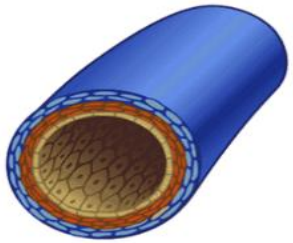
The vena cava takes the deoxygenated blood to the heart	Deoxygenated blood enters the heart into the right atrium	Blood travels through the tricuspid valve into the right ventricle	Blood travels through the semi-lunar valves into the pulmonary artery	The pulmonary artery takes the deoxygenated blood to the lung's
The deoxygenated blood enters the vena cava	**The pathway of blood through the heart and the major blood vessels**			The lungs oxygenate the blood
The deoxygenated blood is taken back to the heart				The oxygenated blood is taken back to the heart through the pulmonary vein
When the body has used the oxygen, the blood becomes deoxygenated	The aorta takes the blood to the rest of the body	Blood travels through the semi-lunar valves into the aorta	Blood travels through the bicuspid valve into the left ventricle	The oxygenated blood enters the left atrium

Blood vessels:



Artery

- Thick muscular walls
- Thick elastic walls
- Small lumen (internal diameter)
- Carry blood at high pressure
- Cary blood away from the heart
- Usually carry oxygenated blood (except the pulmonary artery)



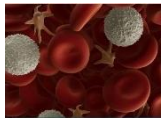
Vein

- Thin walls
- Large lumen (internal diameter)
- Carry blood at low pressure
- Contain valves
- Mainly carry deoxygenated blood (except the pulmonary vein)

Capillary

- Very thin walls (one cell thick)
- Small lumen (internal diameter)
- Link smaller arteries with small veins
- Allow gaseous exchange
- Carry blood at low pressure

The role of red blood cells:



Red blood cells carry oxygen and carbon dioxide.

The oxygen binds with haemoglobin in the blood.

It is then transported to the working muscles by the plasma.

Oxygen is used to release energy in the muscles during physical activity.

The waste product carbon dioxide is also transported by the red blood cells, it is also carried by the plasma

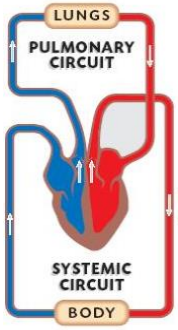
The double-circulatory system:

There are two types of circulatory systems:

- Pulmonary circulation
- Systemic circulation

Pulmonary circulation:
This transports blood between the heart and the lungs.

Systemic circulation:
This transports blood between the heart and the rest of the body.



The definitions of:

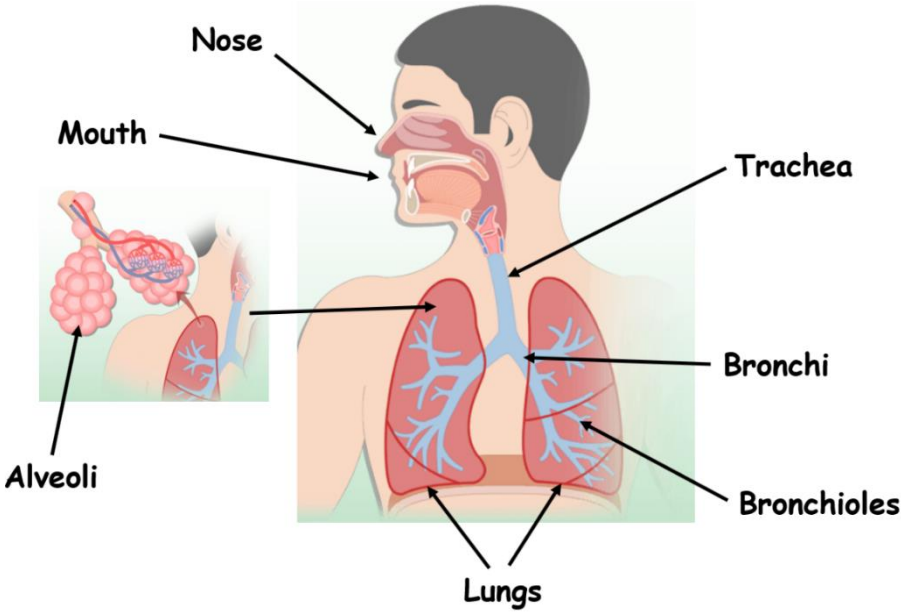
- Heart rate
- Stroke volume
- Cardiac output

Cardiac Output = Stroke Volume x Heart Rate

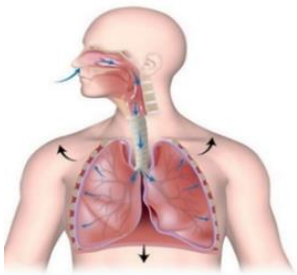
Stroke volume = Amount of blood pumped from the heart in 1 beat
Heart rate = Amount of time the heart beats per minute
Cardiac output = Amount of blood pumped from the heart in 1 minute

1.1.d. The respiratory system

Main structures of the respiratory system:

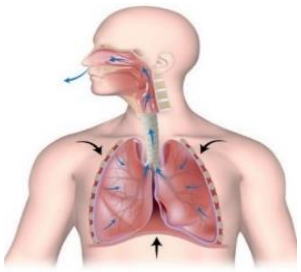


The role of the muscles in breathing:



Inspiration

The **diaphragm** and the **intercostal muscles** contract. The intercostal muscles raise the ribs upwards and outwards. This increases the volume of the chest cavity and causes air to rush into the lungs



Expiration

The **diaphragm** and the **intercostal muscles** relax, this lowers the ribs downwards and inwards. This decreases the volume of the chest cavity and causes the air to be forced out the lungs

The definitions of:

- Breathing rate
- Tidal volume
- Minute ventilation

Minute Volume = Breathing Rate X Tidal Volume

Breathing rate:
The number of breaths taken in one minute

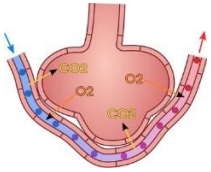
Tidal Volume:
The volume of air you breathe in or out in one breath

Minute Volume:
The volume of air you breathe in or out in each minute

Alveoli as the site of gas exchange:

Gas exchange happens between

- Alveoli and the capillaries
- Capillaries and the muscle tissue



Structures of alveoli that assist in gaseous exchange	• Alveoli have very tiny air sacs with moist thin walls (only one cell thick) this allows gasses to pass easily • Alveoli have a very large surface area this allows plenty of opportunity for gasses to pass through • Alveoli are surrounded by capillaries this means there is only a short distance for the gasses to travel. It also provides a large blood supply
Gas exchange	• Gases move from areas of high concentration to areas of low concentration. If there is more oxygen in the alveoli than the capillaries oxygen will move into the capillaries • Oxygen is diffused into the blood. It binds with the **haemoglobin** in the blood to form **oxyhaemoglobin** • Oxyhaemoglobin is transported to the working muscles where it is used for aerobic activity • During aerobic activity carbon dioxide is produced this is removed from the muscles by haemoglobin

Aerobic and anaerobic exercise:

Aerobic Exercise	Anaerobic Exercise
• Uses oxygen for energy production • Includes activities that are of a long duration and of moderate intensity • The heart and lungs can supply all the blood and oxygen to the working muscles to produce energy aerobically Examples: • Long distance cycling • Marathon running • Triathlon	• Does not use oxygen for energy production • Include activities that are of a short duration and of a high intensity • The heart and lungs cannot supply blood and oxygen to muscles fast enough Examples: • Shot-put • Sprinting • Long jump

Aerobic Energy Equation	$Glucose + O_2 \longrightarrow CO_2 + H_2O + Heat + Energy$
Glucose and oxygen are used to release energy aerobically. This process produces carbon dioxide, water and heat (as well as energy)	
Anaerobic Energy Equation	$Glucose \longrightarrow lactic\ Acid + Energy$
Lactic acid is produced as a waste product when carbohydrates are broken down without oxygen during anaerobic respiration.	

1.1.e. Effects of exercise on body systems

Short term effects of exercise:

Body system		
Muscular System	**Respiratory System**	**Cardiovascular System**
• Increase in oxygen to the working muscles • Increase in muscle temperature • Lactic acid production	• Increase in respiratory rate • Increase in tidal volume • Increase in minute ventilation	• Increase in heart rate • Increase in stroke volume • Increase in cardiac output • Redistribution of blood flow

Long term effects of exercise:

Body system			
Muscular System	**Skeletal System**	**Respiratory System**	**Cardiovascular System**
• Hypertrophy of muscle • Muscular strength • Muscular endurance • Resistance to fatigue	• Bone density	• Increase aerobic capacity • Increased strength of Respiratory muscles • Increase in tidal volume and minute volume during exercise	• Hypertrophy of the heart • Decrease in resting heart rate and resting stroke volume • Increased cardiac output • Capillarisation • Improved rate of recovery

Sporting example:

Muscular System

When we start to exercise, we work anaerobically Lactic acid is a waste product of anaerobic exercise.

There is an increase in oxygen to the working muscles, when this oxygen is converted into energy it releases heat therefore there is an increase in muscle temperature

Cardiovascular and respiratory systems work together

When you exercise there is an increase in demand for oxygen to the working muscles and the removal of carbon dioxide. Tidal volume and minute ventilation all increase.

Blood carries oxygen. To get the oxygen to the working muscles heart rate, stroke volume and cardiac output all increase.

The cardiovascular system will redistribute blood around the body through vasoconstriction and vasodilation. It will increase blood flow to the working muscles (vasodilate) and decrease blood flow to inactive (vasoconstrict)

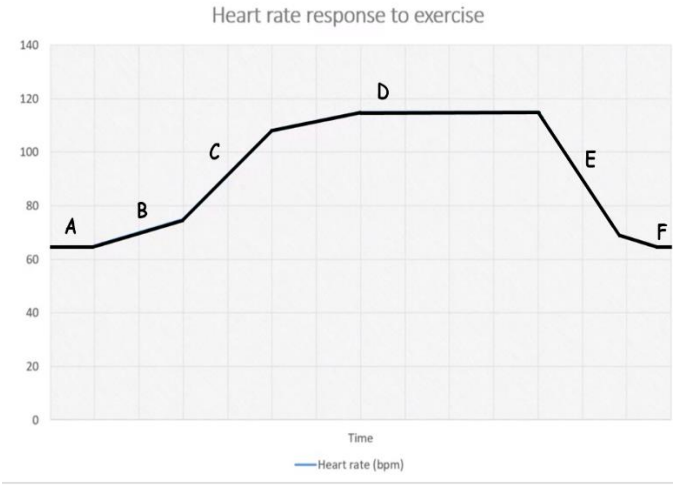
Sporting examples:

An increase in bone density will decrease the chance of a fracture from a bad tackle in football

Muscular hypertrophy and strength. This will allow rugby players to bust through tackles more effectively

An increase in the size of the diaphragm and intercostal muscles will allow a long distance runner to get more oxygen to the working muscle so they will not tire as easily

Muscular endurance will allow a rower to keep going for longer without getting tired. This will give him more chance of winning



A = Heart rate is at rest

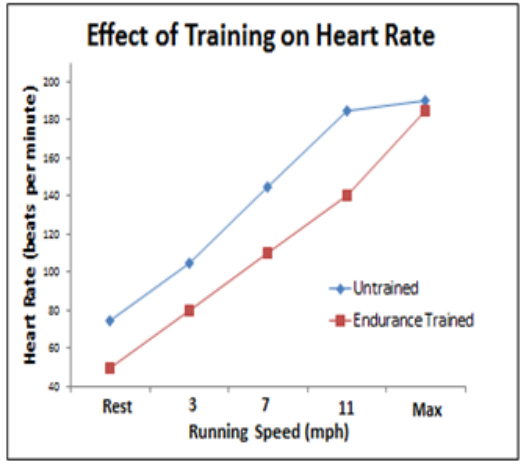
B = Immediately before exercise resting heartrate will increase. This is called an anticipatory rise;

C = When you start to exercise the heart rate increases sharply. This is due to the demand of oxygen. Cardiac output and stroke volume also increase

D = During continuous exercise heart rate levels off this is because the heart rate is sustaining the amount of oxygen needed.

E = Immediately after exercise heart rate decreases sharply, this is because exercise has stopped and the demand for oxygen has reduced.

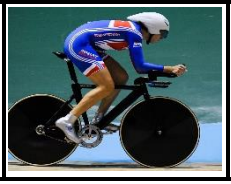
F = Heart rate slowly returns to its resting rate



The untrained athlete has a higher heart rate when running at the same speed as the endurance athlete.

This is due to the long term adaptations the cardiovascular system. The endurance athlete will have a larger heart due to hypertrophy. This will allow them to pump more blood per beat (stroke volume) and per minute (cardiac output). More oxygen is delivered to the working muscles

1.2.a. Components of fitness

Cardiovascular fitness	Muscular Endurance	Flexibility	Reaction Time	Power	Speed	Agility	Balance	Coordination	Strength
'The ability to continue exertion while getting energy from the aerobic system used to supply the body with energy'	'The ability to move your body and muscles repeatedly without fatiguing'	'A bending movement around a joint in a limb'	'The ability to respond quickly to a stimulus'	'The ability to exert a maximal force in as short a time as possible' Power = Strength x Speed	'The ability to move quickly across the ground or move limbs rapidly through movements'	'The ability to change direction at speed'	'The ability to stay upright or stay in control of body movement' (static or dynamic)	'The ability to move two or more body parts under control, smoothly and efficiently'	'The amount of force a muscle can exert against a resistance'
Explanation	**Explanation**	**Explanation**	**Explanation**	**Explanation**	**Explanation**	**Explanation**	**Explanation**	**Explanation**	**Explanation**
They need good cardiovascular fitness to be able to maintain a high standard of performance throughout the race/match.	They need a prolonged additional oxygen delivery to the working muscles to repeat muscle contractions over a long period of time without tiring	Performers need good flexibility to be able to get into position without getting injured and to perform complex movements	Performers need to react to a stimulus. A stimulus can include: a ball, whistle, starters gun, or an opponent	Performers need power to improve performance. Speed and strength are needed in sports where you throw jump kick and sprint	Performers need speed to get from one position to another. This may be leg speed to run or arm speed when throwing or hitting	Performers need agility to change direction quickly. This can be used to evade opponents or move around the court or pitch quickly	Performers need balance so they don't fall over. E.g. in gymnastics when performing a balance (static) or travelling across the beam (dynamic)	Performs need coordination when they are using two body parts at the same time. It can be used when aiming, or striking/hitting a ball	Performers need Strength to support weight **(static)** lifting a weight **(maximal)** punch **(dynamic)** throw **(explosive)**
Fitness Test	**Fitness Test**	**Fitness Test**	**Fitness Test**	**Fitness Test**	**Fitness Test**	**Fitness Test**	**Fitness Test**	**Fitness Test**	**Fitness Test**
Bleep test 12 min cooper run	30 second Sit-up & press-up test	Sit and reach	Ruler drop test	Vertical jump Standing long jump	30m sprint	Illinois agility run	Stork balance test	Wall toss	Grip dynamometer
Sports	**Sports**	**Sports**	**Sports**	**Sports**	**Sports**	**Sports**	**Sports**	**Sports**	**Sports**
Games players Long distance runners/rowers	Cyclist Boxing Swimmer	Gymnasts Goal keepers Divers	Sprinters Badminton Rugby players	Shot put Football (kicking) High jump	Sprinting Badminton Javelin thrower	Rugby side-step Tennis Ice hockey	Gymnastics Skiing Hammer throw	Tennis Archery Football	Weight lifting Rugby Gymnastics
									
									

1.2.a. Fitness testing

Reasons for fitness testing:

Before a training programme:

- To identify strengths and areas for improvement
- Identify training requirements
- To show a starting level of fitness
- To motivate and provide goals

During and after a training programme:

- To monitor improvement
- To provide variety to a training programme
- Compare results against norms of the group
- To identify whether training has been successful

Limitations of fitness testing:

- Tests are often general and not sport specific
- The movement required in the test is not the same as in the actual activity
- Tests do not have competitive conditions required in sports
- Some tests do not use direct measuring and are an estimate or are submaximal
- Some tests need motivation, because they are exhausting to complete
- Some tests questionable reliability

Cardiovascular Fitness Tests

Fitness Test	Test Procedure
Multi stage fitness test 	• Measure out 20 metres • Place cones to mark the distance • Start the audio recording Run from one cone to the other until you cannot continue • Record result and compare to a rating chart
Used by games players, long distance runners/swimmers	

Fitness Test	Test Procedure
12 minute cooper run 	• The test requires you to run as far as possible in 12 minutes • Mark out a 400m/200m track • Assistant counts laps completed • Record results and compare to a rating chart
Used by games players, long distance runners/swimmers	

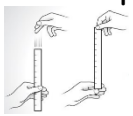
Muscular Endurance Fitness Test

Fitness Test	Test Procedure
press-up & sit-up test 	• Using a mat Perform as many press-ups or sit-ups as possible in 30 seconds • Sit-ups knees bent arms across chest • Press-ups arms must bend to 90 degrees • Record results and compare to a rating chart
Used by tennis and football players	

Balance Fitness Test

Fitness Test	Test Procedure
Stork test 	• Place hands on your hips & foot on your knee • Raise your heel from the ground so you are balancing on your toes • Time starts when you lift your heel • Record result and compare to a rating chart
Used by gymnasts and games players	

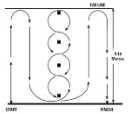
Reaction Time Fitness Test

Fitness Test	Test Procedure
Ruler drop 	• Stand with your hand open around the ruler, with the 0 cm mark between thumb and forefinger • The assistant holds and drops the ruler • Catch the ruler as quick as possible • Record results and compare to a rating chart
Used by basketball, rugby, badminton players	

Strength Fitness Test

Fitness Test	Test Procedure
Hand grip dynamometer 	• Adjust the grip to your hand • Keep your arm beside you at a right angle to your body • Squeeze the handle as hard as you can • Record result and compare to a rating chart
Used by performer such as climbers (to lift body weight)	

Agility Fitness Test

Fitness Test	Test Procedure
Illinois run 	• Set up the course as shown in the picture • Lie face down on the floor, by the first cone • On 'Go' run around the course as fast as you can • Record result and compare to a rating chart
Used by performers who change direction quickly such games players	

Flexibility Fitness Test

Fitness Test	Test Procedure
Sit and reach test 	• Sit with your legs straight and the soles of your feet flat against the box • With palms face down, one hand on top of the other, stretch and reach as far as possible • Record result and compare to a rating chart
Used by performers such as gymnasts and high divers	

Speed Fitness Test

Fitness Test	Test Procedure
30m sprint 	• Measure and mark out 30 metres in a straight line • Place one cone at the start and one at the end • On 'Go' run as fast as you can Record result and compare to a rating chart
Used by 100 m sprinters and rugby players	

Power Fitness Tests

Fitness Test	Test Procedure
Standing jump 	• Crouch down and using the arms and legs jumps horizontally as far as possible land on both feet • Assistant marks the distance • Repeat 3 times • Record best result and compare to a rating chart
Used by sprinters, rugby players and long jumpers	

Fitness Test	Test Procedure
Vertical jump 	• Stand side onto the wall, feet flat on the floor • Mark the highest point that the tips of your fingertips can reach • Holding a piece of chalk, jump as high as you can • Mark on the wall the top of your jump • Measure the distance between the 1st and 2nd
Used by sprinters, rugby players and long jumpers	

Coordination Fitness Test

Fitness Test	Test Procedure
Wall toss 	• Stand 2 meters away from a wall • Throw a tennis ball underarm against the wall • Throw with the right hand and catch with the left hand; then alternate hands Record result and compare to a rating chart
Used by badminton and cricket players	

1.2.b. Applying the principles of training

Principles of training:

Specificity: Training must match the requirements of the activity so that the right muscles and body systems are adapted

Progression: Gradually increasing the amount of working training so that fitness gains occur, but without the risk of injury

Overload: A greater than normal intensity is applied on the body for training adaptations to take place

Reversibility: Just as fitness improves with training it can decline if you stop training. This can be from an injury or stop training

Applying overload to the F.I.T.T principle:

Frequency: How often you train (should be gradually increased)
E.g. Week 1 = train once per week - Week 2 = train twice per week

Intensity: How hard you train (should be gradually increased)
E.g. Week 1 = 1 set of 5 repetitions of a 5 kg weight - Week 2 = 2 sets of 5 repetitions of a 5 kg weight

Time: How long you train (should be gradually increased)
E.g. Week 1 = 20-minute session - Week 2 = 25-minute session

Type: Relates to specificity. training should closely match the activity.
E.g. A marathon runner should use continuous training

Types of training:

Continuous Training	Fartlek Training	Circuit Training	Interval Training	Plyometric Training	Weight Training	High Intensity Interval Training HITT
Is sustained exercise at a constant rate. It lasts for a minimum of 20 minutes and can improve cardiovascular & muscular endurance	Form of continuous training that varies in pace and terrain. It is both aerobic & anaerobic and can improve cardiovascular & muscular endurance	Contains stations organised in a circuit, they can be skill or fitness based, aerobic or anaerobic Intensity is measure by circuits, time or repetitions. Can be adapted to improve all types of fitness	High intense exercise followed by periods of rest to recover Usually anaerobic can be used in a variety of locations Improves speed but can improve strength and cardiovascular	Maximal intensity involving jumping/bounding. It involves an eccentric contraction (muscle lengthens) immediately followed by a concentric (muscle shortens) Improves power (speed & strength)	Form of interval training which involves reps and sets. The weight provides the resistance. Can be done using free or fixed weights. It improves strength, power and muscular endurance	Form of interval training where you use max effort. Max effort lasts for short periods of time and is followed by periods of rest or low intensity exercise. It can improve cardiovascular fitness, strength, power and speed
Advantages	**Advantages**	**Advantages**	**Advantages**	**Advantages**	**Advantages**	**Advantages**
No equipment or facilities Has many health benefits (CHD) Can be done on your own	No equipment or facilities Change of pace can be more interesting Can be done on your own	Variety of stations generates interest Can be skill or fitness Can easily be adapted	Can be used to improve health and fitness (aerobic & anaerobic) No equipment needed	Develops power quickly No equipment	Can target specific areas of the body	Workouts are short so good for busy individuals. Has health benefits and can be adapted easily
Disadvantages	**Disadvantages**	**Disadvantages**	**Disadvantages**	**Disadvantages**	**Disadvantages**	**Disadvantages**
Boring No change of pace Can cause impact injuries	High intensity can be avoided A safe route may be hard to find	Equipment can be costly Can be time consuming to set up	Can be repetitive and boring Need to plan and keep track of sets	Can cause injury due to high intensity	Can cause injury with poor technique a spotter needed with free weights Can be expensive	Can be tiring and hard for beginners. Equipoment may be needed
Sports	**Sports**	**Sports**	**Sports**	**Sports**	**Sports**	**Sports**
Marathon running Cycling Swimming	Fotball Rugby Netball	Can be adapted to suit all sports	Usually for speed It can be adapted to other sports	Basketball Long jump Hurdles	Weight lifting, tennis (muscular endurance)	Most sports and activities benefit from static stretching
						

1.2.b. Applying the principles of training (warm-up and cool-down)

The Physical benefits of a warm-up:

- Warming up muscles/preparing the body for physical activity
- Body temperature
- Heart rate
- Flexibility of muscles and joints
- Pliability of ligaments and tendons
- Blood flow and oxygen to muscles
- The speed of muscle contraction

Key components of a warm-up:

Warm-up

Phase 1: Pulse raiser

The aim of a warm-up is to prepare the body for physical activity. When you start to warm up your heart rate increases due to the demand for blood flow and oxygen to the working muscles. During the warm-up body temperature will increase, muscles ligaments and tendons become more pliable, this makes them more easily to move and giving them less chance of injury

Phase 2: Mobility

Move the joints through their full range of movement, focus on movements used in your sport/activity. E.g. hip circles in football or hockey

Phase 3: Stretching

Stretching the muscles increases their elasticity and their range of movement, hold a stretch (static) or even better add movement. E.g. lunge or high kicks (dynamic)

Phase 4: Dynamic movements

Dynamic movements involve quick explosive movements and increase the speed of muscle contraction, getting them ready for intense exercise. E.g. agility ladders/poles

Phase 3: Skill rehearsal

Practice skills used in the game or activity. This prepares the muscles that will be used, it also helps with mental preparation. E.g. passing in rugby/football

The physical benefits of a cool-down:

- Helps the body's transition back to a resting state
- Increases removal of waste products such as lactic acid
- Gradually lowers heart rate
- Gradually lowers temperature
- Circulates blood and oxygen
- Gradually reduces breathing rate
- Reduces the risk of muscle soreness and stiffness
- Aids recovery by stretching muscles

Key components of a cool-down:

Cool down

Phase 1: low intensity exercise

The aim of a cool down is to help your body transition back to a resting state. Low intensity exercise like slow jogging or walking gradually lowers the breathing/heart rate, body temperature and continues to circulate oxygen to the working muscles. Oxygen is still needed after exercise at it help remove waste products such as lactic acid

Phase 2: stretching

Although a cool down does not prevent injury it does aid recovery and reduces the risk of muscle soreness and stiffness, DOMS (delayed onset of muscle soreness). Stretching will also help maintain/develop flexibility and can be done by static (still) or dynamic (moving) stretching

A cool down is **NOT** designed to prevent injury it is to return the body to its resting levels

1.2.c. Preventing injury in physical activity and training

Injury prevention:

Personal protective equipment	Correct clothing/footwear	Appropriate level of competition	Lifting and carrying equipment safely	Use of warm up and cool down
Protective equipment should be used to prevent injury and includes: • Helmet (cycling) • Gum shield (rugby/boxing) • Post protector (rugby/netball) • Lifejacket (sailing) **Sporting example:** Shin pads may prevent bruising, cuts or a possible fracture when getting tackled	Wearing the correct clothing and footwear is important to prevent injury and include: • Gloves (BMX) • Under armour/skin (cold weather) • Boots (football/rugby) • Padded shorts (goal keeper) **Sporting example:** Spikes are needed in athletics so the athlete does not slip which can cause injury	You should make sure the competition is balanced when taking part in physical activity it can be balanced by: • Age (contact sports) • Skill (contact sports) • Sex (rugby) • Weight (boxing/judo) **Sporting example:** A heavy weight boxer should fight against someone their own sex, skill level and weight	You should always take care when lifting heavy objects using the correct technique (bend at the knees) some equipment such as a trampoline will have a procedure to set up	Warming up prepares the body for exercise muscles, tendons and ligament become more pliable and can move more freely. This will help prevent injuries such as sprains and strains. Although cooling down does not prevent injury it can prevent muscle soreness and stiffness
 	 	 		

Potential hazards in a range of physical activity and sport settings:

Sports Hall	Fitness Centre	Playing Field	Artificial Outdoor Area	Swimming Pool
Risks include: • Slippy floors • Badly stored equipment • Damaged equipment • Trip hazards • Poorly maintained equipment	Risks include: • Slippy floors • Using weights incorrectly • Health & safety instructions • Badly stored equipment • Poorly maintained equipment	Risks include: • Uneven surface • Field clear of any hazards • Safe to play (water, ice, snow)	Risks include: • Wrinkled surface • Badly stored equipment • Poorly maintained equipment	Risks include: • Drowning/death It is important that the poolside has clear warning/danger signs and has clear rules, e.g. no diving, running, bombing. Swimming pools should be well supervised with a lifeguard