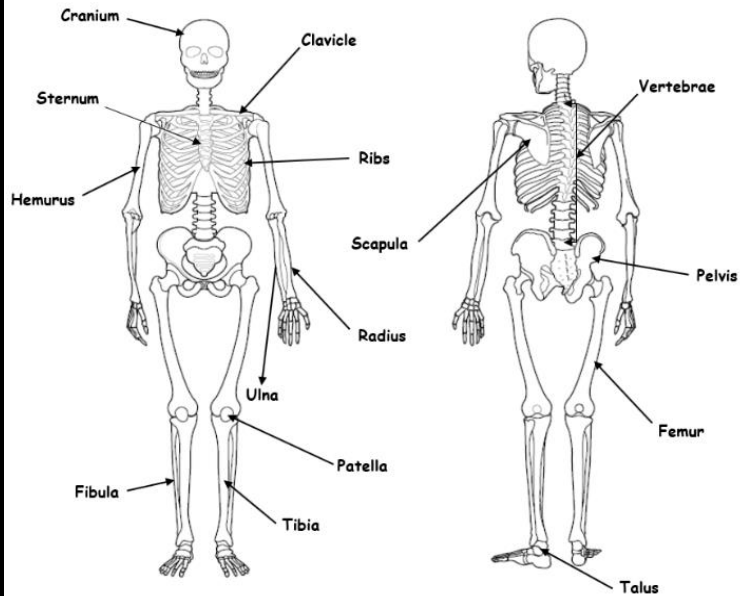


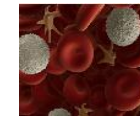
Paper 1: The structure and functions of the musculoskeletal system (part 1)

Bones of the skeleton:



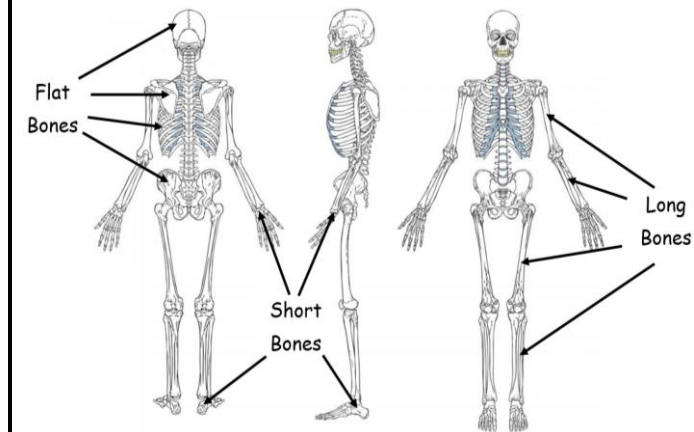
The functions of the skeleton:

- 1. Protection of vital organs**
Cranium protects the brain when heading
- 2. Structural shape & muscle attachment**
Your skeleton provides **support** by providing a structural shape for muscles and tissues to attach
- 3. Formation of joints for movement**
Bones provide anchors for muscles to attach. Tendons attach muscle to bones. Muscles pull on bones to create movement
- 4. Blood cell production**
Red blood cells carry oxygen. White blood cells fight infection. Platelets clot blood
- 5. Store of minerals**
Calcium and Phosphorus is stored in the bones to keep them strong



Structure of the skeleton:

Bones are classified by their shape each type of bone has a function.

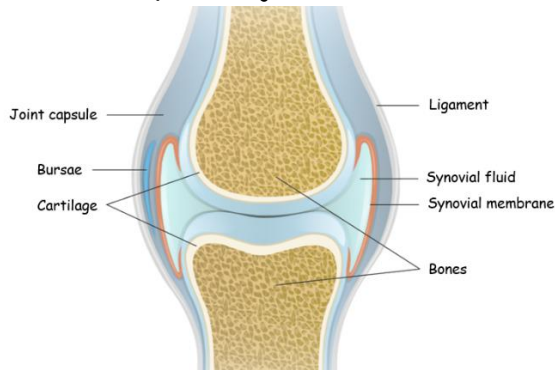


Flat bones: They are longer than they are wide. They enable gross movements by working as levers e.g. the humerus, tibia and ulna.

Short bones: They are as wide as they are long. In sport they allow finer controlled movements e.g. the tarsals (ankle) and carpals (wrist).

Flat bones: Flat bones usually protect organs or offer a broad surface for muscles to attach to. Flat bones protect us in sporting situations, e.g. the ribs protect our internal organs when getting tackled in rugby

Structure of a synovial joint:



Synovial fluid: Lubricates and reduces friction of the joint it supplies nutrients and removes waste products
Synovial membrane: Contains and releases synovial fluid
Articular cartilage: Prevent bones from rubbing and acts as a shock absorber
Joint capsule: Surrounds the synovial joint it protects and stabilises the joint
Ligament: Joins bone to bone, helps stabilise the joint
Bursae: Fluid filled sacs that provides a cushion between the tendons and bones reducing friction

Types of freely movable joints:



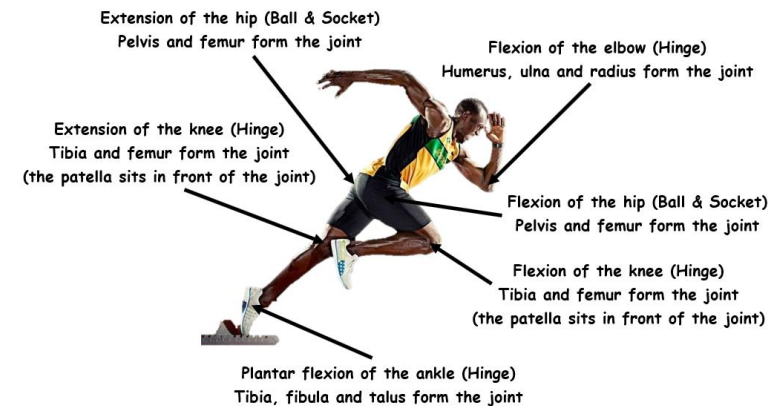
Hinge joint: Found at the elbow and knee and ankle, allows flexion and extension



Ball and socket joint: Found at the hip and shoulder, allows flexion, extension, abduction, adduction, rotation & circumduction

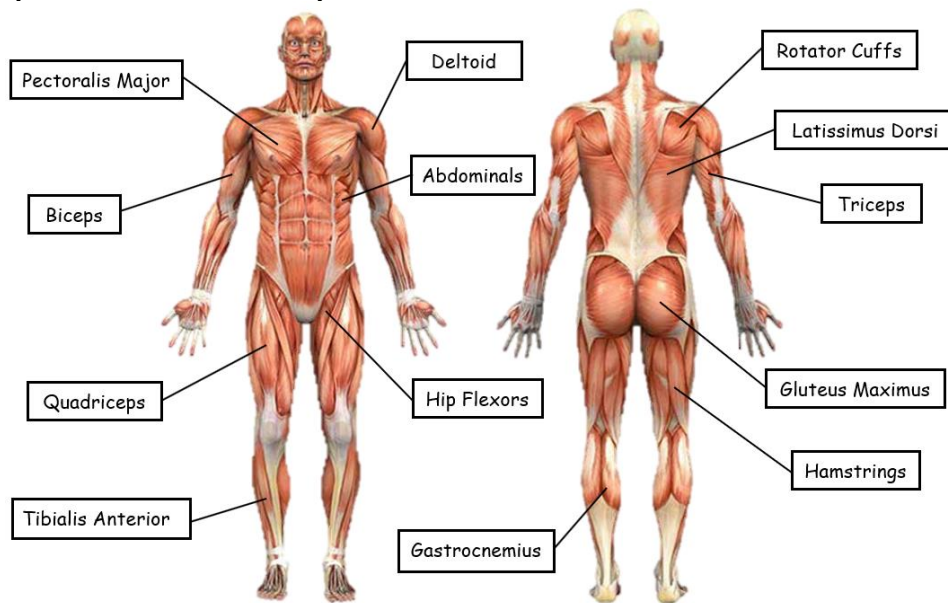
Movement possibilities at joints:

Flexion: bending movement (decreases angle)
Extension: Straightening movement (increase angle)
Abduction: Moving away from midline
Adduction: Moving towards the midline
Plantar flexion: Pointing the toes downwards
Dorsi flexion: Pointing the toes upwards
Rotation: Rotation around a joint or axis
Circumduction: Movement in the shape of a cone, flexion/extension abduction/adduction



Paper 1: The structure and functions of the musculoskeletal system (part 2)

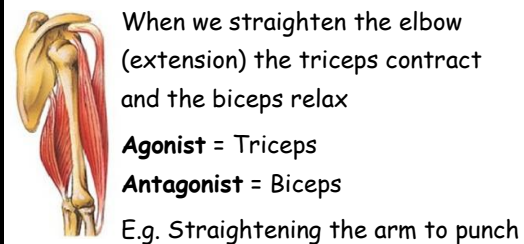
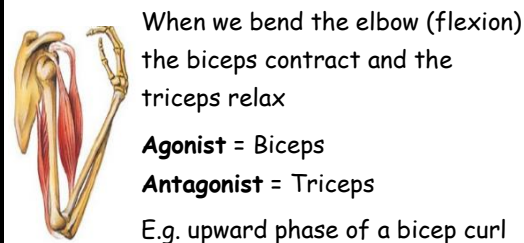
Voluntary muscles of the body:



Muscles and their function:

Muscle	Location	Function	Sporting Example
 Deltoid	muscle on the upper arm and top of shoulder	Move the upper arm (shoulder) in all directions	Serve in tennis Front Crawl Cricket Bowling
 Latissimus Dorsi	Back muscle from the lower spine to the upper arm.	Adducts and extends the arm at the shoulder	Butterfly stroke Pull ups Rowing stroke
 Rotator Cuff	On the scapula in the shoulder	Rotation of the shoulder	Bowling in cricket Swimming front crawl
 Pectoralis Major	Muscle covering the chest	Adducts the arm at the shoulder	Forehand shot Hand off in rugby Boxing hook
 Abdominals	Side of the abdomen	Pulls the chest downwards Flexion of spinal column	Crunches
 Biceps	Front of Upper Arm	Elbow flexion (bending)	Boxing Uppercut Preparing to Throw a javelin
 Triceps	Back of Upper Arm	Elbow extension (straightening)	Throwing a javelin Hand off in rugby Boxing Jab
 Gluteus Maximus	Form the buttocks	Adducts & 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 Jumping upwards on a lay-up shot
 Hamstrings	Back of Upper Leg	Knee flexion (bending)	Bending knee before kicking a ball
 Gastrocnemius	Calf muscle, attached by the Achilles tendon	Plantar flexion, points the toes	Running Diving and gymnastics
 Tibialis Anterior	Muscle that runs down the shin	Dorsi flexion, pulls toes upwards	Ski jumping Hurdling

Antagonistic muscle pairs:



Other antagonistic pairs include:

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

Muscular contractions:

Isotonic muscle contractions are those that result in movement e.g. running and jumping

Isometric muscle contractions are when the muscle contracts but no movement e.g. holding a balance

Concentric & eccentric isotonic contractions:

Concentric muscle contraction is when the muscle shortens during the contraction (positive/upward phase)

Eccentric muscle contraction is when the muscle lengthens during the contraction (negative/downward phase)



Upward phase of a bicep curl

biceps are contracting concentrically

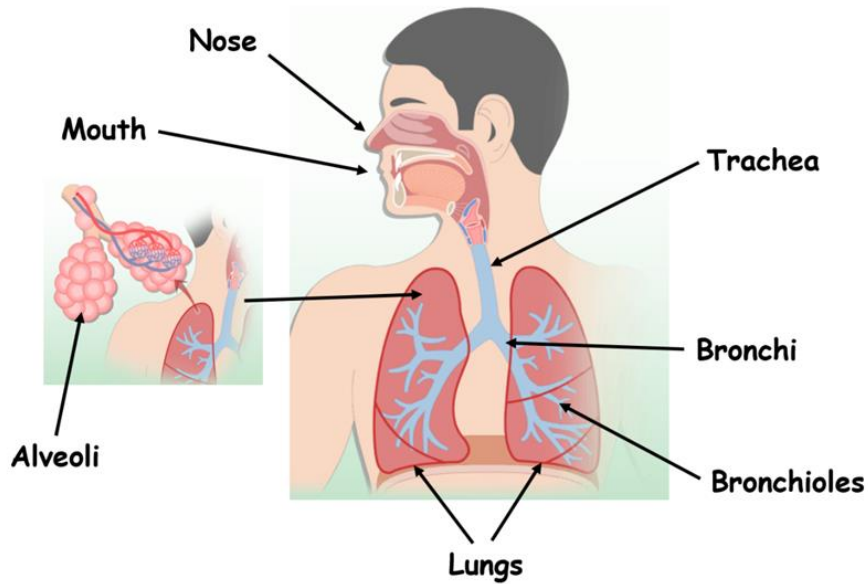


Downward phase of a bicep curl

biceps are contracting concentrically

Paper 1: The structure and functions of the cardio-respiratory system (part 1)

The pathway of air into the lungs:



Nose and mouth: Air enters the body through the nose and mouth

Trachea: Air from the nose and mouth enters the wind pipe called the trachea. The trachea is surrounded by rings of cartilage to keep its shape and prevent it collapsing

Bronchi: Air travels from the trachea and to each lung via a bronchus. Bronchi is the term for both the left and right bronchus. The passage of air gets smaller and smaller

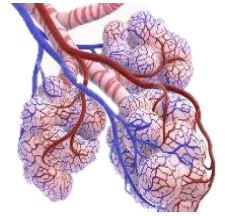
Bronchioles: The smaller airways that branch off the bronchi are called bronchioles. Bronchioles branch out throughout the lungs and carry the air from the bronchi to the alveoli

Alveoli: The bronchioles carry the air to the alveoli which are tiny air sacs. They are attached to the bronchioles. The exchange of oxygen and carbon dioxide occurs at the alveoli

Gaseous exchange

Features that assist in gas exchange

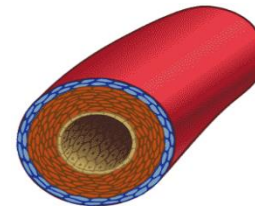
- Alveoli have very tiny air sacs with moist thin walls (only one cell thick)
- Alveoli have a very large surface area
- Alveoli are surrounded by capillaries
- It provides a large blood supply



Gaseous exchange

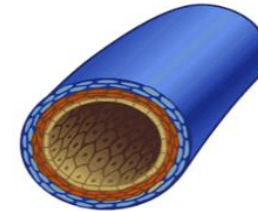
- Gases move from areas of high concentration to areas of low concentration. If there is more oxygen in the alveoli than the capillaries oxygen will move into the capillaries
- Oxygen is diffused into the blood. It binds with the **haemoglobin** in the blood to form **oxyhaemoglobin**
- Oxyhaemoglobin 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
- Gaseous exchange occurs at the alveoli - capillaries and capillaries - muscle tissue

Blood vessels:



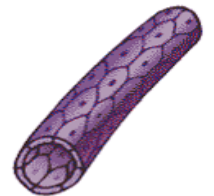
Artery

- Thick muscular walls
- Thick elastic walls
- Small lumen (internal diameter)
- Carry blood at high pressure
- Carry 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

Redistribution of blood:

When we exercise blood is redistributed. The working muscles need more oxygen than other inactive areas of the body such as the stomach. Blood is diverted away from inactive areas to the working muscles.



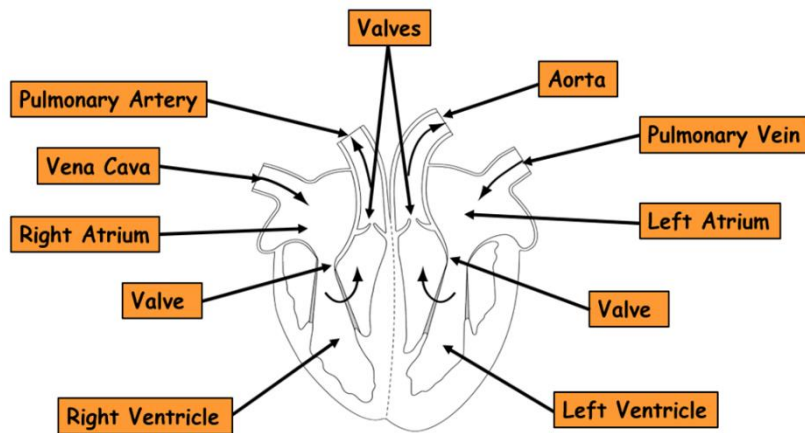
Vasoconstriction means that the blood vessels constrict to make them smaller. Chemical changes signal the nervous system to **constrict** blood vessels to **inactive** areas.



Vasodilation means that the blood vessels dilate to make them bigger. Chemical changes signal the nervous system to dilate blood vessels that supply active areas.

Paper 1: The structure and functions of the cardio-respiratory system (part 2)

Structure of the heart:



The right atrium contracts (systole) ejecting deoxygenated blood through a valve and into the right ventricle.

The right ventricle is relaxed (diastole) and fills with deoxygenated blood

The right ventricle contracts (systole) pushing the deoxygenated blood through valves to the pulmonary artery

The pulmonary artery carries deoxygenated blood away from the heart to the lungs. The blood becomes oxygenated

The vena cava is the main vein bringing the deoxygenated blood back to the heart and into the right atrium



The pulmonary vein transports the oxygenated blood back to the heart and into the left atrium, which fills with oxygenated blood

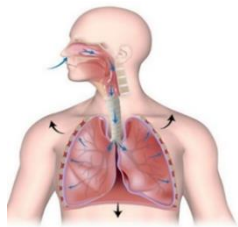
The aorta carries oxygenated blood away from the left ventricle to the working muscles the blood then become deoxygenated

The left ventricle contracts (systole) pushing the oxygenated blood through valves to the aorta

The left ventricle is relaxed (diastole) and fills with oxygenated blood

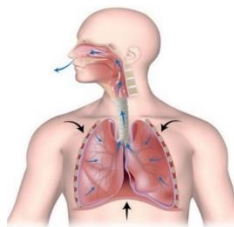
The left atrium contracts (systole) ejecting oxygenated blood through a valve and into the left ventricle

Mechanics of breathing:



Inspiration

The **diaphragm** and **external intercostal muscles** contract. The external 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 **external intercostal muscles** relax, the internal intercostals contract. 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

Inhaling and exhaling during exercise:

During inspiration

The **pectorals** and **sternocleidomastoid** muscles raise the sternum allowing the lungs to expand further

During expiration

The rib cage is pulled down quicker due to the contraction of the **abdominal muscles**

Cardiac Output = Stroke Volume X Heart Rate

Cardiac Output = amount of blood leaving the heart per minute

Stroke Volume = amount of blood ejected from the heart per beat

Heart Rate = the number of times the heart beats per minute

Interpreting heart rate graphs:



A = Heart rate is at its lowest at rest

B = Immediately before exercise resting heart rate will increase. This is called an **anticipatory rise**; this is due to the release of the hormone adrenaline.

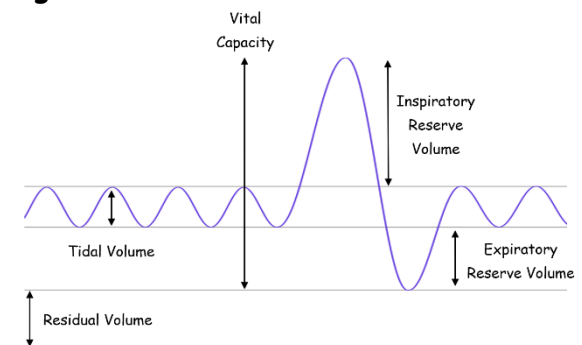
C = When you start to exercise the heart rate increases sharply. This is due to the demand of oxygen. **Cardiac output** increases

D = During continuous exercise heart rate levels 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

Lung volumes:



Tidal Volume: The amount of air inspired (inhaled) or expired (exhaled) in a normal breath

Vital Capacity: The maximum amount of air the lungs can expire (breathe out) after the maximum inspiration (breathe in)

Expiratory Reserve Volume: The maximum volume of air that can be exhaled. In addition to tidal volume

Inspiratory Reserve Volume: The maximum volume of air that can be inhaled. In addition to tidal volume

Residual Volume: The amount of air that remains in the lungs even after a forced maximal exhalation

Tidal volume during exercise increases. Breathing rate and depth increase due to meet the demand of oxygen, carbon dioxide is also removed

Paper 1: Aerobic & anaerobic exercise

Aerobic exercise:

- Uses oxygen for energy production
- Includes activities that are of a long duration
- Includes activities that are of a moderate intensity
- The heart and lungs can supply all the blood and oxygen to the working muscles to produce energy aerobically

Sports and activities:



Long distance cycling



Marathon running



Triathlon



Long distance rowing

Aerobic equation:



- Glucose and oxygen combine to release energy aerobically
- This process produces carbon dioxide, water and heat (and energy)

Anaerobic exercise:

- Does not use oxygen for energy production
- Include activities that are of a short duration
- Includes activities that are of a high intensity
- The heart and lungs cannot supply blood and oxygen to muscles fast enough to use so energy is produced anaerobically

Sports and activities:



Shot put



Sprinting



Weight lifting



Long jump

Anaerobic equation:



- Lactic acid is produced as a waste product when carbohydrates are broken down without oxygen during anaerobic respiration
- This causes muscles to become tired and work less efficient

Paper 1: Excess post-exercise oxygen consumption

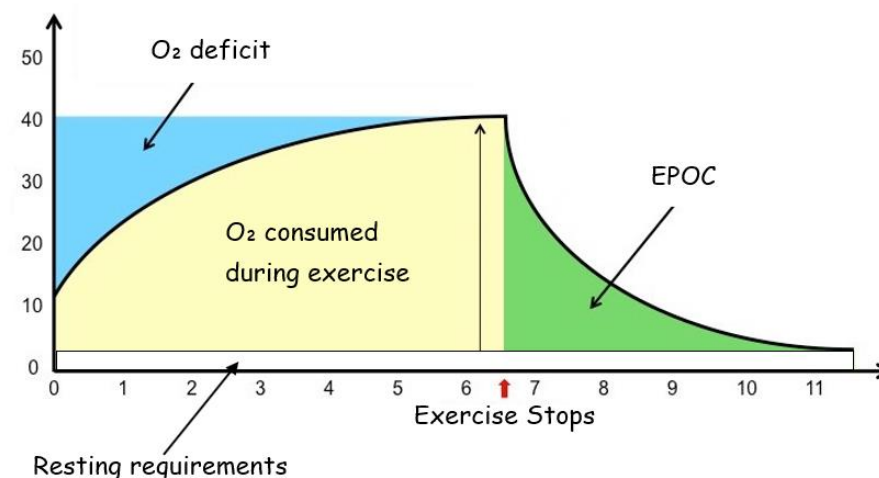
Excess post-exercise oxygen consumption (EPOC):

EPOC is the additional amount of oxygen consumed after anaerobic exercise. Sometimes EPOC is referred to as oxygen debt

EPOC:

- Refers to the amount of oxygen needed to recover after exercise
- Enables lactic acid to be converted to glucose, carbon dioxide and water
- Explains why we breathe deeply and quickly after vigorous exercise

Analysing EPOC:



Explanation

- The **resting requirement** identifies how much oxygen is required at rest
- When we start to exercise the demand for oxygen increases. it takes time to get the oxygen to the working muscles, not all the oxygen can be provided (anaerobic) we get an **O₂ deficit**
- When we stop exercising the demand for oxygen remains higher (to pay back the deficit) this is **EPOC**

Paper 1: The recovery process from vigorous exercise

Recovery process	Explanation	Sporting Example
Cool down 	A cool down is important after vigorous exercise. Light exercise and stretching help to: To keep the breathing/heart rate elevated ensures blood flow to the muscles which helps convert the lactic acid to glucose, carbon dioxide and water to prevent muscle soreness	Any sport or activity after vigorous exercise
Massage 	A massage helps the delayed onset of muscular soreness (DOMS). This is when muscle soreness does not happen immediately but one or two days after a period of intense exercise The massage: - Reduces inflammation of a tender area - Increases blood flow, so increases oxygen delivery to the muscles which helps the removal of lactic acid	Games players may use an ice bath after an intense match to help recovery
Ice baths 	Getting into an ice bath 5 to 10 minutes after intense exercise helps: - Aid and repair micro tears in muscle fibres preventing DOMS - Reduce swelling of an injured area - When you get out an ice bath the warmer temperature dilates blood vessels which allows oxygenated blood to rush to the muscles removing lactic acid and other waste products	Games players may use an ice bath after an intense match to help recovery
Manipulation of diet Carbohydrates  Rehydration 	Carbohydrates Foods high in carbohydrates should be consumed soon after exercise this aims to: - Replace glycogen stores Rehydration Water or isotonic drinks should be consumed before during and after vigorous exercise, this helps to: - Replace fluids that are lost during exercise - Prevent dizziness and nausea that are symptoms of dehydration	Endurance athletes such as runners Any performer that sweats needs to rehydrate

Paper 1: Short and long term effects of exercise

Immediate effects of exercise:

These are the effects that happen during exercise

Immediate effects of exercise	Explanation
Getting hot	Heat is a by-product of energy production, the harder we train the hotter we get
Getting sweaty	Sweat glands produce sweat to cool you down, sweat evaporating from the surface of your skin removes some body heat
Having red skin	Blood vessels dilate close the surface of the skin to help you lose heat, this makes you look red
Increased depth and rate of breathing	This allows more gaseous exchange to occur more quickly. More oxygen can be delivered to the working muscles and more carbon dioxide can be removed
Increased heart rate	This allows gases to be transported around the body. Oxygen can be delivered to the working muscles and carbon dioxide can be removed

Short term effects of exercise:

These are the effects that happen 24 to 36 hours after exercise

Short-term effects of exercise	Explanation
Tiredness and fatigue	When we are exercising energy, stores are being used up this will lead to tiredness and fatigue
Light headedness or nausea	When we exercise, we lose fluids, this can lead to dehydration, Light headedness and nausea are symptoms of being dehydrated
Aching muscles	Blood vessels dilate close the surface of the skin to help you lose heat, this makes you look red
Cramp	Cramp is an involuntary muscular contraction. A cause of cramp is a depletion of energy stores or dehydration and a lack of electrolytes due to sweating
DOMS	DOMS can occur due to micro tears in the muscles from vigorous activity

Long term effects of exercise and improvements in specific components of fitness:

These are the effects that happen months or years after training

Long-term effects of exercise	Explanation
Change in body shape	A change in body shape can improve performance. An increase in muscle mass will assist in strength and power sports such as sprinting and rugby. A reduction of body fat will assist a long-distance runner
Improved stamina	Improved stamina will allow performers to last longer in an activity without getting tired. For example, performing to a high standard for 90 minutes in football
Increase in size of the heart (cardiac hypertrophy)	An increase in the size of the heart will allow more blood pumped per beat (stroke volume) when exercising. This will allow more oxygen to be delivered to the working muscles
Lower resting heart rate (bradycardia)	Because the heart can pump more blood per beat it will not have to work as hard at rest therefore resting heart rate will be lower



Strength allows us to provide a force applied by a muscle group to overcome a resistance



Muscular endurance allows repeated contractions and avoid fatigue



Suppleness/flexibility allows a greater range of movement at a joint



Speed allows us to perform movements quickly



Cardiovascular endurance allows oxygen to be supplied to the working muscle so you can perform for a long time without getting tired

Paper 1: Lever Systems

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 the three classes of lever
- Describe the lever
- Give examples in sport

Key Words

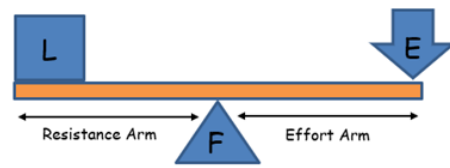
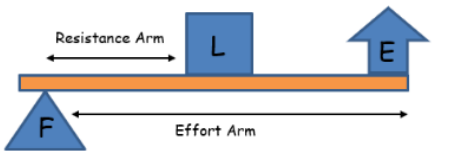
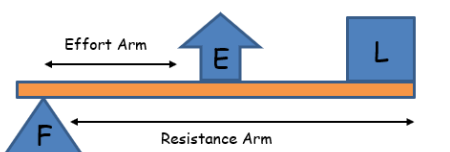
Lever: Is a bone and is shown as a straight line

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

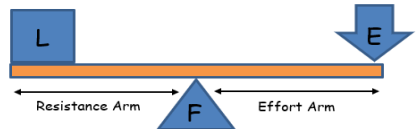
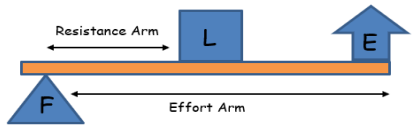
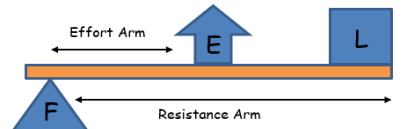
Effort: Is a force provided by muscles and is shown by an arrow

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

Levers:

Lever	Description	Sporting example
1st Class 	The fulcrum is surrounded by the effort and the load	 Heading a ball
2nd Class 	The load is surrounded by the fulcrum and the effort	 Calf raises
3rd Class Lever 	The load is surrounded by the fulcrum and the effort	 Bicep curl

Mechanical advantages:

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

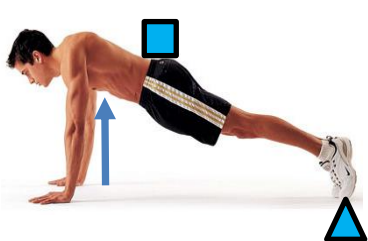
Identifying lever systems:

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

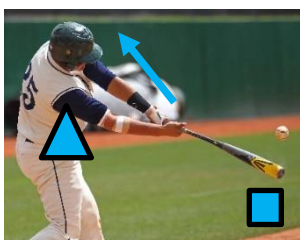
One F (fulcrum)	Two L (load)	Three E (effort)
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Effort = Biceps
Load = water
Fulcrum = hand/oars
1st class lever
(fulcrum in the middle)



Effort = Triceps
Load = Body weight
Fulcrum = Feet
2nd class lever
(load in the middle)

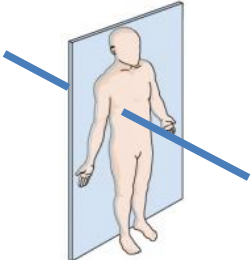
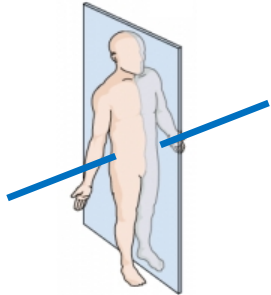
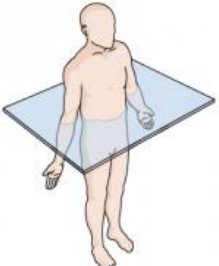
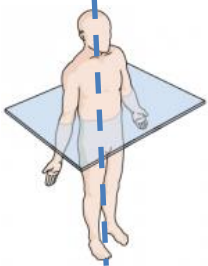


Effort = muscles
Load = bat/ball
Fulcrum = shoulders
3rd class lever
(effort in the middle)

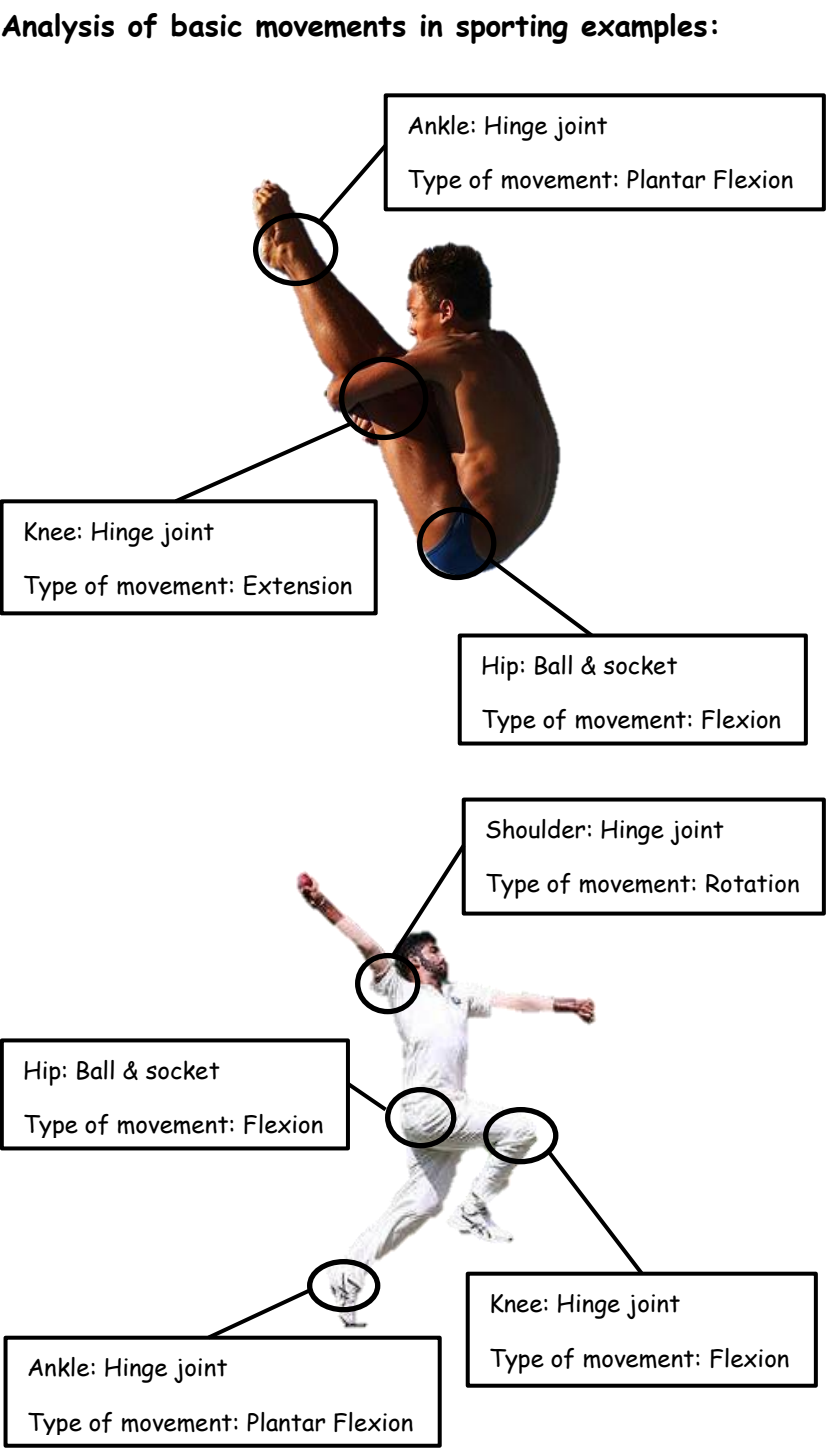
Paper 1: Planes & Axes of Movement

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 Goes 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

Analysis of basic movements in sporting examples:



Top Athlete (Gymnast):

- Ankle: Hinge joint
Type of movement: Plantar Flexion
- Knee: Hinge joint
Type of movement: Extension
- Hip: Ball & socket
Type of movement: Flexion

Bottom Athlete (Soccer Player):

- Shoulder: Hinge joint
Type of movement: Rotation
- Hip: Ball & socket
Type of movement: Flexion
- Knee: Hinge joint
Type of movement: Flexion
- Ankle: Hinge joint
Type of movement: Plantar Flexion

Paper 1: Health and components of fitness

Health and fitness:

Fitness definition: 'The ability to meet the demands of the environment'

Explanation: Are you fit enough to do your everyday tasks in your everyday life. e.g. the fitness needed to be a window cleaner to that of an office worker

Health: 'A state of complete emotional, physical and social wellbeing ant not merely the absence of disease or infirmity'

Explanation: Not only are you free from disease and infirmity you are socially active, physically fit and have no emotional problems such as stress

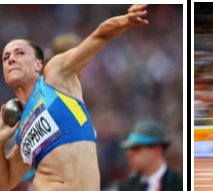
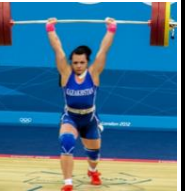
The relationship between health and fitness:

Regular Exercise

Increased Fitness

Health benefits

- Exercise improves fitness, an increase in fitness will improve performance
- Exercise improves all aspects of health (physical, social, emotional)
- If you are not healthy enough to take part in regular exercise your fitness will deteriorate causing your performance to drop. Health benefits will not be gained

Cardiovascular fitness	Muscular Endurance	Flexibility	Reaction Time	Power	Speed	Agility	Balance	Coordination	Strength
'The ability of the heart and lungs to supply oxygen to the working muscles'	'The ability of a muscle group to undergo repeated contractions, avoiding fatigue'	'The range of movement possible at a joint'	'The time taken to respond to a stimulus'	'Is the ability to do strength performances quickly' Power = Strength x Speed	'The amount of time it takes to perform a particular action or cover a particular distance'	'Is the ability to change position of the body quickly while maintaining control of the movement'	'Is the ability to retain the body's centre of mass above the base of support' static or dynamic	'Is the ability to use two or more body parts together smoothly and efficiently'	'The ability to overcome a resistance. it requires a force to be applied to a muscle or muscle group'
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)	Performers 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)
Sports	Sports	Sports	Sports	Sports	Sports	Sports	Sports	Sports	Sports
Games players Long distance runners/rowers	Cyclist (legs) Boxing (punching) Swimmer (arms/legs)	Gymnasts Goal keepers Divers	Sprinters Badminton players Rugby players	Shot put Football (kicking) High jump	Sprinting Badminton Javelin thrower	Rugby side-step Tennis Badminton	Gymnastics Skiing Hammer throw	Tennis Archery Football	Weight lifting Rugby Gymnastics
									
Fitness Test	Fitness Test	Fitness Test	Fitness Test	Fitness Test	Fitness Test	Fitness Test	Fitness Test	Fitness Test	Fitness Test
Multi stage fitness test	Sit-up bleep test	Sit and reach	Ruler drop test	Vertical jump	30m sprint	Illinois agility run	Stork balance test	Wall toss	Grip dynamometer 1 rep max test

Paper 1: Fitness testing

Reasons for fitness testing:

Before a training programme:

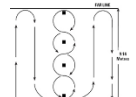
- To identify strengths and areas for improvement
- Identify training requirements
- To show a starting level of fitness
- To motivate and provide goals

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 Test		Coordination Fitness Test		Muscular Endurance Fitness Test	
Fitness Test	Test Procedure	Fitness Test	Test Procedure	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	Wall toss test 	• 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	Sit-up bleep test 	• Lie on a mat, knees bent, feet on the floor. your hands across your chest on shoulders • Start the audio recording • Sit up until you can no longer continue • Record results and compare to a rating chart
Used by games players, long distance runners/swimmers		Used by badminton and cricket players		Used by tennis and football players	
Balance Fitness Test		Reaction Time Fitness Test		Strength Fitness Test 1	
Fitness Test	Test Procedure	Fitness Test	Test Procedure	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	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	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 gymnasts and games players		Used by basketball, rugby, badminton players		Used by performer such as climbers (to lift body weight)	
Agility Fitness Test		Flexibility Fitness Test		Strength Fitness Test 2	
Fitness Test	Test Procedure	Fitness Test	Test Procedure	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	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	One rep max 	• Warm up • Lift the maximum weight you can in one attempt • Record result and compare to a rating chart
Used by performers who change direction quickly such games players		Used by performers such as gymnasts and high divers		Used by performers such as power lifters rugby players & boxers	
Speed Fitness Test		Power Fitness Test		Qualitative or quantitative data: When collecting pieces of data for fitness tests they are usually quantitative meaning. The measurements can be quantified as numbers such: Time (seconds) Distance (meters) Levels or numbers Data can be collected qualitative meaning the measurements are based on quality rather than quantity, such as a number out of 10 for a routine. They are opinions not facts.	
Fitness Test	Test Procedure	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	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 100 m sprinters and rugby players		Used by sprinters, rugby players and long jumpers			

Paper 1: Principles and types of training

Principles of training: SPORT

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

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

Reversibility: Just as fitness improves with training it can decline if you stop training

Tedium: This is the boredom that can occur when you train the same way every time. A variety of training methods are needed to keep motivated to carry on without giving up

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

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

Intensity: How hard you train (should be gradually increased)
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) 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

Training intensities:

Aerobic target zone:

60% - 80% of max heart rate

Anaerobic training zone:

80% - 90% of max heart rate

Max Heart rate:

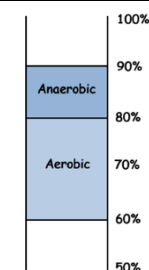
220 - age

Strength/Power

high weight/low reps above 70% of 1 rep max (3 sets of 4/8 reps)

Muscular endurance

low weight/high res below 70% of 1 rep max (3 sets of 12-15 reps)

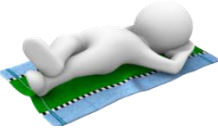


Types of training:

Continuous Training	Fartlek Training	Circuit Training	Interval Training	Plyometric Training	Weight Training	Static Stretching
Is sub-maximal aerobic exercise that has no breaks or rest. 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	Stretch as far as you can. The stretch is held (isometric) for up to 30 seconds. It Can be done on your own, with apparatus or with a partner. Improves flexibility
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	Develops flexibility
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	Not as effective as other stretching methods and can take a long time to go through all muscle groups
Sports	Sports	Sports	Sports	Sports	Sports	Sports
Marathon running Cycling Swimming	Football 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
						

Paper 1: Injury prevention

Considerations to prevent injury:

Complete a warm up	A warm up should be completed to: increase the temperature in the muscles, tendons and ligaments. This increases the elasticity which will help prevent muscle pulls and strains	
Avoid overstretching	Stretching should be completed carefully without overstretching or bouncing as this can result in a muscle strain	
Avoid overtraining	If you train too hard adaptations will not take place e.g. lifting too heavy weight can cause an injury such as a strain	
Take adequate rest	Training programmes should include rest days. Make sure you have enough resting between sessions to allow for recovery	
Use taping or bracing	When necessary taping and bracing can be used to provide additional support to joints and muscles. E.g. an ankle support can reduce the chance of a twisted ankle (sprain)	
Remain hydrated	Maintain an appropriate level of hydration by drinking water. If you don't maintain your hydration levels you can become dehydrated, this can lead to dizziness and nausea	
Wear appropriate clothing and footwear	This may include non-slip footwear such as boots to prevent ankle injuries Gum shield in rugby to protect the teeth in boxing and rugby Shin pads to reduce the impact on the shins in football and hockey	
Use correct technique	When completing any activity, using correct technique will lead to better results. Help avoid injury by using the correct technique when lifting weight or throwing the javelin	

Paper 1: High altitude training

High Altitude training as a form of aerobic training:

There are fewer air molecules at altitude. This means there is less oxygen available to take into our body. This means there is less oxygen available to get to the working muscles. The body's oxygen carrying capacity is reduced at high altitude.

When an athlete first tries altitude training their performance will be worse. However, after several weeks of training at high altitude their body will adapt:

- Increasing red blood cells
- Increasing haemoglobin

When they return to sea level, they will have an advantage because their oxygen carrying capacity will have increased



Benefits of high-altitude training:

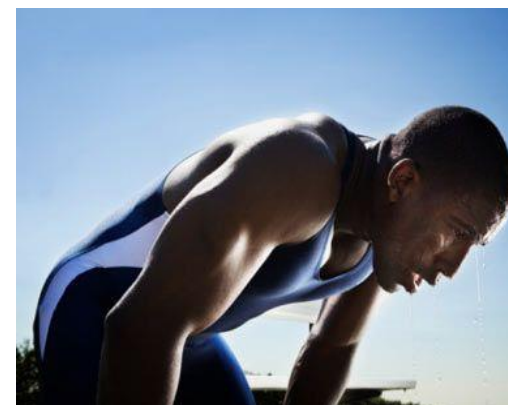
- Increased red blood cell production
- Increased oxygen carrying capacity
- A greater amount of oxygen being transported to the working muscles once athletes return to sea level

These benefits are particularly helpful to endurance athletes who rely on aerobic energy production for example marathon runners and triathletes



Limitations of high-altitude training:

- Adaptations take time
- Expensive to live away from home
- Timing of training for competition needs careful planning
- Altitude sickness (nausea caused by training at altitude)
- Limited to aerobic activities (no effect on anaerobic events)
- Can make it harder to train at high intensities need for anaerobic activities



Paper 1: Seasonal aspects

Pre-season (preparation phase):
This is the period up to competition:

Training includes:

- Develop techniques specific to the sport
- General fitness training such as continuous, fartlek or interval training sessions to increase aerobic fitness
- Weight training to build up strength and muscular endurance

Benefits:

- Fitness and skill lost during post season can be regained
- Skills and techniques can be improved. This means matches at the start of the season are more successful



Competitive-season (peak):
This is the playing season

Training includes:

- Taking part in matches every week
- Maintenance of fitness related to activity
- Limited training, as it may cause fatigue which would decrease performance
- Concentration on skills, set plays and tactics to improve performance

Benefits:

- Fitness levels and quality of performance can be maintained throughout the season



Post-season (transition phase):
This is the period of rest, active recovery and light aerobic work after the competitive season

Training includes:

- Rest to recover from the competitive season
- Light aerobic exercise, to maintain a level of general fitness

Benefits:

- Athletes are fully rested, ready for pre-season
- Not too much fitness is lost



Paper 1: Warm-up and cool-down

Warm-up:

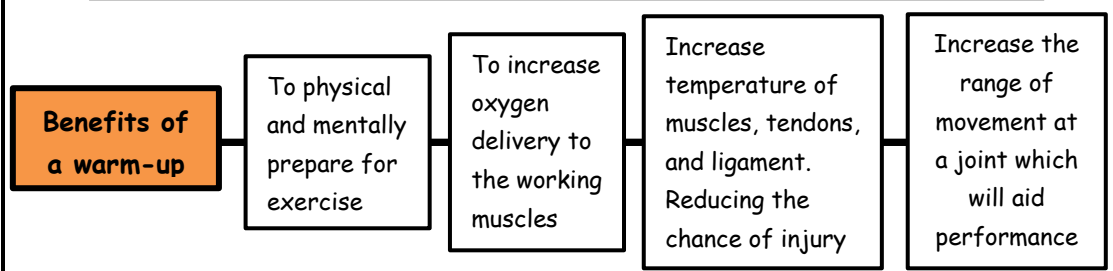
A warm-up has three phases:

Warm-up

Phase 1 Pulse raiser
To raise the heart rate and speed up oxygen delivery to the working muscles.
E.g. jogging a lap of the pitch

Phase 2 Stretching
Stretching the muscles and soft tissues you are about to use increases their elasticity and range of movement

Phase 3 Drills
These are more intense practices relating to the main session, such as dribbling if you are playing basketball



Cool-down

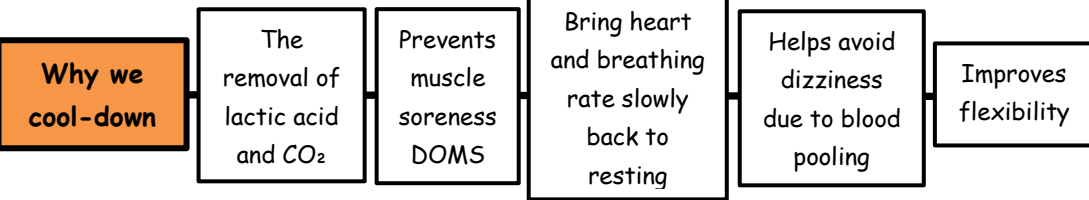
A cool-down has two phases:

Cool-down

Phase 1 Light exercise
e.g. slow jogging at a much lower intensity you have been working

Phase 1 Stretching
Stretch the muscles you have used in the main activity

Why we cool-down



The removal of lactic acid and CO₂

Prevents muscle soreness DOMS

Bring heart and breathing rate slowly back to resting

Helps avoid dizziness due to blood pooling

Improves flexibility

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

Paper 1: Use of data

The use of data:

Data can be collected in many ways.

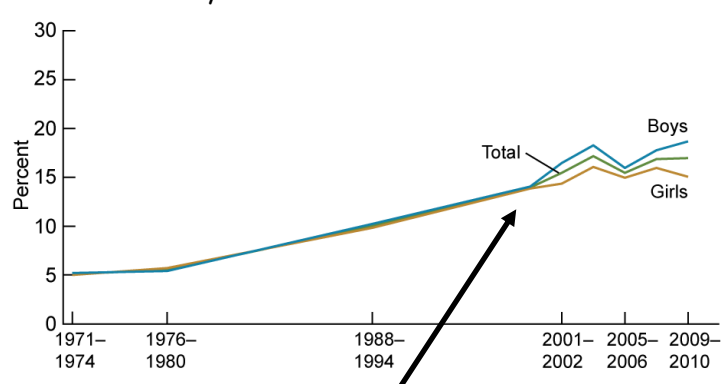
- Data can be collected on the quality that you see, e.g. how well a skill is performed which is called **qualitative** data it can be collected by interviews or observations. It is personal opinion not fact
- Data can be collected based on numbers e.g. how many press-ups completed which is called **quantitative** data it can be collected by questionnaires or surveys

Below is a table showing lots of data in normative table for the vertical jump test. There are lots of numbers but all you have to do is locate the age group and the score. For example, a female scored 44 cm

rating	males (cm)	females (cm)
excellent	> 70	> 60
very good	61-70	51-60
above average	51-60	41-50
average	41-50	31-40
below average	31-40	21-30
poor	21-30	11-20
very poor	< 21	< 11

Trends

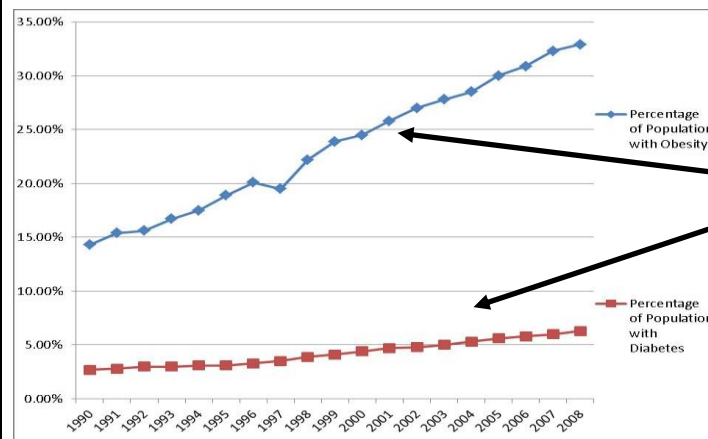
Below is a graph showing trends in obesity of young children aged 2 -19. You will need to analyse the date and identify the trends in data



The overall trend is that obesity is rising steadily from 1971-1974 to 2009-2010. It has risen from 5% to 15%. Boys are more obese than girls

Graphs and Charts

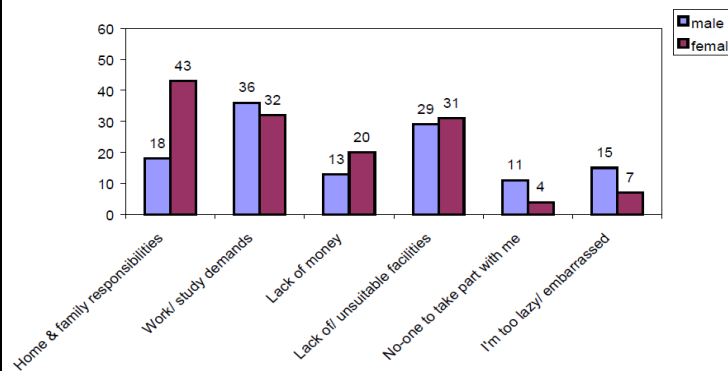
Some information that happens over time will be represented as a line graph, such as the correlation between obesity and diabetes over time. See below



Obesity and diabetes have both risen from 1990-2008.

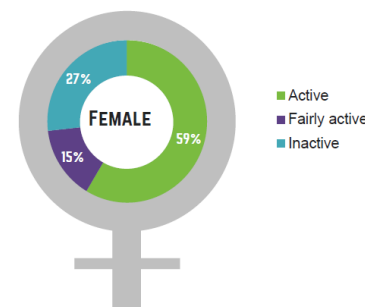
Obesity levels have risen at a greater rate than diabetes

In information that compares different categories of data may be represented in a bar graph, such as the reason why males and female don't take part in physical activity.



Females find home & family, lack of money and unsuitable facilities reasons why not to take part in physical exercise

If you are trying to compare parts of a whole you may use a pie chart such as a pie chart to show the percentage of women who are active, fairly active and inactive.



59% of females are active
15% are fairly active
27% are inactive