GCSE Physical Education – Principles of Training

Principles of training - **Guidelines** that ensure **training is effective** and results in **positive adaptations**. These principles are used in **Personal Exercise Programmes (PEP)**

PAR-Q – Physical Activity Readiness Questionnaire
Conducted before fitness testing or an activity programme to examine the performer's readiness for training or any health conditions/lifestyle choices that may affect the successful completion.

1. FITT Principle

Frequency	How often training takes place.	*Increase training from once a week to two*
Intensity	How hard the exercise is.	*Increase resistance from 10kg to 15kg or increase incline on the treadmill.*
Time	The length of the session.	*Increase training session from 45 minutes to 55 minutes.*
Type	The method of training used.	*Change to from interval training to Fartlek training.*

3. Progressive Overload

Working the body harder than normal/gradually increasing the amount of exercise you do. *i.e. bench press 50kg x 10 repetitions and increase to 55kg x5 repetitions.*

4. Reversibility

If training is not regular, adaptations will be reversed. This can happen when:

- Suffering from illness and cannot train
- Injury
- After an off-season.

2. Specificity

Training showed be **matched** to the requirements of the sport or position the performer is involved in.
Training must be specifically designed to develop the right:

- Muscles
- Type of fitness
- Skills

5. Individual needs

All PEP's would differ depending on:

- Performer's goals/targets
- Strength and weaknesses
- Age/gender
- Current health/fitness levels

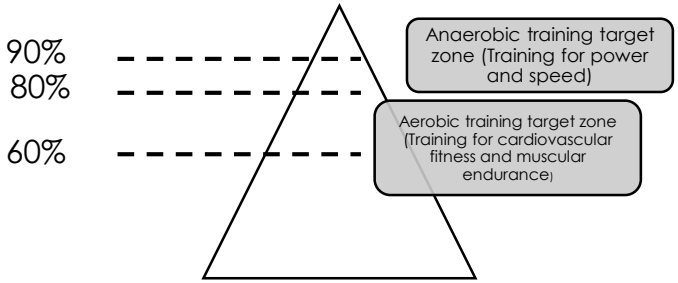
6. Overtraining

Occurs when you **train too hard** and do not allow the body enough **rest/recovery time**. Signs/symptoms include: extended muscle soreness, frequent illness & increase injuries.

7. Thresholds of Training

Karvonen formula used to calculate aerobic and anaerobic target training zones.

Maximum Heart Rate (MHR) = 220 – age	**Aerobic target zone: 60–80% of MHR (60% = x 0.6 / 80% = x 0.8)**	**Anaerobic target zone: 80%–90% of MHR (80% = x 0.8 / 90% = x 0.9)**



GCSE Physical Education – Components of Fitness

Health – A state of complete mental, physical and social well-being. Not merely the absence of disease or infirmity.
Fitness - The ability to meet the demands of the environment.
Exercise - A form of physical activity done primarily to improve health and/or fitness. Not competitive sport.
Performance – How well a task is completed.

Relationship between these:
- Regular **exercise** increases general **health & fitness**.
- High levels of **fitness** can in turn have a positive impact on **performance**.

It is possible to be fit but not healthy!

Health Related Components of Fitness

Component	Definition	Sporting Example
Body Composition	The percentage of a body that is fat, muscle, bone and water. *Long distance runner need low body fat otherwise the would expend too much energy carrying the extra weight and fatigue quicker.*	
Muscular Strength	The amount of the force muscles can generate against a resistance. *To lift a teammate higher than opponent in a rugby lineout.*	
Muscular Endurance	The ability to use voluntary muscles, over long periods of time without getting tired. *Cyclists need to use their leg muscles repeatedly without fatigue.*	
Flexibility	The range of movement at a joint. *A gymnast needs flexibility to get into an aesthetically pleasing position to gain a higher score from the judges.*	
Cardiovascular Fitness (Aerobic Endurance)	The ability to exercise the entire body for long periods of time (get O2 to working muscles). *A footballer needs high levels of CVF to get around the pitch for 90 minutes without fatigue.*	

Components of Fitness

Component	Definition	Sporting Example
Coordination	The ability to move two or more body parts at the same time. *To hit the ball in the middle of the racket for power and accuracy.*	
Reaction Time	The time taken for a response to occur after a stimulus. *A goalkeeper when a shot is deflected needs good reaction time.*	
Agility	The ability to change direction at speed. *Dribbling <u>around</u> an opponent. (Dodging)*	
Balance	The ability to keep the body steady when in a static position or when moving. Static balance/dynamic balance.	
Speed	The time taken to cover a set distance/complete a movement. *A boxer need quick hands to land a punch.*	
Power	The ability to combine speed and strength. *To jump up higher than opponent to catch a ball in netball.*	 

GCSE Physical Education – Fitness Testing

Muscular Strength

Test: Hand Grip Dynamometer Test
Protocol: Grip the dynamometer in one hand. Start with your hand up and bring down to side while pulling in handle. No swinging your hand.

Advantages	Disadvantages
• Simple and easy to complete	• Only one size of dynamometer which may affect reading. • Focuses solely on forearm strength.

Muscular Endurance

Test: 1 minute sit up test

Test: 1 minute press up test

Protocol: Complete as many full sit ups/press ups as possible in 1 minute.

Advantages	Disadvantages
• Simple test to complete • Minimal equipment needed.	• Difficult to assess whether each repetition is performed correctly. Difficult to accurately measure large groups.

Flexibility

Test: Sit and Reach Test
Protocol: Sit with legs straight out in front and soles of feet against box/table. Reach forward without bending knees. No jerking movements.

Advantages	Disadvantages
• Quick and easy to perform. • Data table readily available for comparison	• Can cause injury if not fully warmed up appropriately. • Only measures flexibility of lower back and hamstrings.

Cardiovascular Fitness (Aerobic Endurance)

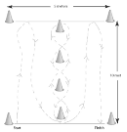
Test: 12 min Cooper Run/swim
Protocol: Continuously run/swim for 12 minutes. Distance recorded.

Advantages	Disadvantages
• Minimal equipment needed • Test can be self administered.	• Inaccuracy of heart rate measurements • Motivation dependant

Test: Harvard Step Test
Protocol: Step continuously for 5 minutes. Measure heart rate at 1, 2 and 3 minutes after exercise.

Advantages	Disadvantages
• Simple test to complete	• Motivation dependant

Agility



Test: Illinois Agility Test
Protocol: Start lying down at the start line. Complete course as quick as possible (10m x 5m – 4 central cones)

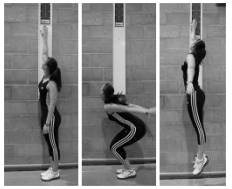
Advantages	Disadvantages
• Simple and easy to complete	• Motivation dependant / Timing errors.

Speed

Test: 30m Sprint Test
Protocol: Start from stationery position. Complete distance in the quickest possible time. Time is stopped when chest crosses the line.

Advantages	Disadvantages
• Quick test to complete. • Minimal equipment needed and can be performed anywhere with a flat 50m run.	• Running surfaces/weather conditions can affect the results. • Inaccuracies with stopwatch usage.

Power



Test: Vertical jump Test
Protocol: Stand next to wall and mark an initial reach while feet are flat on the ground. Standing jump to reach as high as possible. Measure distance from first mark to second.

Advantages	Disadvantages
• Quick and easy to perform. • Easy to complete with large groups.	• Technique plays are large role in successful completion.

Reliability /Validity

Validity relates to whether the test actually measures what it sets out to measure.
Reliability is a question of whether the test is accurate. It is important to ensure that the procedure is correctly maintained for ALL individuals.

<u>Results can be improved:</u>

- By using experienced testers & calibrating equipment
- Ensuring performers have the same level of motivation to complete each test
- Repeatedly test to avoid human error (x3)

GCSE Physical Education – Methods of Training

1. Continuous training - Involves a steady but regular pace at a moderate intensity (aerobic) which should last for at least 20 minutes. i.e. running, walking, swimming, rowing or cycling.
Used by a **marathon runner** to improve **<u>cardiovascular fitness</u>**

Advantages	Disadvantages
• Ideal for beginners • Highly effective for long distance athletes	• Can be extremely boring as repetitive

2. Fartlek training – Referred to as **'speed play'**
This is a form interval training but without rest.
Involves a variety of changing intensities over different distances and terrains.
i.e. 1 lap at 50% max, 1 lap walking, 1 lap at 80% (aerobic and anaerobic used)
Used by **games players – Hockey players**
Fartlek training will improve **<u>cardiovascular fitness</u>**

Advantages	Disadvantages
• More enjoyable than interval and continuous training • Good for sports which require changes in speed • Easily adapted to suit the individuals level of fitness and sport.	• Performer must be well motivated particularly when intensity is high • Difficult to assess whether performer is performing at the correct intensity

3. Weight/Resistance training – A form of training that uses progressive resistance against a muscle group. Used by **cyclists**.
Muscular strength: High weight x low repetitions
Muscular endurance: Low weight x high repetitions

Advantages	Disadvantages
• Variety of equipment to prevent boredom • Strengthens the whole body or the muscle groups targeted. • Can be adapted easily to suit different sports	• Requires expensive equipment • If exercises are not completed with the correct technique it can cause injury to the performer

<u>Fitness classes</u>
Body pump – Weight based exercise class
Aerobics – Rhythmical dance movements set to music
Pilates/Yoga – Series of movements completed to core muscle strength & posture
Spinning – A high intensity workout on a stationery bike.

Advantages	Disadvantages
• Variety avoids boredom • Instructor will challenge & motivate • Great way to meet new people	• Gym membership can be expensive. • Group classes are not tailored to individual needs.

4. Interval training - Involves periods of work followed by periods of rest. *i.e. Sprint for 20 metre + walk back to start.* Used by a **200m sprinter.**
Interval training **at high intensity will increase speed**, (AO1) so the sprinter can complete the race in a quicker time (AO2)
Interval training can also develop CVF if the work intervals are longer.

Advantages	Disadvantages
• Quick and easy to set up. • Can mix aerobic and anaerobic exercise which replicates team games.	• It can be hard to keep going when you start to fatigue (high motivation and self discipline needed) • Over training can occur if sufficient rest is not allowed between sessions (48 hours)

5. Plyometric training
Involves high-impact exercises that develop **power**. *i.e. bounding/hopping, squat jumps.* Used by **long jumpers**, **100 m sprinters** or **basketball players**.

Involves the muscles lengthening and then followed by a rapid contraction. **<u>Develops Explosiveness.</u>**

Advantages	Disadvantages
• Easy to set up requiring little or no equipment • Hugely effective in developing power	• Can result in injury if not fully warmed up. • Can place a great stress on joints and muscles.

6. Circuit training - A series of exercises completed one after another. Each exercise is called a station. Each station should work a different area of the body to avoid fatigue.
i.e. press ups, sit ups, squats, shuttle runs.

Advantages	Disadvantages
• Quick and easy to set up • Easy to complete with large groups • Can be adjusted to be made specific for certain sports. *i.e. netball specific circuit* • Can develop any chosen component of fitness	• Technique can be affected by fatigue and can increase risk of injury • Must have motivation and drive to complete the set amount of repetitions and sets.

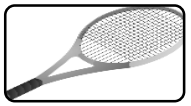
GCSE Physical Education – Performance-enhancing dugs, injury and prevention

Injury prevention – to prevent injury performers and coaches should recognise and identify risks and reduce them.


Using the right principles of training to over overuse injuries

Understand and following the rules of the sport during play


Using appropriate protective clothing and equipment


Checking the equipment and facilities


Following a full warm up and cool down

Performance Enhancing Drugs (PEDs)

The rewards that come with winning are so great that athletes are increasingly temped to cheat. Fame, money and pressure are commonly cited despite the health risks or even death.

Drug	Reason for athlete taking this	Health risk	Sporting example who might use it
Beta Blockers	Slows heart rate, calms and steadies hands	Lowers blood pressure and oxygen delivery to muscles	Target sports 
Anabolic Steroids	Promote muscle growth and promotes a faster recovery time	High blood pressure, aggressive behaviour & develops male features	Power Events - 100m 
Narcotic Analgesics	Masks pain and increase pain threshold	Vomiting, addiction and liver/kidney damage	Any athlete wanted to mask pain.
Diuretics	Rapid weight loss from removal of fluids. Masks other PEDs	Dehydration, nausea and headaches. Heart and kidney failure.	Jockey Boxing 
Stimulants	Increased alertness and reduce tiredness	Heart rate irregularities & increased aggression.	Boxing 100m sprinter
Peptide Hormones	**EPO** – increase Red Blood Cell production **Growth Hormone** – increase muscle mass	Increased blood thickness/blood clot Abnormal growth	 

Blood doping – a method of artificially increasing red blood cell count – increases endurance.

Injuries

Soft tissue injuries

Strain – Pulled or overstretched **muscle**.

Sprain - Twisted or wrenched ligament **(joint).**

Treatment for strain and sprain = **RICE** (Rest, Ice, Compression, Elevation)


R – rest the injured part.


I - Apply ice to reduce the swelling for a maximum of 10 minutes.


C – Compress the injured area using a bandage.


E – Elevate the injured part to decrease the blood supply.

Golfers Elbow/Tennis Elbow – overuse injury caused by inflamed tendons that attach muscles to the elbow joint. Symptoms also include soreness and pain. Tennis – outside of elbow and Golfer – inside of elbow.

Abrasions – minor injuries to the surface of the skin. *i.e. a graze.* Symptoms are a hot/burning sensation, redness and occasionally some light bleeding. Treatment – clean and cover with a low adhesive dressing.

Torn Cartilage – This can occur when a joint is twisted excessively. This is commonly caused when players change direction quickly. Treatment – ice and surgery

Concussion – An injury to the brain caused by a knock to the head. Common in contact sports. If an athlete is concussed, they may:

- Become unconscious.
- Feel sick, dizzy or drowsy.
- Get confused, stare & suffer memory loss.

Dislocation - a sudden impact on a joint can cause the bones that meet to become disconnected.

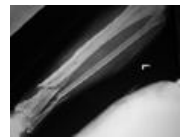
Fracture – a broken bone.

Open/compound/complex fracture – bone through the skin

Closed/simple fracture – bone remains in the skin.

Greenstick fracture – bone bends (younger children)

Stress fracture - repeated or prolonged forces against the bone



GCSE Physical Education – Diet, Weight, Nutrition & Hydration

A balance diet – eating the right foods in the correct proportions. Insufficient macro and micronutrients can cause health issues *i.e. anaemia, rickets and scurvy.*

7 components of a balanced diet:

Macronutrients

- Carbohydrates – Main energy source. i.e. pasta & potatoes
- Fats – Secondary energy source & provides insulation. i.e. butter
- Proteins – Help growth and repair of muscles. i.e. eggs, meat & fish

Micronutrients

- Minerals – Maintains a healthy bodily functioning. i.e. iron and calcium
- Vitamins - Maintains a healthy immune system. i.e. vitamin C/D

Other components

- Fibre – Aids digestion of food in the gut. *i.e. cereals & nuts*
- Water – Maintains hydration of an athlete.

Dietary manipulation to optimise performance

Carbohydrate Loading – a strategy used by endurance athletes to **maximise** carbohydrate stores prior to event. For most recreational activity, your body uses its existing energy stores for fuel. But when you engage in long, intense athletic events, your body needs extra energy to keep going.

- Increase carbohydrate intake 1-4 days prior to race whilst tapering back your training.

Protein intake – the intake and timing of this consumption is vital to maximise the repair of muscle tissues after training. Protein **should be take straight away** to increase muscle repair. Used by **sprinters, shot putters & power events**.

Hydration and physical activity

Water is necessary for:
- Transportation of nutrients
- Removes waste products through urine
- Regulates body temperature

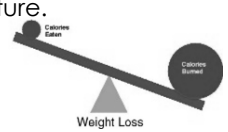
The body must sweat to reduce body temp (evaporate heat). Therefore, water is lost. Reducing blood volume.

A lack of water can cause **dehydration**. Symptoms are tiredness, lack of concentration, muscle cramps, dizziness, nausea and increased heart rate.

After the event - An athlete will continue to drink fluids to replace the water and carbohydrate levels that are depleted.

Organising meals around exercise – it is recommended to eating 2-3 hours before exercise. This is due to redistribution of blood during exercise (Blood Shunting). When exercising, the distribution of blood around the body changes according to the demands. *i.e. away from digestive system and to working muscles.*

Energy Balance – this relates to intake and energy expenditure.



Optimum Weight – this is the ***ideal weight*** someone should be. This will depend on:
- Height
- Gender
- Bone structure
- Muscle girth (size)

Optimum weight varies depending on the requirements of different sports/positions.
i.e. rugby forwards & backs

GCSE Physical Education – Health, Fitness and Well-Being

Lifestyle choices – the decisions we make about how we live and behave that impact on health.

Diet

Eating healthy	Eating unhealthy
1. Boosts energy levels 2. Reduces the risk of developing serious health conditions 3. Help lose weight	1. Leads to deficiencies 2. Increases weight and % body fat 3. Causes depression with poor body shape

Activity levels

Active lifestyle	Inactive lifestyle
1. Boosts self esteem 2. Reduces stress and anxiety 3. Improves fitness levels	1. Increases risk of disease 2. Decreases muscle mass, strength and energy levels

Work/rest/sleep balance

Good balance	Poor balance
1. Improves mood 2. Increases productivity at work 3. Contributes to quality of sleep	1. Increases the risk of depression 2. Leads to weight gain 3. Increased blood pressure

Well being – a combination of physical, emotional and social health.

Positives effects of training/exercise on:

Physical health
- Stronger bones (increased bone density)
- Lower cholesterol / reduced obesity
- Increase/development of components of fitness
- Increase life expectancy

Emotional health
- To increase self esteem/confidence – increased endorphins released
- Reduced risk of age-related diseases - dementia
- Relieve stress and tension
- Fun/enjoyment / reduced boredom

Social health
- To develop teamwork skill
- To meet new people/friends
- Develop communication skills
- Develop leadership skills

Social benefits may vary depending on age group:
1. Elderly
2. Children

Negative effects of training on:
- Physical health – overexertion leading to heart failure / overuse injuries
- Emotional health – training can lead to injury and cause depression
- Social health – training long hours means less time spent with family.

Recreational drugs – these are taken for pleasure and are legal to those over a certain age.

Smoking

Causes breathlessness and reduces the oxygen-carrying capacity. This affect aerobic ability for endurance events. Smoking (nicotine) increases the risk of lung cancer, bronchitis, pneumonia & emphysema.

Alcohol - contains chemicals which act on the brain affect judgement

Balance, co-ordination and reactions are affected

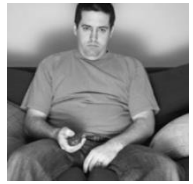
Diuretic – increased water levels in urine and cause dehydration.

Reduction of glycogen levels and slower lactic acid removal

Liver problems

Sedentary lifestyle – a lifestyle with no or irregular physical activity. This includes sitting, reading, watching television & playing video games.

Health risks associated are:



- Heart disease
- Type 2 diabetes
- Obesity
- Osteoporosis
- Depression

Impact of a sedentary lifestyle on weight

Overweight – weighing more than the expected weight for height and gender / **Overfat** – high percentage of body fat

Obese – excessive fat accumulation.

GCSE Physical Education – Health, Fitness and Well-Being	
Term	**Definition/notes/concept**
Bronchitis	**(Bronchitis** is an inflammation of the lining of your bronchial tubes, which carry air to and from your lungs). Smoking Increases risk of bronchitis (1) by causing an infection of the main airways/bronchi in the lungs (1) due to breathing in the chemicals in tobacco smoke (1).
Lung cancer	Smoking increases risk of lung cancer (1) as chemicals in the smoke enter the lungs (1) and damage the cells that line the lungs (1).
Emphysema	(A condition in which the air sacs of the lungs are damaged and enlarged, causing breathlessness). **Smoking** Increases risk of emphysema (1) by killing the cilia (1) so that they are not available to clear toxins from the airways (1).
Cholesterol	**High**-density lipoprotein (**HDL**) **is** positively associated with a decreased risk of coronary heart disease (CHD). Blood levels of **Low**-density cholesterol (**LDL**) are often assessed when evaluating the risk of future heart disease. - Heavy drinking can significantly increase LDL. **- Cigarette smoke** raises levels of LDL, or "bad" **cholesterol**, and a blood fat called triglycerides. Those cause waxy plaque to build up in your arteries. At the same time, it lowers HDL, or "good" **cholesterol**
Type 2 Diabetes	**Type 2 diabetes is a common condition** that causes the level of sugar (glucose) in the blood to become too high. **It's caused by problems with a chemical in the body (hormone) called insulin.** It's often linked to being overweight or inactive.
Depression	**Depression** is a common mental disorder that causes people to experience **depressed** mood, loss of interest or pleasure, feelings of guilt or low self-worth, disturbed sleep or appetite, low energy, and poor concentration.
Osteoporosis	**Osteoporosis** is a condition that weakens bones, making them fragile and more likely to break. Weight bearing activity can help reduce the risk.
Cirrhosis	Drinking alcohol can cause liver damage. Such as cirrhosis. This because normal liver tissue is replaced by scar tissue, which causes liver cells to die, making it harder to function.

GCSE Physical Education – Sports Psychology (1)

Classification of skill

Skills are specific tasks that can be learnt and practiced. *i.e. Golf swing / Lay up / Tennis volley*

Continuum = sliding scale of extremes at each end

Environmental influence – Open/Closed Continuum

OPEN

CLOSED

- Unpredictable
- Need to make decisions

- Predictable
- Set routine
- Very little decision making

Difficulty - Complex/Basic Continuum

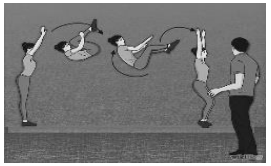
COMPLEX

- High level of decision making
- Difficult to perform
- Need to concentrate

- Easier to perform
- Little focus required
- Smaller cognitive element

Organisation Level - Low/High Continuum

LOW ORGANISED



HIGH ORGANISED

- Can be broken down into subroutines
- Can practice each part separately

- Cannot be broken down – it has to be practiced as whole.

Types of Practices

Massed practice: When no rest intervals are given.

+ learn skills quickly
+ movement pattern is grooved (get the feel for the skill)
+ Good for advanced performers
- Can be boring
- Physically hard work

Distributed practice: When a rest interval is given to allow recovery, feedback & coaching.

+ Prevents boredom
+ Chance for Feedback
+ Allows for rest
- Takes time to learn a skill
- Lose focus/momentum
- Doesn't build muscle memory

Fixed practice: Uses repetition of the same activity to develop consistency in performance.

This practice is best with **closed skills.**

Allows movements/skills to be perfected.

Varied/Variable practice: Involves or performing a skill in different situations where conditions are changeable.

Best suits the development of **open skills**, for example, catching the ball when playing against an opposition

Guidance

Visual guidance: Learners are shown the whole action by the coach. *i.e. demonstration/ use of video playback.*

+ learners see what the skill looks like and can copy
+ good for large groups
- If demonstration is poor, incorrect movement can be learned
- Complex/quick movements can be hard to see clearly.

Verbal guidance: Learners listen to information given to a performer often using associated terminology. *i.e. instructions told to a team.*

+ can be used during performance
+ no costly equipment needed
+ coach can provide specific feedback
- Some skills are difficult to explain.
- Relies on good communication skills.

Manual guidance: Coaches will physically move a performer and support them in performing a skill. *i.e. Trampolining somersault support.*

+ can help bredk a movement into phases
+ the performer can get a feel for the movement
+ Can build confidence
+ Can reduce danger
- Performer can become dependent on support
- Can only be used 1:1
- Performer may feel uncomfortable with contact from

Mechanical guidance: Learners use equipment to help support the practicing of a skill. *i.e. floats during swimming stroke development.*

+ Can build confidence
+ Can reduce danger
- Performer can become dependent on support
- Feeling is not the same as actually doing it.
- Performer can become dependent on support

GCSE Physical Education – Sports Psychology (2)

Feedback

Vital part of information processing which provides confidence, motivation and improves performance.

Intrinsic feedback: This comes from within the performer. Kinaesthetic senses provide feelings from muscles/joints about the action.
- A novice performer may not know what the 'right movement' actually feels like.
+ Performers are able to self correct and improve performance without coach.

Extrinsic feedback: This comes from results and match analysis. 1.Knowledge of results – the outcome 2.Knowledge of performance
+ Important feedback as it can motivate performers to improve and learn from their practice.
+ Important for beginners.

Concurrent feedback: Information provided to the athlete during the performance. This can be intrinsic or extrinsic feedback. For an example, an experienced swimmer could adjust their movements during a race., or a coach may give a footballer direction (tactics) during the game from the touchline.

Terminal feedback: Information provided to the athlete after the performance. Sometimes feedback cannot be given during the performance e.g. Long jump.

Mental Preparation for Performance

Mental rehearsal/Imagery involves the athlete imagining themselves in an environment performing a specific activity using all of their senses.

This can be used to:
- **Familiarise** the athlete with a competition site or a complex play pattern or routine.
- **Motivate** the athlete by recalling images of their goals or of success in a past competition.
- Block out crowd – **improve focus.**
- **Reduce negative thoughts** by focusing on positive outcomes. Increase confidence. Reduce anxiety.

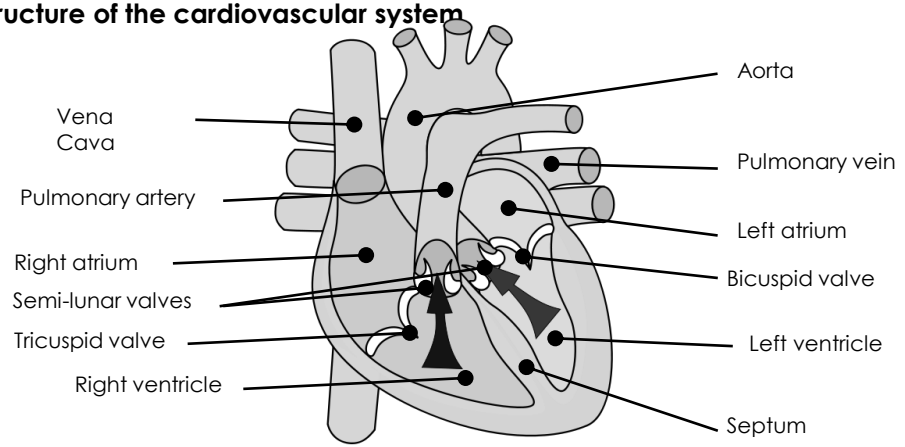
SMART Targets
- Short Term goals
- Long Term goals

Benefits of SMART Goals:
- Motivation
- Improve focus
- Increase task persistence
- Decrease stress
- Allow you to assess progress

Specific	Measureable	Achievable	Realistic	Time-Bound
Targets must be concise. ***"To take a 0.5 second off my time personal best time"***	Must be measured and compared. ***"I will time my runs every training session for the next five weeks of training"***	Target must be challenging but yet reachable. ***"My coach and I devised the training programme around improving leg power for my start"***	Matched to the performers skill level. ***"We agreed that a 0.5 seconds off my personal best is realistic for my current ability and status"***	Set for a particular time to be completed. ***"We agreed to do the training programme four times per week for the next five weeks"***

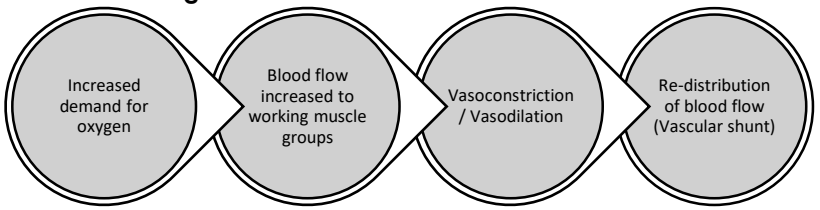
GCSE Physical Education – The structure and functions of the cardiovascular system

Structure of the cardiovascular system



Deoxygenated blood = **BLUE** (Right side)
Oxygenated = **RED** (Left side)

Vascular Shunting

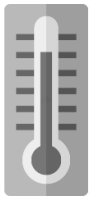


Vasoconstriction – NARROWING of the lumen

Vasodilation – Widening of the lumen

Functions of the cardiovascular system

- **Transport** of oxygen, carbon dioxide and nutrients
- **Clotting of open wounds** (protection)
- **Regulation of body temperature** – (vasoconstriction/vasodilation).

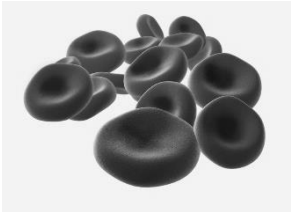


Blood vessels – function and characteristics

Arteries	Veins	Capillaries
1. Away from the heart 2. Oxygenated blood (except pulmonary artery) 3. Thick/elastic walls 4. High pressure 5. Small lumen	1. Back to the heart 2. Deoxygenated blood (except pulmonary vein) 3. Thin walls + larger lumen 4. Lower pressure 5. Valves	1. In the tissue 2. Site of gaseous exchange 3. Very thin walls

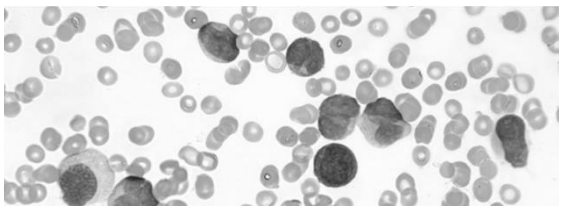
Components of blood – 1. Red blood cells

Carry oxygen from the lungs to the working muscles + Removes CO_2.
Haemoglobin binds the oxygen



2. White blood cells

Are part of the immune system and **fight disease** and infection.



3. Platelets & 4. Plasma

Platelets **clot blood** and form a scab around the site of injury. Therefore the athlete can continue.

Plasma is the **liquid/fluid** part of blood that allows it to flow. It **transports nutrients** to cells and helps remove waste e.g. urea.

GCSE Physical Education – Participation rates, Commercialisation & Deviancy

Participation rates – The number of people taking part in physical activity.

Age – The reason why different age groups participate can vary based on **access, cost, time available** and the **nature of the activity**.

Gender – Men and women can participate for different reasons including image, cost, time and society. Increased media coverage has helped remove many stereotypes.

Ethnicity – The number of **ethnic groups** (black, white & other minorities) playing sport are on the rise. Reasons for the difference include stereotypes, cost and cultural influences.

Disability – This can be a physical or mental impairment. Activities and rules are often adapted *i.e. Wheelchair tennis.* Other barriers include availability, cost and access.

Staying active from childhood into adulthood can improve quality of life.

Socio-economic group – This is determined by profession and available income. Factors include cost, availability and time. *i.e. golf is far more expensive to participate than athletics.*

Early involvement in sport is key to lifelong participation

Data – facts and statistics gathered to highlight information. Shown in table or graph format.

Trends - a general direction in which something is developing or changing.

Deviancy

Sportsmanship – the qualities of fairness and following the rules. *i.e. shaking hands after a match. PLAYING IN THE SPIRIT OF THE GAME!*

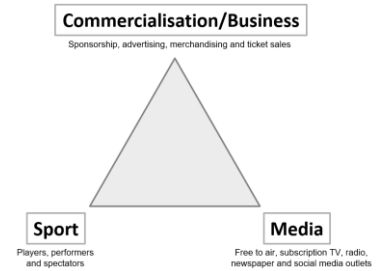
Gamesmanship – Bending the rules to gain an advantage *i.e. feigning injury to waste time*

Deviant behaviour – Behaviour that goes against the norms of society or the rules of a sport. This type of behaviour causes **negative role models**. *i.e. drug taking or biting a player*

Consequences:

1. Punishment – red card/sin bin/bans
2. Loss of sponsors / contracts with clubs
3. Damaging own reputation or club/country

Commercialisation - Sport, media and commercialisation are closely linked in a what is known as a 'GOLDEN TRIANGLE'



Sponsor

Advantages	Disadvantages
• Raise awareness of brand leading to increased sales/profit • Displays goodwill	• Poor behaviour from athletes/clubs causes negative media attention. Drop in sales and profit. • Smaller sponsors might struggle to compete with larger more global brands. • Some sponsors are not suitable to be promoted within sport. *i.e. tobacco*

Player/Performers

Advantages	Disadvantages
• Allows athletes to earn income as a full time job. • Can lead to additional roles post playing career within the sport.	• Encourages deviant behaviour due to the pressure of success. • Generally, favours male over female and able bodied over disabled. • Sponsorship might be short term.

Spectator

Advantages	Disadvantages
• Raises the profile of the sport due to increased exposure. • Changes to sport format/rules to make audience friendly.	• Tends to only support the popular sports. • The influence of TV has caused an increase in adverts and changed TV timings (traditions lost)

Advantages	Disadvantages
• Offers a wider choice of sports available to watch. • Viewing experience has ben enhanced due to technology	• Encourages spectating not participating. • Can become very expensive for fans/spectators. • Affects view experience - increased TV breaks.

GCSE Physical Education – Movement analysis

Levers – a rigid bar that moves around a pivot point with force applied to it.

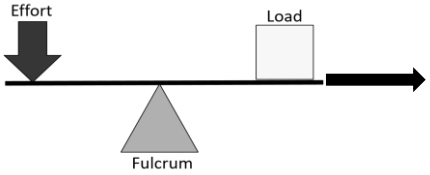
Fulcrum (F)	Effort (E)	Load (L)
A fixed pivot point 	The source of energy that will be applied 	The weight/resistance to be moved 

Classes of lever

First class lever:

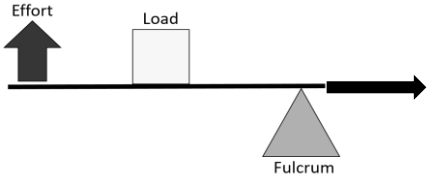
Can be a Mechanical advantage Or disadvantage depending On location of fulcrum.

Drawing

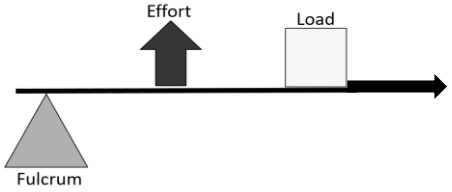


Example

Second class lever:
Mechanical advantage



Third class lever:
Mechanical disadvantage



Mechanical advantage
This is were a lever's **effort arm** is greater than its **load arm**.

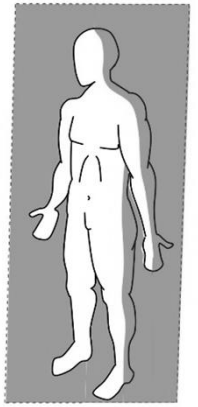
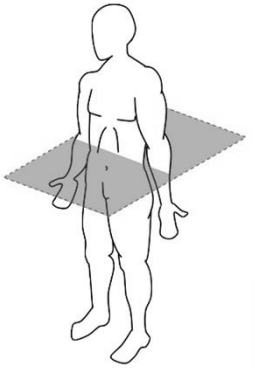
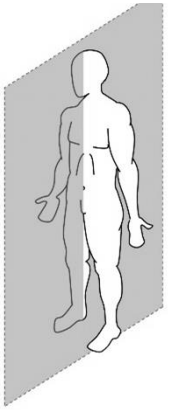
<u>Large loads can be moved with limited effort.</u>

Mechanical disadvantage
This is were a lever's **load arm** is longer than its **effort arm**.

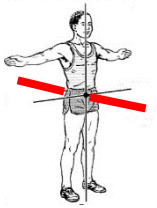
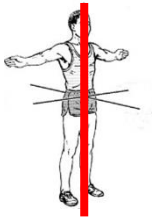
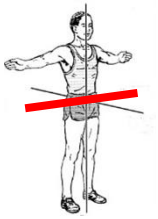
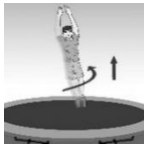
<u>Greater force need to be applied than the load to be moved.</u>

However, useful in sport as it allows a large range of movement – generating speed.

Planes – imagery lines that divide the body into two.

Frontal plane	Transverse plane	Sagittal plane
A vertical plane but this divides the body into **front** and **back.** 	A horizontal plane that divides the body into **upper** and **lower** halves. 	A vertical plane that divides the body into **right** and **left** sides. 

Axes – imagery lines that the whole body turns around.

Sagittal axis	Vertical axis	Frontal axis
Runs through the body horizontally from the back to front. 	Runs through the body vertically from the top to bottom. 	Runs through the body horizontally from the left to right. 
Example: Cartwheel 	Example: Full twist 	Example: Somersault 

GCSE Physical Education – Aerobic/Anaerobic and long term effects of exercise

Aerobic and Anaerobic exercise – two methods of energy production by the body (Energy: the capacity to do work)
Two factors determine which method is used: **Intensity & duration**

Aerobic energy production – takes place in the presence of oxygen

glucose + oxygen ➡ energy + carbon dioxide + water

Exercise intensity is moderate/low for a sustained period of
i.e. marathon runner/endurance cycling

By products are released as sweat and CO2 exhaled.

Anaerobic energy production – takes place in the absence of oxygen

glucose ➡ energy + lactic acid

Intensity of anaerobic activity is high as muscle contraction are powerful & quick time.
i.e. 100m sprinter/long jump

By product (lactic acid) builds up and causes fatigue.

Oxygen is required in aerobic energy production/not required in anaerobic respiration
<u>By-products</u> of aerobic respiration is carbon dioxide/water

Cardiovascular system
Cardiac equation – Cardia output = Stroke Volume (SV) x Heart Rate (HR)

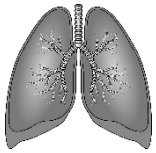
Long term effects of exercise

1. Cardiac hypertrophy – this is the increased size of the heart due to training. This impacts on the cardiac equation above.
   Lower <u>resting</u> HR - Increased <u>maximum</u> CO - Increased <u>resting</u> SV
2. Increased elasticity in the walls of arteries and veins – more efficient constriction and dilation.
3. Increased number of red blood cells – has capac carry more oxygen to working muscles.
4. Increased Capilliarisation.
5. Drop in resting Blood pressure.

Respiratory system

Long term effects of exercise

1. Increased capilliarisation – better blood supply **around the alveoli**.
2. **Increased number of alveoli** – results in better gaseous exchange (oxygen delivery and waste product removal)
3. **Increased strength of diaphragm and intercostal** muscles – this increased <u>tidal volume</u> and <u>vital capacity</u>.
4. Increased lung capacity



Skeletal system

Long term effects of exercise

1. **Increased bone density** – strong bones reduce the risk of injuries.
2. **Increased strength of ligaments and tendons** – allows the body to change direction quickly without injury occurring.

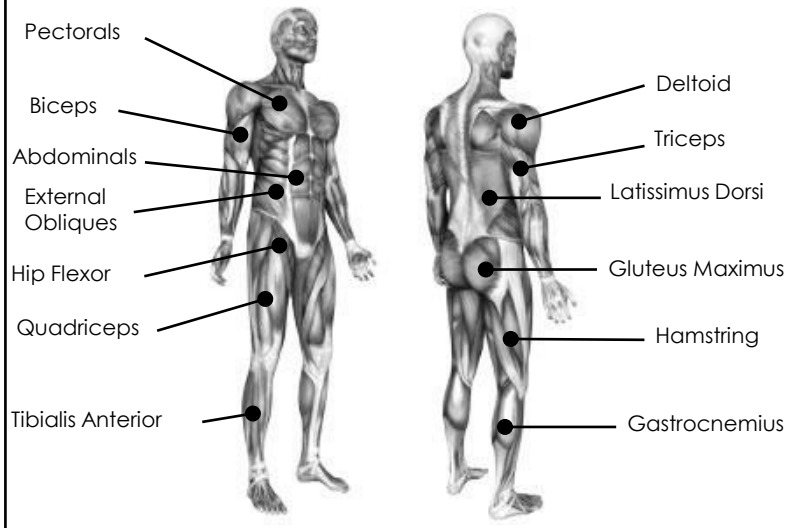
Muscular system

Long term effects of exercise

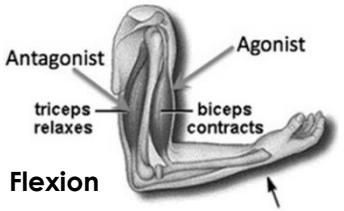
1. Muscular hypertrophy – increase in muscle size and strength/endurance.
2. Increase size and number of mitochondria – produces more energy aerobically.
3. Increased tolerance to lactic acid – reduces muscle fatigue.

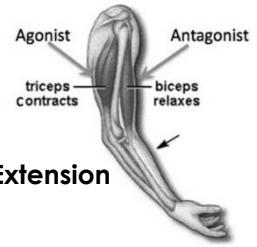
GCSE Physical Education – The structure and functions of the muscular system

Structure of the muscular system



Antagonistic pairs - Muscles are arranged in antagonistic pairs.
As one muscle contracts (shortens) its partner relaxes (lengthens) *i.e. Biceps and Triceps.*

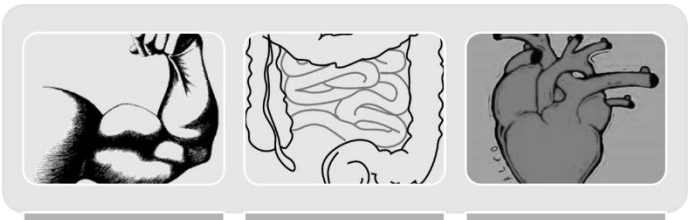




Agonist = the muscle that contracts to produce movement.
Antagonist = the muscle that relaxes to allow the movement to occur.

Examples in the body:
- Biceps & Triceps
- Quadriceps & Hamstring
- Hip Flexor & Gluteus Maximus
- Tibialis Anterior & Gastrocnemius

Types of muscle



Voluntary muscles enable movement throughout the body.

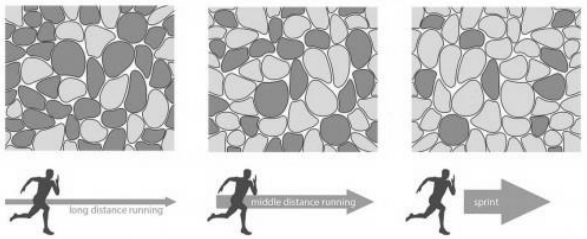
Involuntary muscles are essential in maintaining healthy body systems.

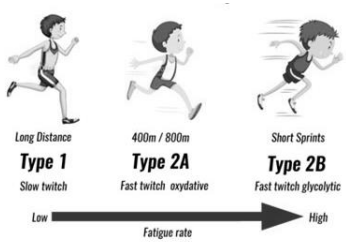
Cardiac muscle is vital in sport because it makes the heart pump. Fitness training will strengthen cardiac muscle making the heart more efficient at pumping blood around the body.

The **short term effects** of exercise on the muscles:
1. Working muscles produce heat
2. Increased muscle fatigue due to lactate accumulation
3. Blood is re-distributed to working muscles (Shunting)

Muscle fibre types

Slow twitch muscle fibres (Type I)	Fast twitch muscle fibres (Type IIa)	Fast twitch muscle fibres (Type IIx/b)
1. Smaller in size. 2. High aerobically capacity with high fatigue resistance. 3. Have a good oxygen supply = deep red in colour. Lots of myoglobin. 4. They contract slowly, but can work for long periods. **Marathon runner**	1. Larger in size 2. Work anaerobically & linked to high intensity activities. 3. Are paler in colour and have limited oxygen supply. 4. They contract quickly and powerfully, but tire easily. **400/800m runner (Extended high Intensity work)**	1. Large in size 2. Work anaerobically & linked to extreme high intensity activities. 3. Very high speed of contraction but low fatigue resistance. 4. Powerful contraction **100m Sprinter**

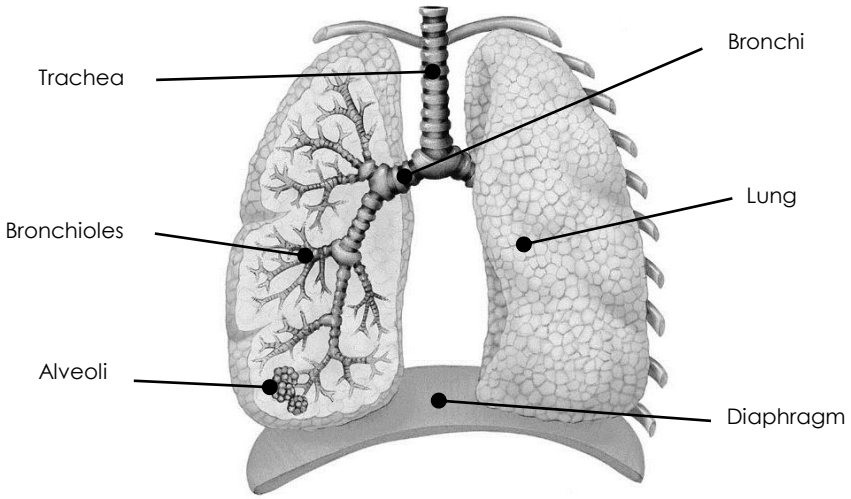




Link of the muscular and skeletal system – both systems work together to produce movement. *i.e. a contracting muscle pulls on a bone which changes the angle at a joint.*

GCSE Physical Education – The structure and functions of the respiratory system

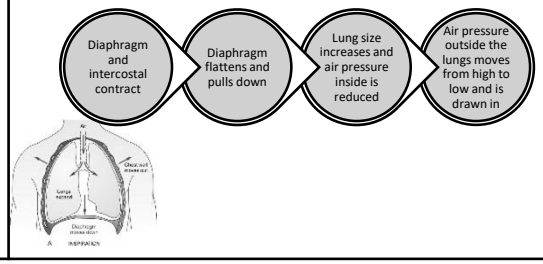
Structure of the respiratory system



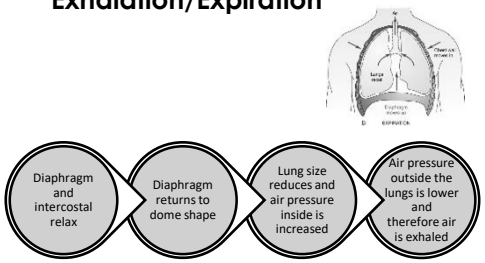
Composition of inhaled and exhaled air

Gas	Inhaled air	Exhaled air
Oxygen	21%	16%
Carbon dioxide	0.04%	4%
Nitrogen	78%	78%

Inhalation/Inspiration



Exhalation/Expiration



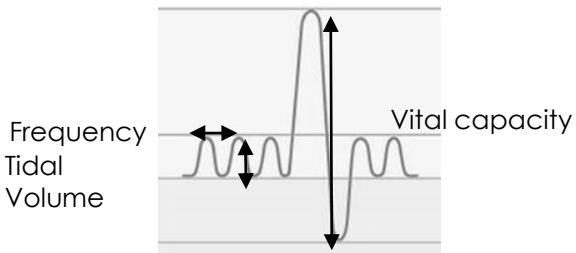
Respiratory values

Tidal Volume – the amount of air inhaled and exhaled per breath. Resting value = 500ml

Vital Capacity – The maximum amount of air exhaled following a maximal breath in.

Frequency – The number of breaths taken per minute. Resting value – 12-20 breaths.

Minute Ventilation – The amount of air inhaled and exhaled per minute. Measured in litres.

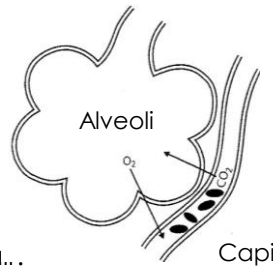


Gaseous exchange at the alveoli

- Diffusion is the movement of molecules from an **area of high concentration to a low one. (Pressure Gradient)**
- The alveoli have **thin moist walls** to allow diffusion to occur.
- Capillaries are **closely wrapped** around the alveoli to reduce the distance o diffusion and increase efficiency.

During inhalation:

- The concentration of **oxygen** is air is higher than the alveoli.
- The concentration of **carbon dioxide** in the blood is higher than that in the a…



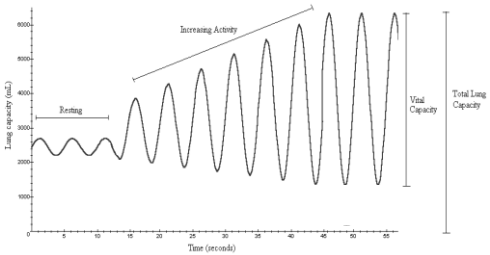
During exercise

Gaseous exchange increases as the intensity of the activity increases to cope with:

- An increase demand for oxygen at working muscles
- An increase in carbon dioxide production and the need to rid this waste product.

Frequency ↑ + Tidal Volume ↑

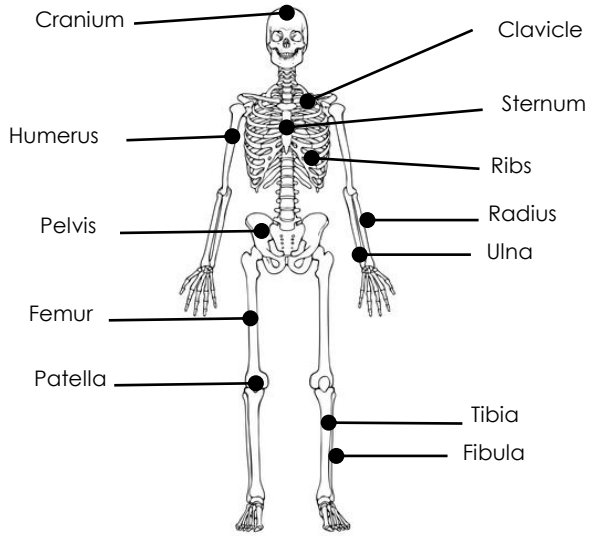
Training increases total lung capacity and vital capacity readings.



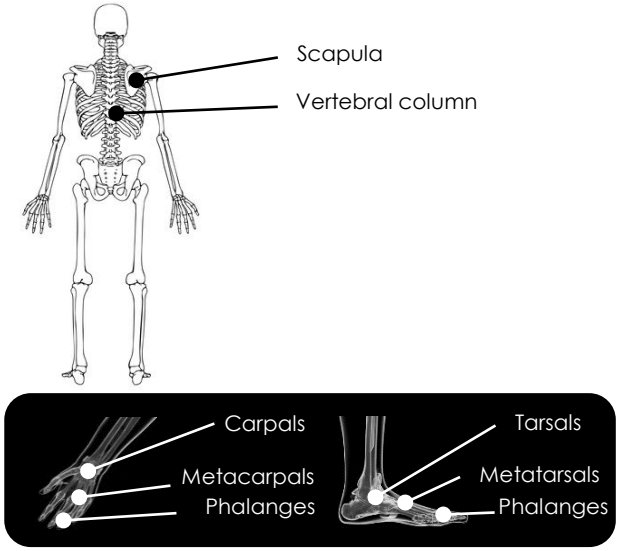
Explain changes to graph – line become longer (deeper breaths) and lines closer together (breathing frequency)

GCSE Physical Education – The structure and functions of the skeletal system

Structure of the skeletal system



Structure of the skeletal system

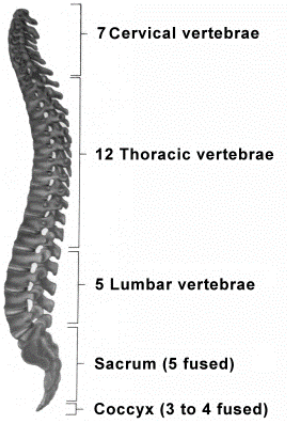


Vertebral Column

The vertebral column is divided into 5 sections. It is made up of irregularly shaped bones called vertebrae.

Each vertebra is protected with cartilage to prevent friction.

The vertebrae protects the spinal cord.



Functions of the skeleton

1. Protection of vital organs
2. Muscle attachment
3. Joints for movement
4. Blood cell production (platelets, red and white)
5. Storage of calcium and phosphorus

Classification of joint

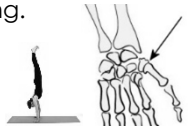
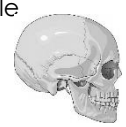
- Pivot (neck – atlas and axis)
- Hinge (elbow and knee)
- Ball and socket (hip and shoulder)
- Condyloid (wrist)

Connective tissue

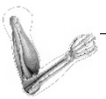
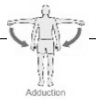
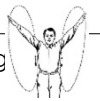
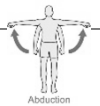
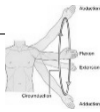
Ligaments – attaches bone to bone to add joint stability.

Tendons – attaches muscles to bone and contributes to joint movement as a result of muscle contraction.

Classification of bones

Long (leverage)	Short (weight bearing)	Flat (protection + muscle attachment)	Irregular (protection and muscle attachment)
Clear shaft region to the bone. *i.e. femur, humerus & phalanges* 	Light, small and very strong. *i.e. carpals tarsals* 	Broad surface area for muscle attachment. *i.e. cranium* 	Assist the functioning of certain joints. *i.e. vertebrae* 

Joint movements

Flexion	Adduction	Rotation	Dorsi-Flexion (ankle joint)
Decreasing the angle at a joint (bending) 	Limbs moving **towards the midline** of the body. 	A twisting/turning action around a joint. 	When the **toes** are **turned up** to the body. 
Extension	**Abduction**	**Circumduction**	**Planter-Flexion (ankle joint)**
Increasing the angle at a joint (straightening) 	Limbs moving **away from the midline of** the body. 	Movement in a Circular or **Conical** shape. 	When the **toes are pointed away** from the body.