Questions matter

Subject specific vocabulary

The following subject specific vocabulary provides definitions of key Physical Education terms used in our A-level Physical Education (7582) specification.

Your students should be familiar with, and gain understanding from, all these terms.

3.1.1 Applied Anatomy and Physiology

3.1.1.2 Cardiovascular system

Anticipatory rise

An increase in heart rate prior to exercise, due to the release of adrenalin.

Arterio-venous oxygen difference (A-VO_2 diff)

The difference in the oxygen content of the blood between the arterial blood and the venous blood.

Blood pressure

Blood pressure is a measure of the force that your blood exerts against blood vessel walls.

- **Systolic blood pressure:** Blood pressure while the heart is contracting.
- **Diastolic blood pressure:** Blood pressure while the heart is relaxing.
- **High blood pressure** can occur for many reasons including obesity; eating too much salt; stress; or smoking. It increases the risks of heart attack and stroke.

Bohr shift

The Bohr shift is when an oxyhaemoglobin dissociation curve moves to the right during exercise. An **oxyhaemoglobin dissociation curve** correlates the oxygen saturation of haemoglobin across a range of oxygen pressures.

The Bohr shift occurs as a result of increased CO_2 in the blood; increased blood acidity; decreased blood pH; and increased temperature. As a result, haemoglobin has a lower affinity for oxygen at working muscles, giving up oxygen more easily.

Bradycardia (athlete's heart)

A reduction in resting heart rate below 60 beats per minute.

Cardiac conduction system

A group of specialised cardiac muscle cells in the walls of the heart that send signals to the heart muscle, causing it to contract. The main components of the cardiac conduction system are:

- **Sino-atrial node (SAN)**, the heart's pacemaker, which sends an impulse through the atria causing them to contract.
- **Atrio-ventricular node (AVN)** which delays the impulse to allow ventricular filling.
- **Bundle of His** which conducts the impulse down the septum.
- **Purkinje fibres** spread the impulse through the ventricles causing them to contract.

Cardiac hypertrophy

Increase in thickness of the muscular heart wall, especially around the left ventricle. This increases the maximal strength of contraction. It may also make the size of the ventricular cavity bigger. These factors increase stroke volume.

Cardiac output

Cardiac output is the amount of blood which leaves the left ventricle per minute. It is calculated by multiplying heart rate and stroke volume.
Heart rate is the number of times the heart contracts per minute.
Stroke volume is the amount of blood which leaves the left ventricle per contraction.

Cardiovascular drift

A reduction in stroke volume when exercising in warm conditions for longer than 10 minutes. Results in an increase in heart rate to maintain cardiac output.
Occurs due to sweating which reduces blood volume and increases viscosity. This decreases venous return which, in line with Starling's law, decreases stroke volume.

Cholesterol

Cholesterol is a type of fat which is transported in the blood. There are two types:

- **High-density lipoproteins:** 'Good' cholesterol which transports excess cholesterol to the liver to be broken down. This lowers the risk of heart disease.
- **Low-density lipoproteins:** 'Bad' cholesterol as too much can result in fatty deposits developing in the arteries. This has a negative effect on heath increasing blood pressure, and the risk of heart disease.

Haemoglobin

Found in red blood cells. Haemoglobin combines with oxygen to form oxyhaemoglobin, transporting it around the body.

Heart disease

Also known as coronary heart disease. This occurs when coronary blood vessels become blocked by fatty deposits, called **atheroma**, limiting the supply of oxygenated blood to the heart. This process is known as **atherosclerosis**.
The lack of oxygen results in discomfort, known as **angina**. If a compete blockage occurs, cutting off the blood supply, this can result in a heart attack.

Myoglobin

Found in muscle cells, myoglobin stores and transports oxygen. It has a higher affinity for oxygen than haemoglobin, so it aids transport into muscle cells.

Receptors

Part of the nervous system that detects changes in the body. Types of receptors:

- **Baroreceptors:** Located in blood vessels, these detect changes in blood pressure.
- **Chemoreceptors:** Monitors and detects increases in blood acidity during exercise due to increased carbon dioxide in the blood.
- **Proprioceptors:** Detect increases in muscle movement during exercise.

Redistribution of blood

The **vascular shunt mechanism** directs blood flow around the body. It does this using two mechanisms:

- **Vasodilation:** Precapillary sphincters will relax, widening the internal diameter of blood vessels. During exercise this will happen in the vessels leading to working muscles allowing more oxygen and nutrient rich blood to reach them.
- **Vasodilation:** Precapillary sphincters will contract, decreasing the internal diameter of blood vessels. During exercise this will happen in the vessels leading to non-working muscles and non-essential organs eg digestive system. This allows more blood to be available for the working muscles.

Starling's law of the heart

Increased venous return will result in a higher stroke volume. The is due to the cardiac muscle being stretched, resulting in a stronger force of contraction and greater ejection fraction.

Stroke

A stroke is a serious life-threatening medical condition that happens when the blood supply to part of the brain is cut off. There are two types of stroke:

- **Ischaemic strokes** occur when a blood clot stops the supply of blood reaching the brain. These are the most common type.
- **Haemorrhagic strokes** are the result of a weakened blood vessel to the brain bursting.

Sympathetic and parasympathetic nervous systems

The autonomic nervous system subconsciously controls heart rate, breathing rate and redistribution of blood, among other things.

Controlled by the **Medulla Oblongata** the **sympathetic nervous system** is the body's 'fight or flight' system, speeding up heart rate; while the **parasympathetic system** is concerned with 'rest and digest', decreasing heart rate.

Venous return mechanisms

The body has several mechanisms to return blood to the right side of the heart via the vena cava:

- **Valves:** Found in veins that prevent the backflow of blood.
- **Skeletal muscle pump:** Working muscles contract and compress veins to push blood back towards the heart.
- **Respiratory pump:** Increased respiration/changes in pressure in the thorax compress veins to push blood back towards the heart.
- **Smooth muscle:** Found in veins, smooth muscle contracts to push blood back towards the heart.
- **Suction pump of the heart:** As the heart relaxes it creates a vacuum which pulls blood back toward the heart.

3.1.1.3 Respiratory system

Diffusion
The movement of gases from an area of high partial pressure to an area of low partial pressure.

Expiratory reserve volume
The volume of air which could be forcibly expired in addition to tidal volume.

Inspiratory reserve volume
The volume of air which could be forcibly inspired in addition to tidal volume.

Minute ventilation
Volume of air inspired or expired per minute. Breathing rate x tidal volume.

Partial pressure
The pressure exerted by an individual gas in a mixture of gases.

Residual volume
The volume of air which must remain in the lungs after a maximal expiration. This is to prevent the lungs from collapsing.

Sympathetic and parasympathetic nervous systems
The autonomic nervous system subconsciously controls heart rate, breathing rate and redistribution of blood, among other things.
Controlled by the **Medulla Oblongata** the **sympathetic nervous system** is the body's 'fight or flight' system, speeding up breathing rate; while the **parasympathetic system** is concerned with 'rest and digest', decreasing breathing rate.

Tidal volume
Volume of air breathed in or out per breath.

3.1.1.4 Neuromuscular system

All or none law

Impulses arriving at the neuron must reach a threshold level. If they do all of the muscles in that motor unit will contract. If they do none will contract. A motor unit cannot partially contract.

Fast glycolytic (type IIx)

These muscle fibres produce the highest force and speed of contraction, via the anaerobic respiration. They are highly susceptible to fatigue.

Fast oxidative glycolytic (type IIa)

These muscle fibres produce a high force and speed of contraction, primarily via the anaerobic respiration. However, a limited degree of aerobic capacity allows some fatigue resistance.

Golgi tendon organ

Proprioceptors which are activated when there are high levels of tension in a muscle.
They can initiate **autogenic inhibition**, which is a sudden relaxation of a muscle. This can override the stretch reflex in PNF stretching.

Motor units

A motor neuron and its muscle fibres.
A **motor neuron** is the nerve cell which transmit electrical impulses to the muscle fibres.

Muscle spindles

Proprioceptors which detect how far or fast a muscle is stretching.
They initiate the **stretch reflex**, where a muscle will contract, to prevent over stretching.

PNF (proprioceptive neuromuscular facilitation)

An advanced stretching technique. Considered to be one of the most effective methods for increasing range of motion at a joint.

Slow twitch (type I)

These muscle fibres produce a low force and speed of contraction, via aerobic respiration. However, they are highly fatigue resistant, allowing them to continuing working for long period of time.

Spatial summation

The addition of impulses received at the same time, but at different location on the neuron. If, when added together, the impulses are large enough an action potential will be released.

Tetanic contraction

A smooth sustained muscle contraction. Not a muscle twitch.

Wave summation

Repeated nerve impulse which does not allow the muscle fibres time to fully relax. This results in a tetanic contraction.

3.1.1.5 The musculo-skeletal system and analysis of movement in physical activities

Abduction
The movement of a limb away from the midline of the body.

Adduction
The movement of a limb towards the midline of the body.

Agonist
The muscle responsible for the movement which is occurring.

Antagonist
The muscle working in opposition to the agonist to help produce a smooth movement.

Articulating bones
Where two or more bones meet to allow movement at a joint.

Axis
Imaginary line through the body around which it rotates. Includes:
- **Longitudinal axis** (through the top of the head down and out the bottom of the feet)
- **Transverse axis** (through the hips)
- **Sagittal axis** (through the belly button).

Dorsi flexion
Decreasing the angle at the ankle joint.

Elbow
Hinge joint, made up of the humerus, radius, and ulna.

Extension
Increasing the angle at a joint.

Flexion
Decreasing the angle at a joint.

Hip
Ball and socket joint, made up of the pelvis and femur.

Horizontal abduction
Movement of a limb away from the midline of the body while held parallel to the ground.

Horizontal adduction
Movement of a limb towards the midline of the body while held parallel to the ground.

Hyperextension
Increasing the angle at a joint beyond 180 degrees.

Isometric contraction
The muscle contracts but no movement occurs.

Isotonic concentric
A muscle contracts and shortens producing movement.

Isotonic eccentric
A muscle lengthens under tension controlling the speed of a movement caused by gravity.

Knee
A hinge joint, made up of the femur and tibia.

Plane
Imaginary lines depicting the direction of movement. Types of planes:
Sagittal plane – forwards and backwards / flexion and extension
- **Frontal plane** – left or right / abduction and adduction
- **Transverse plane** – rotation around the longitudinal axis.

Plantar flexion
Increasing the angle at the ankle.

Shoulder
A ball and socket joint made up of the scapula and humerus.

3.1.1.6 Energy systems

Aerobic energy system

Resynthesis of ATP in the presence of oxygen. The processes involved may include:
Glycolysis: Glucose broken down into pyruvic acid. This resynthesises net 2 ATP. Pyruvic acid then enters the link reaction where it is converted into acetyl-coenzyme A.

- **Beta oxidation:** Stored fat is broken down into fatty acids before being converted into acetyl-coenzyme A.
- **Krebs/citric acid cycle:** Oxidation of acetyl-coenzyme-A/citric acid. This resynthesises 2 ATP and produces carbon dioxide as a waste product.
- **Electron transport chain:** Transfer of electrons down a carrier chain/hydrogen is oxidised. Resynthesises 34 ATP and produces water as a waste produce.

Altitude training

Training at altitude where there is less oxygen. The body adapts by making more EPO which results in more red blood cells to carry oxygen. These additional red blood cells are an advantage for endurance athletes returning to sea level to compete.

Anaerobic glycolytic system

Resynthesises ATP quickly for up to 3 minutes but produces fatiguing by products.
Anaerobic glycolysis occurs, resynthesising 2 ATP. With insufficient oxygen available to oxidise pyruvic acid it combines with hydrogen to create lactic acid.

ATP-PC system

Fastest energy system at resynthesising ATP due to the limited number of chemical reactions required. Can only last 8-10 seconds, however, as it is limited by phosphocreatine (PC) stores.
The energy produced by breaking the bond in PC is used to resynthesis ATP from ADP and a free phosphate on a 1:1 ratio.

Energy continuum of physical activity

Refers to the changing mix of energy systems which provide the ATP required across different activities and durations.

Excess post-exercise oxygen consumption (EPOC)

Increased rate of oxygen intake following activity, intended to pay back the oxygen deficit. There are two components:

- **Fast (alactic) component:** Oxygen is used for the resynthesis of ATP and PC, and the re-saturation of myoglobin.
- **Slow (lactic) component:** Lactic acid is removed via excretion and conversion back to blood glucose via the Cori cycle in the liver.

High intensity interval Training (HIIT)

Alternating periods of short high intense anaerobic exercise with less intense, aerobic, recovery periods.

Indirect calorimetry

A technique that provides an estimation of energy expenditure from the amount of carbon dioxide produced and oxygen consumed during rest and steady-state exercise.

Lactate sampling

A tiny blood sample is taken to be analysed by a device. This measures how much lactate is present in the blood.

Lactate threshold

The point at which lactic acid accumulates quickly in the blood.

Onset of blood lactate accumulation (OBLA)

The point at which lactic acid exceeds 4mmols per litre in the blood.

Oxygen deficit

The difference between the oxygen required during exercise and the oxygen supplied and utilised. Occurs at the onset of exercise.

Plyometrics.

Anaerobic training method based on the concept that muscles contract with more force following an eccentric contraction. Movements such as hopping, bounding, depth jumps are used.

Respiratory exchange ratio (RER)

The ratio of carbon dioxide produced to the oxygen consumed. A ratio nearer 0.7 suggests the body is using fats as its primary fuel, while 1.0 would indicate carbohydrates.

Speed agility quickness (SAQ)

This anaerobic method of training aims to improve an athlete's multi-directional movement by reprogramming their neuromuscular system. To do this it utilises equipment such as ladders and cones.

VO_2 max

The maximum amount of oxygen that can be taken in, transported, and used by the body per minute. Measured in millilitres for each kilogram body weight each minute (ml/kg/min).

VO_2 max test

VO_2 max can be estimated using tests such as the multistage fitness test. However, the gold standard is direct gas analysis. In a laboratory the participant will work at increasing intensity, until failure is reached, on a treadmill, static bike, or rowing machine. They do so wearing a mask over their nose and mouth. This is connected to a machine which can measure their oxygen consumption.

3.1.2 Skill acquisition

3.1.2.1 Skill, skill continuums and transfer of skills

Discrete – serial - continuous skill continua

- Discrete skills have a clear beginning and end.
- Serial skills are several skills linked together.
- Continuous skills have no clear beginning or end.

Gross – fine skill continua

- Gross skills use large muscle groups.
- Fine skills use smaller muscle groups.

High organisation – low organisation skill continua

- High organisation skills are difficult to break down into parts/sub routines.
- Low organisation skills are easy to break down into parts/sub routines.

Open – closed skill continua

- Open skills are performed in unstable, ever changing environments.
- Closed skills are performed in stable, unchanging environments.

Self-paced – externally-paced skill continua

- Self-paced skills allow the performer to decide when they start and how fast they perform.
- Externally-paced skills have their start, and the speed at which they are performed dictated by external factors.

Simple – complex skill continua

- Simple skills require few decisions to be made when performing. They may also require limited coordination and concentration due to a limited number of sub routines.
- Complex skills require high levels of information processing / lots of decisions to be made. They may also require high levels of coordination and concentration due to a high number of sub routines.

Skill

Skill is the learned ability to bring about a predetermined result with the minimum outlay of time and/or energy.

Transfer of learning

When the learning of one skill has an effect on the learning of another. Transfer can be:

- **Positive:** The learning of one skill aids the learning of another.
- **Negative:** The learning of one skill hinders the learning of another.
- **Zero:** The learning of one skill has no effect on the learning of another.
- **Bilateral:** The learning of a skill using a limb on one side of the body can be transferred across to the limb on the other side of the body.

3.1.2.2 Impact of skill classification on the structure of practice for learning

Methods of presenting practice

- **Whole practice:** Practising a skill its entirety eg sub routine A B and C all together.
- **Whole-part-whole practice:** Demonstrating the skill in its entirety, eg ABC, to identify a specific weakness. Practising the weakness in isolation eg B. The putting it all back together again, eg ABC.
- **Progressive part practice:** Learning the first part of a skill before adding parts one at a time eg A, B, AB, C, ABC. Sometimes called chaining.

Types of practice

- **Distributed practice:** Practising with rest intervals.
- **Massed practice:** Practising without rest interval.
- **Mental practice:** Rehearsing a skill in your head with no physical movement. Can be done from an internal perspective eg looking from within yourself or external perspective eg like watching yourself on TV.
- **Variable practice:** Repeatedly changing practice type, drills, or situation.

3.1.2.3 Principles and theories of learning and performance

Insight learning (Cognitive theory / Gestalt)

- The theory aims to develop a performer's learning by understanding the relationship between the sub-routines or different factors that may influence the whole problem rather than learning specific movement patterns.
- Practices will require the performer to solve problems designed to make them think about their response and modify their actions based on previous experience and the current situation.

Learning plateau

A period where no improvement is made in performance.

Observational learning (Social learning / Bandura)

This theory states we learn via watching others. Bandura's model suggests 4 factors which affect the success of observation learning:

- **Attention:** Ensuring the performer takes notice by making demonstration clear and accurate.
- **Retention:** The performer needs to create mental image of the skill which they can store in their long term memory for future recall.
- **Motor reproduction:** The performer must be physically and mentally capable of copying the demonstration.
- **Motivation:** The performer must have the drive to practise.

Operant conditioning (Behaviourism / Skinner)

Primarily concerned with observable and measurable aspects of human behaviour. Behaviourist learning theories emphasize changes in behaviour that result from stimulus-response associations made by the learner.

Operant conditioning is trial and error learning. The stimulus response bond is either strengthened using reinforcement or weakened using punishment:

- **Positive reinforcement:** Introduction of a desirable stimulus following the correct response.
- **Negative reinforcement:** The removal of an undesirable stimulus after the correct response.
- **Punishment:** Introduction of an undesirable stimuli after the incorrect response.

Social development theory (Constructivism / Vygotsky)

The idea that meanings and understandings grow out of social encounters, eg young learners who are in contact with adults or more experienced learners. People who support this idea believe that culture is main determinant of individual development.

Social development theory suggests we learn from '**more knowledgeable others' (MKOs)**. This learning can be **inter-psychological**, where we learn directly from external sources, or **intra-psychological** learning, where we use the knowledge gained from others to guide ourselves.

The **zones of proximal development** help the learner to understand what they need to do next to keep making progress. The three stages are:

- What can I do alone?
- What can I do with help?
- What can I not do yet?

Stages of learning

There are three stages of learning. These are:

- **Cognitive stage of learning:** This is the first stage where learning is very much trial and error. The performer lacks a clear mental image of what the skill should look like so learns through observing others to develop understanding of the relationships between sub-routines. Large errors will often be made.
- **Associative stage of learning:** Associative learners are in the practice stage. They will have developed a mental image of the skill but will still be reliant on some external feedback. They are starting to develop intrinsic feedback by comparing their performance to others. Though errors are still evident they are smaller and there are fewer of them.
- **Autonomous stage of learning:** Performance of skills can be completed with little thought allowing the performer to concentrate on other aspects such as tactics and strategies. Intrinsic feedback is highly developed so the performer can self-correct. They're very few, if any smaller errors in skill execution.

3.1.2.4 Use of guidance and feedback

Extrinsic feedback
Feedback from external sources.

Intrinsic feedback
Feedback from within the performer.

Knowledge of performance
Feedback about the execution of the skill.

Knowledge of results
Feedback about the outcome of the skill.

Manual guidance
A coach can physically support an athlete during a movement.

Mechanical guidance
The use of artificial aids to support an athlete during a movement.

Negative feedback
Feedback about what went wrong. The correction of errors.

Positive feedback
Feedback about what went well.

Verbal guidance
Using spoken words to bring about an improvement in performance.

Visual guidance
Providing information which can be observed to bring about an improvement in performance.

3.1.2.5 Memory models

Anticipation

Predicting that something will happen. Types of anticipation:

- **Temporal anticipation:** Refers to the timing of an action or when something will occur.
- **Spatial anticipation:** Where an individual thinks an action will occur.

Baddeley and Hitch working memory model

In 1974 Alan Baddeley and Graham Hitch attempted to present a more accurate model of the short term or working memory. It has four main components:

- **Central executive:** The control centre of the working memory. It directs information to the other sub systems.
- **Episodic buffer:** Acts as a link between the other two sub systems to create sequences that can be compared to or stored in the long term memory.
- **Phonological loop:** Deals with sounds.
- **Visuospatial sketchpad:** Deals with information which can be seen and understanding where things are taking place in relation to each other.

DCR process

The DCR process is an acronym which stands for:

- **Detection** of stimuli
- **Comparison** to memory stores
- **Recognition** of relevant stimuli based on past experiences.

Hick's law

The more choices there are the slower reaction time.

Long term memory

Long term memory has an unlimited capacity. It is where information such as motor programmes and past experiences are stored until they are required by the short term / working memory.

Long term memory can be improved by using:

- **Chunking:** Breaking actions into sub routines or parts so they can be more easily recalled.
- **Chaining:** Linking bits of information together so it can be stored as one item.

Perception

The process of filtering and making sense of sensory information.

Psychological refractory period

The delay in response to the second of two closely spaced stimuli.
Explained by **single channel hypothesis** which suggests that the brain can only deal with one piece of information at a time. When it receives several pieces in rapid succession, a 'bottleneck' is formed.

Response time

Response time is the time from the start of the stimulus to end of the response. Reaction time plus movement time.
Reaction time is the time taken between a stimulus and the start of a response. There are two types of reaction time:

- **Simple reaction time:** The time taken to start a single response to a single stimulus.
- **Choice reaction time:** The time taken between a stimulus and an action which requires a choice.

Movement time is the time from the start of the response to the end of the response.

Schmidt's schema theory

In 1975 Schmidt proposed that we adapt generalised motor programmes (schema) to perform in sport.
Recall schema initiates the action, occurring before the movement:

- **Initial conditions:** Information from the environment eg about where the performer is.
- **Response specifications:** Information about what the performer needs to do.

Recognition schema controls the action, occurring after the movement:

- **Sensory consequences:** Information about how the movement felt.
- **Response outcomes:** Information about what happened.

Selective attention

Filtering information to identify what are perceived to be relevant stimuli and ignore stimuli deemed irrelevant.

Senses

External senses include sight and hearing.
Internal senses are collectively known as proprioception. This includes touch and kinesthesis.
Kinesthesis is your inner awareness of the position of your body.

Short term memory

The short-term memory has a limited capacity of 5-9 items and duration of up to 30 seconds.

Whiting's information processing model

- **Environment:** Everything present in the competitive situation.
- **Display:** The parts of the environment which the perform is aware of.
- **Sensory organs:** The parts of the body which detect stimuli.
- **Perceptual mechanisms:** The stimuli are interpreted, which involves the DCR process and selective attention.
- **Translatory mechanisms:** Is where a decision is made based on comparison of the current situation with information stored in the long-term memory.
- **Effector mechanisms:** Where the response is programmed and sent out via neuromuscular system.
- **Muscular system output:** The response is performed.
- **Feedback:** Information is received about the outcome of performance.

3.1.3 Sport and society

3.1.3.1 Emergence of globalisation of sport in the 21st century

3.1.3.1.1 Pre-industrial (pre-1780)

Feudal system

The basis of the two tier class system where the lower class would hold land owned by the upper class in exchange for service and labour.

Mob football

An early form of football played by the lower class. It was played occasionally, using natural resources with limited rules. This resulted in it being unruly.

Popular recreation

The sports and past times of pre-industrial Britain.

Real tennis

Also known as ‘royal tennis’ it was played by the upper class on purpose built facilities with specialist equipment. It had strict rules and a high moral code.

3.1.3.1.2 Industrial and post-industrial (1780 – 1900)

Gentleman amateur

Amateurs held high status. They were the best performers, demonstrating high morality with a commitment to sportsmanship. These upper and middle class gentleman controlled sport, holding positions at the top of national governing bodies, allowing them to exclude the working class.

Industrial revolution

The change in Britain from a feudal, rural society into a capitalist, urban based society controlled by a powerful middle class.

Industrial patronage

Factory owners set up sports teams to decrease absenteeism by encouraging loyalty in the workforce.

Middle class

The introduction of a new middle class occurred in this period. These were often self-made men taking advantage of the business opportunities which existed in industrialised Britain.
Some of the middle class became **philanthropists**. These were individuals with a high social conscience who were keen to provide a better life for the working class.

Muscular Christianity

The churched used sport as a form of social control. They promoted Christian values, such as patriotic duty, discipline, and self-sacrifice, through the moral and physical beauty of athleticism.

Rational recreation

The development of sports pastimes with greater organisation, order, and control.
Sports became **codified** with the gradual introduction of rules both for playing the sport and the conduct of participants.

Urbanisation

The migration of large numbers of people to towns and cities from their traditional rural homes. They arrived seeking work in the newly formed factories.

Wenlock Olympian Games

Started in 1850 the Wenlock Olympian games were a forerunner to the modern Olympics. Under the founder Dr William Penny Brookes, they aimed to promote moral, physical, and intellectual improvements in the lower class inhabitants of Wenlock.

Working class professional

The working class had to be paid a wage to afford taking time off work to represent factory teams. **Broken time payments** emerged to create the first professionals.
Earning money via sport was seen as an opportunity for social mobility so determination to succeed was high. They trained hard and demonstrated a win at all costs approach, resulting in lower moral standards.

3.1.3.1.3 Post World War II (1950 to present)

Amateur

This term describes someone who:

- takes part in an activity as a hobby rather than for financial gain
- has a main job outside of the activity
- takes part in the activity for fun
- could be competing at a lower level.

Commercialisation

To manage or exploit (an organisation, activity, etc) in a way designed to make a profit.

Golden triangle

The link between sports events, sponsorship by businesses and the media.

Media

Diversified technologies which act as the main means of mass communication. Media includes:

- printed media, eg newspapers
- broadcast media, eg TV and radio
- internet/social media, eg Facebook
- outdoor media, eg billboards.

Sponsorship

Provision of funds or other forms of support to an individual or event in return for some commercial return.

Professional

Someone who receives direct payment for their participation in sporting activities.

3.1.3.2 The impact of sport on society and of society on sport

3.1.3.2.1 Sociological theory applied to equal opportunities

Discrimination

The unfair treatment of different categories of people, especially on the grounds of ethnicity, age, sex, or disability. These are actions based on prejudice.

Prejudice

A preconceived opinion of an individual that is not based on reason or actual experience.

Social action theory

Social action theory considers how sport can impact society. Society is created by social interaction by interacting with others, people create organisations e.g. schools, clubs, campaign groups. These organisations shape wider society eg expecting people to obey the rules of the organisation. Individual motives and meanings for sports participation can vary.

Socialisation

The learning of society's social norms and values. There are two phases to socialisation:

- **Primary socialisation:** This occurs during early childhood via interactions with immediate family.
- **Secondary socialisation:** This follows primary socialisation and occurs via a wider group of 'agents' including friends, teachers, media etc.

Social issues

Problems which can affect many people within a society. An example could be **inequality** where resources or opportunities are unevenly distributed across a society.

Social processes

- **Social control:** Refers to the way people are regulated in social systems. This may include their thoughts, feelings, behaviour, and appearance.
- **Social change:** Involves an altering of the social order of society. Sport can be seen as a powerful force for social change.

Social stratification

Society is divided into different levels based on social characteristics such as wealth or status.

Society

An organised group of people associated for a specific purpose or who hold a shared common interest.

Sport England

- Established by Royal Charter in 1996 Sport England aims to give everyone in England the chance to benefit from sport and physical activity.
- Sport England work with national partners such as National Governing Bodies and local partners including Active Partnerships to achieve this aim.

Stereotyping

Simple generalisations made about all members of a group. A standardised image. This allows others to categorise them and treat them according to these generalisations.

3.2 Factors affecting optimal performance in physical activity and sport

3.2.1 Exercise physiology

3.2.1.1 Diet and nutrition and their effect on physical activity and performance

Caffeine

Caffeine is a stimulant found naturally in coffee and tea. It is also added to energy bars and gels, among other things, to be taken as a supplement. It is thought that caffeine increases mental alertness, reduces fatigue, and can increase the mobilisation of fatty acids in the body, sparing glycogen stores during endurance performance.

Carbohydrate

Carbohydrates are broken down to provide us with glucose, the principal source of energy in the body. There are two types of carbohydrate:

- **Simple carbohydrates:** Those which are broken down easily by the body. Found in fruit and anything with added sugar.
- **Complex carbohydrates:** Those which take longer for the body to digest. Found in nearly all plant based foods.

The **glycaemic index (GI)** ranks different carbohydrates based on their impact on blood glucose levels. Foods with a lower GI score release carbohydrates more slowly into the blood. A high GI score causes a rapid short spike in blood glucose levels. This information can be applied to identify when to eat a specific food in relation to exercise.

Creatine

A naturally occurring compound found in muscle cells, required for the ATP-PC system (see 3.1.1.6 Energy systems). Taking creatine as a supplement is thought to extend the duration of the ATP-PC system increasing athletic performance.

Fat (saturated fat, trans fat and cholesterol)

Fat is a source of energy in the body for low intensity activity. There are different types of fat:

- **Saturated fat:** This is a type of fat containing a high proportion of fatty acid molecules without double bonds. It is mostly found in animal products. Saturated fat is less healthy than **unsaturated fat**.
- **Trans fat:** Trans fats are made when liquid oils are turned into solid fats via industrial processes.
- **Cholesterol:** See cholesterol in 3.1.1 Applied anatomy and physiology (page 2).

Fibre

Fibre is the undigestible parts of plants, which pass relatively unchanged through our stomach and intestines.

Glycogen loading

Aims to increase glycogen stores via super compensation. This increases endurance, delaying fatigue and the experience of 'hitting the wall'. Increasing water intake can aid glycogen storage. Three possible methods for glycogen loading include:

- **Method 1:** Reduce glycogen levels by endurance training. Then for three days eat a low carbohydrate diet, combined with a reduction in training. Following this, consume a high carbohydrate diet for a few days combined with little or no training.
- **Method 2:** The day before competition complete 3 minutes of high intensity exercise. This will open a 'Carbo window' immediately after exercise is completed. Eat a high carbohydrate meal within 20 minutes of finishing exercise. The 'Carbo window' closes after 2 hours.
- **Method 3:** Known as the non-depletion protocol. Training intensity is reduced the week before competition. For 3 days before competition a high carbohydrate diet is followed along with only light intensity exercise.

Minerals (sodium, iron, calcium)

Minerals assist in bodily functions. Those named on the specification are:

- **Sodium:** Helps to regulate fluid levels in the body. However, too much sodium has been linked to increased blood pressure, which can increase the risk of a heart attack or stroke occurring.
- **Iron:** Is required to make haemoglobin. A lack of iron can result in anaemia.
- **Calcium:** Contributes to the development of strong bones and teeth. Calcium is also required for efficient nerve and muscle function.

Protein

Proteins contain one or more long chains of **amino acids**. Amino acids are used by the body to grow and repair muscles and to make enzymes, hormones, and haemoglobin.
Protein can also be used as a minor source of energy.

Sodium bicarbonate

A white soluble alkaline compound. It is taken as a supplement as it is thought to increase the body's **buffering capacity**. This is the ability of the body to manage high levels of lactic acid or hydrogen ions, maintaining the body's optimal pH level.

Vitamins (C, D, B-12, B-complex)

Essential nutrients required by the body in small amounts to work properly. Those named on the specification are:

- **Vitamin C:** Found in green vegetables and fruit. Vitamin C protects cells keeping them healthy. It is also important for bones, teeth, gums, and connective tissue eg tendons.
- **Vitamin D:** Made by our bodies when exposed to sunlight. Vitamin D helps in the absorption of calcium (see minerals).
- **Vitamin B-12:** Found in red meat, dairy products, and fish. Vitamin B-12 is required to produce healthy red blood cells. It also assists in the regulation of energy release from food.
- **Vitamin B-complex:** A group of B vitamins that play a role in your body's functions, including cardiovascular and cell health.

3.2.1.2 Preparation and training methods in relation to maintaining physical activity and performance

Ballistic stretching

Stretches performed with a swinging or bouncing movement to push range of motion further.

Circuit training (muscular endurance)

A series of exercises or 'stations' performed in a sequence with rest an option between each.
Circuit training can be designed to improve muscular endurance which is the ability of a muscle or muscle group to contract repeatedly without fatiguing.

Continuous training (aerobic power)

- Low intensity exercise performed for long periods of time without rest.
- This will increase aerobic power which is the ability of the muscles to use oxygen received from the heart and lungs to produce energy. Measured via VO_2 max.

Cool down

A cool down should take place after all physical activity and include light exercise and stretching.
The physiological effects/benefits of a cool down which can improve performance and decrease the risk of injury include:

- Maintenance of an increased heart rate and breathing rate
- Continuation of the action of the skeletal muscle pump, improving venous return and preventing blood pooling
- Improved removal of lactic acid
- Decreased likelihood of experiencing delayed onset muscle soreness (DOMS).

Fartlek (aerobic power)

Swedish for 'speed play'. Fartlek training involves periods of fast work with intermittent periods of slower work. Often used in running, ie sprint, jog, walk, jog, sprint, etc. It can also be completed over varying terrains.
This offers an alternative to continuous training for increasing aerobic power (see above).

HIIT/interval training (anaerobic power)

Alternating periods of short high intensity anaerobic exercise with less intense, aerobic, recovery periods.
This develops a performer's anaerobic power which is the maximal output which can be applied during all-out, short-term physical effort. It reflects the capacity of ATP-PC and anaerobic glycolytic energy systems.

Objective

Based on empirical data, eg times, scores.

Periodisation

Periodisation involves dividing the training year into sections each with a specific purpose. These sections include:

- **Macro cycle:** A long-term period of training, typically 1 to 4 years eg a season or Olympic cycle.
- **Meso cycle:** A medium-term block of training, typically spanning between 4–12 weeks.
- **Micro cycle:** A short-term repeating block of training, typically one week, or a few days.

A macro cycle is made up of three distinct periods:

- **Preparation:** Also known as preseason there is a focus on quantity over quality of training to develop fitness levels and general conditioning.
- **Competition:** A focus on quality over quantity to refine skills and tactics while maintaining fitness levels. Performance in competition can be improve by **tapering**, a gradual reduction in training volume in the lead up to an event. This allows the performer to **peak**, being in a physical condition to perform at their optimal level.
- **Transition:** A period of activity recovery during the off season.

Principles of training

- **Specificity:** Training should be relevant to your chosen activities; reflecting the energy systems, muscles, and movement patterns.
- **Progressive overload:** Training should gradually increase in difficulty to mirror improvements the athlete is making in their fitness. This can be done by applying the FITT principles:
    - **Frequency:** The performer can train more often eg train three times a week instead of two.
    - **Intensity:** The performer can train harder eg lift 100kg instead of 90kg.
    - **Time:** The performer can train for longer eg train for 60 minutes instead of 50 minutes.
    - **Type of Training:** The performer can include different types of training to challenge the body in different ways eg include Fartlek training alongside continuous training to improve aerobic power.
- **Reversibility:** The performer must avoid detraining. If training is stopped then the adaptions which have been gained will gradually be lost.
- **Recovery:** Rest days should be included as these are when the body repairs and adapts to the demands of training, gradually becoming fitter. Failure to include enough rest days can result in overtraining.

Proprioceptive neuromuscular facilitation (PNF) (flexibility)

An advanced stretching technique. It involves proprioceptors called muscle spindles and Golgi tendon organs (see 3.1.4 Neuromuscular system).
It is considered to be one of the most effective methods for increasing flexibility. This is the range of motion at a joint.

Quantitative

A measurement which can be quantified as a number, eg time in seconds, or goals scored.

Qualitative

Involving opinions relating to the quality of a performance rather than the quantity.

Reliability

Relating to the consistency and repeatability of a test.

Static stretching

A muscle is held, stretched, in a stationary position for 30 seconds or more.

Subjective

An impression or judgement on how well a test was performed.

Validity

The extent to which a test or method measures what it sets out to measure.

Warm-up

A warm-up should take place before all physical activity and include a pulse raiser, stretching, and some form of skill practice. The physiological effects/benefits of a warm-up which can improve performance and decrease the risk of injury include:

- Increased heart rate and breathing rate
- Increased body temperature and elasticity of muscles and connective tissue
- Increased oxygen supply to working muscles.

Weight training (strength)

Involves using the body to overcome a resistance provided by free weights or a fixed weights machine.

Intensity of training can be altered by using different number of **repetitions** (the number of times you do an exercise), **sets** (the number of cycles of repetitions you do), and the **percentage of your one rep max** (the maximum weight a performer can lift for 1 repetition) you lift.

Weight training can be adapted to improve different types of strength:

- **Maximal strength:** 2-6 reps for 4-5 sets at more than 70% of one rep max.
- **Explosive strength:** 2-6 reps for 4-5 sets at more than 70% of one rep max that can be lifted rapidly.
- **Dynamic strength:** 10+ reps for 3-5 sets at less than 70% of one rep max.

3.2.1.3 Injury prevention and the rehabilitation of injury

Acute injury

An acute injury is one that occurs suddenly during performance. Those included in the specification are:

- **Fracture:** A break or crack in a bone.
- **Dislocations:** The ends of bones are forced out of position.
- **Strains:** Also referred to as a 'pulled' or 'torn' muscle. A strain is when muscle fibres are stretched too far and tear.
- **Sprains:** A sprain is where a ligament is stretched too far or tears.

Chronic injury

Also known as an overuse injury which occurs over time. Those included in the specification are:

- **Achilles tendonitis:** The Achilles tendon, connecting the gastrocnemius muscle to the heel bone, becomes inflamed and painful.
- **Stress fracture:** Tiny cracks in a bone caused by repetitive force.
- **Tennis elbow:** A condition that causes pain around the outside of the elbow. It's clinically known as lateral epicondylitis. It often happens after repeated action of the muscles of the forearm, near the elbow joint.

Cold therapy (ice baths, cryotherapy)

Cold therapy can be as simple as cooling the surface of the skin using ice. This can decrease swelling. There are other more advanced methods of cold therapy. These include:

- **Ice baths:** Fully submerging the body in a ball of iced water for 5-10 minutes.
- **Cryotherapy:** Entering a cryogenic chamber which cools to temperatures below -100 degrees using liquid nitrogen.

Compression garments

Compression garments are especially tight fitting items which apply high levels of pressure to improve circulation and prevent medical issues such as deep vein thrombosis (DVT).

Flexibility training (active, passive, static and ballistic)

- **Active stretching:** When the stretched position is maintained by the contraction of an agonist muscle.
- **Passive stretching:** When the stretched position is maintained using external forces or objects eg a partner or a wall.
- **Static and ballistic:** For static and ballistic stretching see 3.2.1.2 Preparation and training methods in relation to maintaining physical activity and performance.

Hydrotherapy

Performing activity in a pool of warm water eg underwater treadmill. The warm water can improve circulation. The main benefit of hydrotherapy is that the buoyancy of the water helps to support body weight. This reduces the load on joints.

Hyperbaric chamber

A chamber pressurised with 100% pure oxygen.

Massage/foam rollers

Massage or foam rolling applies pressure to muscles which can prevent or relieve soft tissue injuries. They work via several mechanisms including increasing blood flow, releasing tension, and breaking down scar tissue.

Proprioceptive training

Proprioceptive training is designed to improve or restore the body's ability to control the position of a joint subconsciously. Hopping, jumping, and balancing exercises are used to achieve this.

Screening

Screening to prevent musculo-skeletal injuries involves undertaking a series of tests to establish the current musculo-skeletal condition of the athlete. Screening can be used to identify muscle imbalances or stress fractures, as well as assessing core strength, joint mobility, and postural alignment. This allows training programmes to be created or adapted to address weaknesses. Additionally, screening can include the use of electrocardiograms to assess heart health. This is to screen for individuals with high cardiac risk in the young (CRY). It is encouraged by most NGBs and has had widespread publicity following high profile cases such as Fabrice Muamba.

Strength training

Strength training can be completed via weight training (see 3.2.1.2 Preparation and training methods in relation to maintaining physical activity and performance). However, there are other methods which can be more suitable in the prevention and treatment of injury:

- **Bodyweight exercises:** Using the body as resistance can develop core strength, while improving posture and addressing muscle imbalances. Examples include plank, press ups, and body weight squats/lunges.
- **TheraBands:** Latex bands which offer a range of different resistance levels. They can be used when not strong enough for traditional weight training or when targeting small/difficult movements. Low resistance bands are used at the beginning of rehabilitation programmes with the resistance increased as progress is made.

Taping and bracing

Taping can provide support to a weakened joint. Kinesiology tape is applied to muscles to improve function.

Braces are more substantial structures often offering hinged support to joints such as the knee and ankle. Their aim is to prevent further injury when the joint is unstable following a previous injury.

Warm-up

See Warm-up in 3.2.1.2 Preparation and training methods in relation to maintaining physical activity and performance.

3.2.2 Biomechanical movement

3.2.2.1 Biomechanical principles

Centre of mass

The point of balance of body or the point of concentration of mass.

Factors affecting stability

- **Height of centre of mass:** The lower an object's centre of mass the more stable it is.
- **Area of base of support:** The larger an object's base of support the more stable it is.
- **Position of line of gravity:** The closer to the centre of the base of support an objects line of gravity is the more stable it is.
- **Body mass:** The greater the mass of an object the more stable it is.

Newton's three laws of linear motion

- **Newton's first law of linear motion (Law of Inertia):** A body will remain in a state of rest or uniform motion until a force acts upon it.
- **Newton's second law of linear motion (Law of Acceleration): Acceleration** is directly proportionate to the magnitude of the force produced and is governed by the direction the force is applied/ Force = mass x acceleration.
- **Newton's third law of linear motion (Law of Action/Reaction):** For every action there is an equal and opposite reaction.

Scalars

Quantities have only magnitude (size). These include:

- **Speed:** The distance covered by a moving object in unit time taken. Distance divided by time. Measured in metres per second (m/s).
- **Distance:** The length of the space between two points. Speed multiplied by time. Measured in meters (m).
- **Mass:** The quantity of matter a body possesses. Density multiplied by volume. Measure in kilograms (kg).

3.2.2.2 Levers

Mechanical advantage/disadvantage

Mechanical advantage is calculated by dividing the **effort arm** (the distance from the fulcrum to the effort) by the **resistance arm** (the distance from the fulcrum to the resistance).

A number greater than one indicates the lever system has a **mechanical advantage**. This allows it to produce large forces, but they are slower and have limited range of motion. Second class levers have a mechanical advantage.

A number lower than one suggests the lever system has a **mechanical disadvantage**. While it cannot produce as much force, it can move quickly over a greater range. Third class levers are at a mechanical disadvantage.

Three classes of lever

A lever is a rigid bar (bone) that turns about an axis to create movement. The force to move the lever comes from muscle/muscles. Each lever has three components:

- Fulcrum
- Resistance
- Effort

There are three classes of lever:

- **1st class lever system:** The fulcrum is in the middle. Examples in the human body include extension at the elbow.
- **2nd class lever system:** The resistance is in the middle. Examples in the human body include plantar flexion at the ankle.
- **3rd class lever system:** The effort is in the middle. The most common example in the human body includes flexion at the elbow.

3.2.2.3 Linear motion

Forces acting on a performer during linear motion

- **Gravity/Weight:** Weight is gravitational force that the Earth exerts on the body. It acts downwards.
- **Frictional force:** The force that resists motion when the surface of one object comes into contact with the surface of another.
- **Air resistance:** A force which opposes the motion of a body moving through the air.
- **Internal-muscular force:** The force applied by the contraction of muscles in the body. If these forces are applied downwards into the ground, eg contraction of the quadriceps when jumping, an equal and opposite **ground reaction force** will be produced pushing the athlete upwards.

Impulse

The effect of a force acting over a period of time. Force multiplied by time. It is also a change in momentum. Impulse is measured in newtons per second (Ns) reduced to kg/s.

Scalars

See 3.2.2.1 Biomechanical principles.

Vectors

Quantities have both magnitude (size) and direction. These include:

- **Weight:** The gravitational force that the Earth exerts on the body. Mass x acceleration due to gravity. It is measured in newtons (N).
- **Velocity:** The rate of change of displacement. Displacement divided by time. Measured in metres per second (m/s).
- **Displacement:** The shortest route between the starting and finishing point. Calculated by measuring a straight line between the two points. Measures in meters (m).
- **Acceleration:** The rate of change of velocity or the difference between final and initial velocities divided by the time taken. Measured in metres per second squared (m/s2).
- **Momentum:** The quantity of motion of a body. Mass multiplied by velocity. Measured in kg m/s, or Ns.

3.2.2.4 Angular motion

Angular displacement

The smallest change in angle between the starting and finishing point of the rotation. Measured in **radians (rad)**. 1 radian = 57.3 degrees.

Angular momentum

The quantity of rotation a body possess. Moment of inertia multiplied by angular velocity. Angular momentum is a constant. It remains the same unless an external torque is applied (Newton's 1st law). Therefore, moment of inertia and angular velocity are inversely proportional. If you increase one, you decrease the other.

Angular velocity

The rate of change of angular displacement. Angular displacement (rad) divided by time taken (s). Measured in radians per second (rad/s).

Angular acceleration

The rate of change of angular velocity. Change in angular velocity (rad/s) divided by time taken (s). Measured in radians per second squared (rad/s^2).

Application of Newton's laws to angular motion

- **First law (inertia):** A body in rotation will continue its rotation with a constant angular velocity unless acted upon by an external **torque**. Torque is the rotational consequence of the application of a force.
- **Second law (acceleration):** The rate of change of angular momentum is proportional to the torque causing it . The change takes place in the direction in which the torque acts.
- **Third law (action/reaction):** For every torque, there is an equal and opposite reaction torque.

Moment of inertia

The resistance of a body to change its state of angular motion. Moment of inertia is a product of an object's mass and the distribution of this mass away from the axis of rotation. An object with a greater mass or the same mass distributed further away from the axis of rotation will have a higher moment of inertia.

3.2.2.5 Projectile motion

Horizontal displacement

The shortest distance from the point of release to the finishing point, in a straight line parallel to the ground.

Factors affecting horizontal displacement of projectiles

- **Angle of release:** The **optimum angle of release** depends on the release height relative to the landing height. When both are equal, eg long jump, 45 degrees is the optimum angle of release. When the height of release is below the landing height, eg basketball shot, the optimum angle will be greater than 45 degrees. Conversely when the height of release is above the landing height, eg shot putt, the optimum angle will be less than 45 degrees.
- **Speed of release:** The faster an object is released the further it will travel, all other things being equal.
- **Height of release:** The higher an object is released the further it will travel, all other things being equal.

Parabolic flight

A symmetrical flight path eg a shot putt. A flight path which is not symmetrical, eg a badminton shuttle, is known as **non-parabolic flight**.

Vector components of parabolic flight

The flight path of an object is made up of **horizontal and vertical components**. These are vectors so can be represented by arrows, indicating both magnitude and the direction. The larger the arrow the greater the magnitude of that component. An object travelling upwards at a 45 degree angle would have vertical and horizontal components equal in magnitude.

3.2.2.6 Fluid mechanics

Bernoulli principle

- Bernoulli's principle describes the relationship between the speed and pressure of particles. His principle states that an increase in the speed of particles occurs simultaneously with a decrease in pressure.
- Bernoulli's principle results in **lift forces**. These cause an object to move perpendicular to the direction of travel.
- The Bernoulli principle can be applied to explain why a discus has an **upwards lift force** when thrown with correct **angle of attack**. This is the tilt of a projectile relative to the air flow. It can also be used to explain the **downwards lift force** produced by cyclists and racing cars.

Drag

The dynamic fluid force component that acts in opposition to the motion of an object with respect to a fluid, air, or water. There are two different types of drag:

- **Surface drag:** Otherwise known as 'skin drag', this refers to the friction between the surface of an object and the fluid environment.
- **Form drag:** Otherwise known as 'shape drag', this refers to the impact of the fluid environment on the object. Forces acting on the leading edge of an object increase form drag. Forces acting on the trailing edge reduce form drag.

3.2.3 Sport psychology

3.2.3.1.1 Aspects of personality

Interactionist perspective

- Interactionalist perspectives are theories which combine trait and social learning to predict how a person will act in a specific situation. These include:
- Hollander's model: Hollander suggested that personality is made up of three components**:**
    - **Psychological core:** Stable characteristics or traits
    - **Typical response:** Usual or expected behaviour in a given situation, dictated by the psychological core.
    - **Role related behaviour:** How behaviour can be further modified when the situational demands change.
- **Lewin's formula:** Behaviour is a function of personality and the environment. B = f(PxE)

Nature vs nurture debate

The nature versus nurture debate considers the extent to which aspects of behaviour are a product of innate traits (nature) or developed via social learning (nurture).

Social learning

Personality is learned from significant others via the process of **socialisation** (see 3.1.3.2.1 Sociological theory applied to equal opportunities).

Trait approach

Innate characteristics (those you are born with) dictate your personality producing consistent behaviours.

3.2.3.1.2 Attitudes

Attitude

A value aimed at an **attitude object**.

Cognitive dissonance

Providing new information to create a feeling of psychological discomfort by challenging one or more of the components of an existing attitude.

Persuasive communication

Attempting to talk a person into changing their attitude. To be successful a number of factors must be considered:

- Ensure **the messenger** is of high status so that the performer values their opinion.
- **The message** must contain new information so that old beliefs are outweighed allowing a change in attitude.
- Current strength of **the recipient's** attitude will impact because if the performer values their belief highly, they will be more resilient to change.

Triadic mode

There are three parts to an attitude:

- **Cognitive component:** What you think about an attitude object.
- **Affective component:** How you feel about an attitude object.
- **Behavioural component:** Your physical response to an attitude object.

3.2.3.1.3 Arousal

Arousal

A physical and mental (physiological and psychological) state of alertness varying from deep sleep to intense excitement.

Catastrophe theory

As arousal increases so does performance up until an optimal point is reached, after which a dramatic (catastrophic) decrease in performance occurs.

Drive theory

As arousal increases so does performance. P= f(DxH). Later revised to suggest that as arousal increase so does the likelihood of the dominant response occurring.

Inverted U theory

As arousal increases so does performance up until an optimal point is reached, after which performance will gradually decrease. The 'optimal point' will vary for different individuals and sports.

Zone of optimal functioning theory

A development of inverted U theory which suggested optimal arousal was not single point but a wider 'zone'.

Being 'in the zone' results in **peak flow experience**. This is characterised by:

- High focus on the task
- Movement feels effortless
- Clear goals
- High levels of self-efficacy
- Sub-conscious feelings of control, being on autopilot.

3.2.3.1.4 Anxiety

Anxiety

A negative emotional state usually associated with feelings of apprehension and worry, caused by over arousal due to a person being stressed. Types of anxiety:

- **Somatic anxiety:** Physiological reactions to stress.
- **Cognitive anxiety:** Psychological reactions (unpleasant thoughts, usually concerned with under achieving) to stress.
- **Competitive trait:** An enduring personality trait, giving a tendency to view all competitive situations as threatening.
- **Competitive state:** Anxiety felt in a particular competitive situation.

3.2.3.1.5 Aggression

Aggression
An emotional response (involving anger) to an individual perceived as an enemy or frustrating rival. It is the intent to cause harm, outside the rules of the sport.

Aggressive cue theory
Begins in the same manner as frustration-aggression hypothesis (see below) but suggests that frustration will only lead to aggression when learned triggers are present eg a coach is encouraging you to act aggressively or has previously reinforced that aggressive behaviour is acceptable in this situation.

Assertive behaviour
Forceful behaviour which occurs within the rules of the sport.

Frustration-aggression hypothesis
When a performer is blocked from achieving a goal they will become frustrated. The closer they were to achieving a goal the more frustrated they will become. Frustration must be released so will always lead to aggression. The aggressive act has a **cathartic effect** on the performer.

Instinct theory
Aggression is an innate trait.

Social learning theory
Aggression is a learned response. It is developed by copying from others.

3.2.3.1.6 Motivation

Intrinsic motivation
Motivation from within.

Extrinsic
Motivation from an outside source. This can be:
- **Tangible:** Physical rewards which can be touched.
- **Intangible:** Non-physical rewards which cannot be touched.

3.2.3.1.7 Achievement motivation theory

Achievement goal theory

Motivation and task persistence depend on the type of goal which is set. **Task or mastery goals** focus on learning to master a specific skill or activity. This type of goal creates high intrinsic motivation, developing a positive attitude. On the other hand, **ego or performance goals** (not to be confused with another type of performance goal identified in Goal setting 3.2.3.10) involve comparison to others. As such the performer can be more easily discouraged and is likely to select easier tasks where choice is available.

Approach behaviours

Approach behaviours are the positive 'can do' actions displayed by Nach performers. Where they do not currently exist, they can be developed by:

- Reinforcement
- Attribution retraining
- Allowing success
- Goal setting.

Atkinson's model of achievement motivation

Atkinson's model of achievement motivation states that:
Achievement motivation = desire to succeed – fear of failure.
The desire to succeed and the fear of failure are dictated by a combination of personality and the situation. It is an interactionalist perspective.
Personality can be either **Need to Achieve (nAch)** or **Need to Avoid Failure (nAf).** The situational factors which matter are the **probability of success** and the **incentive value of success**.

Incentive value

The intrinsic reward (pride) experienced by the individual after success has been achieved, the harder the task, the greater the incentive value.

Need to achieve (Nach)

Nach personality types enjoy tasks with a high incentive value of success irrespective of the probability of success. Nach personality types are characterised by:

- Seeking out challenging situations
- Taking risks
- Displaying high levels of task persistence
- Valuing feedback
- Developing a self-serving bias

Need to avoid failure (Naf)

Naf personality types will only attempt tasks with a high probability of success, irrespective of the limited incentive value of success on offer. A high incentive value of success will not encourage them to try tasks with a low probability of success. Naf personality types are characterised by:

- Low task persistence
- Dislike of feedback or evaluation
- Selecting the easy option when choice is available.

Probability of success

The extent to which the performer is likely to complete the task correctly.

3.2.3.1.8 Social facilitation

Evaluation apprehension

A sense of anxiety caused by a performer thinking they are being watched and judged by somebody.

Social facilitation

The beneficial influence of the presence of others on performance (eg coach, audience, co-actors doing the same activity).

Social inhibition

The negative influence of the presence of others on performance (eg coach, audience, co-actors doing the same activity).

Zajonc's model

Zajonc's model suggests that the presence of others increases arousal. These 'others' fall into two categories:

- **Passive:** The **audience** and **co-actors** (those doing the same task but not in direct competition).
- **Interactive: Social reinforcers** (observers who have a direct influence on the event eg coach) and **competitive co-actors** (those with whom you are in direct competition).

Increased arousal leads to increase in likelihood of dominant response occurring. The dominant response of a cognitive performer will be incorrect, resulting in social inhibition. The dominant response of an autonomous performer will be correct, resulting in social facilitation.

3.2.3.1.9 Group dynamics

Cohesion

The dynamic forces that cause a team to stick together. Can be:

- **Social cohesion:** The ability of the group to work together while maintaining positive relationships.
- **Task cohesion:** The ability of the group to work together towards achieving a common goal.

Ringelmann effect

The tendency for individual members of a group to become increasingly less productive as the size of a group increases.

Social loafing

Refers to the concept that people will tend to exert less effort when working collectively as part of a group, compared to performing a task alone. Losses in motivation may occur when a member of a group feels their efforts are not being recognised.

Steiner's model

Actual productivity = potential productivity – Losses due to faulty processes

- **Actual productivity:** The outcome of group performance.
- **Potential productivity:** The best performance a group is capable of under ideal circumstances.
- **Faulty processes:** Factors that decrease group performance. These can be motivational eg social loafing and Ringelmann effect or co-ordinational eg application of tactics and strategies.

Tuckman's model

Tuckman suggests there are 4 stages to group formation:

- **Forming:** The group coming together and getting to know each other.
- **Storming:** Conflict occurs as individuals compete to establish their position within the group.
- **Norming:** Agreement on roles occurs as cohesion starts to be developed.
- **Performing:** Group members work cohesively to achieve shared goals.

3.2.3.1.10 Importance of goal setting

Principles of effective goal setting

- **S**pecific: Goals should be clear and precise linked to both the performer and sport.
- **M**easurable: Assessment of whether the goal has been achieved should be possible. This is usually best done using quantitative data.
- **A**chievable: Within the scope of the performer's effort levels.
- **R**ealistic: Within the scope of the performer's ability levels while still providing enough challenge to be motivating.
- **T**ime bound: The deadline by which the goal will be achieved should be clearly defined.
- **E**valuate: After the deadline the performer should consider whether the goal was achieved or not. These reasons for success or failure should also be identified.
- **R**e-do: The process should be repeated with a new goal, either focused on an identified weakness or with an increased level of challenge to maintain progress.

Types of goals

- **Outcome goals:** A goal based on the outcome of performance which requires direct comparison to others.
- **Performance related goals:** A goal based on performance with no direct comparison to others.
- **Process goals:** A goal which focuses on the development of technique.

3.2.3.1.11 Attribution theory

Attribution

Perceived reason for success or failure.

Attribution retraining

The coach changes the usual internal stable attributions for failure (ability) into external or unstable factors.

Learned helplessness

The state that occurs when a performer believes that failure is inevitable and that they have no way of changing that outcome. There are two types of learned helplessness:

- **General learned helplessness:** Self-doubt that affects an individual in a range of situations. The belief they're unable to perform in all aspects of a sport or even all sports.
- **Specific learned helplessness:** Self-doubt that affects an individual in an individual sporting situation. A performer feels they're unable to perform well in one particular position or when executing one type of skill.

Self-serving bias

The tendency to attribute success to internal stable factors and losses or failures to external or unstable factors. Protects self-esteem.

Weiner's model

Weiner's model suggests there are four attributions available to a performer. These are categorised in two loci. The **locus of causality** (internal or external) relates to whether it is within the performer's control or not. The **locus of stability** (stable or unstable) relates to whether there is likely to be a change in the short term. The attributions and their loci are as follows:

- **Ability** (internal and stable)
- **Effort** (internal and unstable)
- **Task difficulty** (external and stable)
- **Luck** (external and unstable).

3.2.3.1.12 Self-efficacy and confidence

Bandura's model of self-efficacy

Bandura's model highlights four factors which affect a performer's self-efficacy:

- **Performance accomplishments:** How the athlete has performed in the task previously. Past success will lead to high levels of self-efficacy, whereas previous failures reduce it.
- **Vicarious experiences:** Watching others, especially those of a similar perceived ability. Seeing them being successful will boost self-efficacy whereas if they fail it will be lowered.
- **Verbal persuasion:** Reinforcement or encouragement from others. This is especially powerful from significant others eg coach or parents. If they demonstrate belief in your ability to succeed this will increase self-efficacy, while any doubts will decrease it.
- **Emotional arousal:** Arousal at or close to an optimal level will increase self-efficacy. Arousal significantly above or below this level will reduce self-efficacy.

Home field advantage

Playing at home tends to increase the chances of a team or individual being successful. A larger crowd, located closer to the playing surface, is thought to increase the effect. This may be explained by the fact that home teams tend to play more attacking styles. Away teams can also become anxious or over–aroused due to the crowd or unfamiliar surroundings.

Self-confidence

A person's belief in their ability to achieve success.

Self-efficacy

Situation specific self-confidence.

Self-esteem

Confidence in one's own worth, abilities or morals.

Vealey's model of self-confidence

Sport Confidence theory measures two factors: trait sports confidence (SC trait) and state sports confidence (SC state).

- **Trait sports confidence (SC trait):** Innate and therefore relatively stable. Trait confidence is a generalised belief of an individual about the extent to which their ability will bring success across a wide range of sports.
- **State sports confidence (SC state):** Developed through learning which makes it unstable and changeable. State confidence relates to an individual's belief about the extent to which their ability will bring success in a specific sporting situation.

State sports confidence (SC state) directly determines the quality of the skill that is to be performed and is determined by the interaction of three factors:

  - Trait sports confidence (SC trait): See above.
  - **The objective sports situation:** The type of skill that is to be performed and the situation in which the skill could be performed.
  - **Competitive orientation:** The extent to which an individual is prepared to compete, competitiveness.

High trait sports confidence, a positive view of the objective sports situation, and a high competitive orientation will produce high levels of state sports confidence.

3.2.3.1.13 Leadership

Chelladurai's multi-dimensional model

- Chelladurai's multi-dimensional model identifies that situational, performer or team, and leader characteristics must be considered. Based on their characteristics the performer or team will have a preferred behaviour, and the situation a required behaviour. The actual behaviour represents the leader's action towards the performer or group.
- The closer the leader's actual behaviour is to that preferred by the performer or team the greater the levels of satisfaction will be. The closer the leader's actual behaviour is to that required by the situation the greater the levels of performance will be. Having all three behaviours match is the ideal.

Emergent leaders

A leader who is appointed or approved by the group.

Fiedler's contingency theory

Fiedler suggested that the preferred style of leadership depends on the favourableness of the situation. Most and least favourable situations require a task orientated (autocratic) leader. Whereas a moderately favourable situation requires a person orientated (democratic) leader.
A favourable situation is considered to be one where:

- The leader is respected by the group.
- The group highly motivated and able.
- There are clearly defined tasks, goals, and roles in place.
- Good resources, eg equipment and facilities, are available.

Styles of leadership

- **Autocratic leader:** A task oriented leader who governs with a dictatorial style, making all the decisions and communicating them in a very direct manner.
- **Democratic leader:** A person orientated leader who listens to the members of the group and follows their suggestions. They rely on group consultation and recognise the importance of group relationships.
- **Laissez-faire leader:** Provides little support or input letting team members do as they wish. More of a figurehead.

Prescribed leaders

A leader who is appointed by an external authority to lead the group.

3.2.3.1.14 Stress management

Cognitive stress management techniques

- **Thought stopping**: The use of a cue (an action or word) to re-direct attention to positive thoughts or prevent negative thoughts reoccurring.
- **Positive self-talk:** Reciting positive statements about performance.
- **Imagery/visualisation/mental rehearsal**: Formation of mental pictures of ideal performance. These can be:
    - **Internal:** Seeing the action through the performer's eyes. This can develop the kinaesthetic feeling of the movement.
    - **External:** Seeing the action from outside of the body eg like watching themselves on TV. This can create familiarity with the environment.
- **Attentional control and cue utilisation**: Cue utilisation theory predicts that, as arousal increases, attention focus narrows. The narrowing process tends to block out irrelevant cues first and then, if arousal is high enough, the relevant ones. This results in reducing the availability of important information to an over aroused performer and the overwhelming influx of irrelevant information in an under aroused performer.
- To avoid this, performers should learn attentional control. This is where they develop four attentional styles: Broad (focus on a number of cues); Narrow (focus on few cues); External (focus on information from the environment); Internal (focus on information from within the performer).
- These styles can then be combined to meet the demands of the situation:
    - **Broad / external:** Used during games to detect fast changing situations and identify the best option.
    - **External / narrow:** Used to concentrate on specific objects or tasks.
    - **Narrow / internal:** Used to mentally rehearse a skill or task.
    - **Internal / broad:** Used to analyse performance and plan future strategies and tactics.

Somatic stress management techniques

- **Biofeedback:** Involves measurement of physiological responses such as heart rate, breathing rate, sweat production, or blood pressure. The performer learns to recognise these physiological changes and practise strategies to control them.
- **Centring:** A form of breathing control used to allow a performer to relax the upper body whilst concentrating on the slow movement of the abdominals. This is used to divert attention away from stressful situations.
- **Breathing control:** Deep, slow, conscious, breathing. Box breathing is one example where the athlete would breathe in for 4 seconds, hold for 4 seconds, breathe out for 4 seconds, hold for 4 seconds, and repeat several times.
- **Progressive muscle relaxation:** Focuses on specific muscle groups working in a sequential order eg up the body from the feet to the neck. The target muscles are contracted and held, to increase tension, before being relaxed to allow all tensions to be released.

Stress

Negative **somatic** (physiological) and/or **cognitive** (psychological) response to a perceived threat.

Stressor

The cause of stress.

3.2.4 Sport and society and the role of technology in physical activity and sport

3.2.4.1 Concepts of physical activity and sport

Physical education

The national curriculum states that physical education is compulsory for all students across key stage 1-4 (ages 5-16). It is delivered by teachers in formally taught, timetabled lessons. Teachers pre-plan the lessons making them highly structured.

Physical recreation

Physical recreation is usually fun. Winning is not important so it can be self-officiated. It is flexible in its organisation with modified rules.

Sport

Sport is highly organised involving written rules. It is competitive so requires officials. Participants are committed to regular training, developing strategies and tactics in order to be successful. There may be extrinsic rewards available.

School sport

School sport is different to PE as it occurs in extra-curricular time as an additional option for students. School sport is competitive, demonstrating many of the characteristics of traditional 'sport'.

3.2.4.2 Development of elite performers in sport

National Governing Bodies

Organisations responsible for the promotion, development, and regulation of a single sport in the UK. Examples include the Football Association, UK Athletics, and the Lawn Tennis Association

National Institutes of Sport

As of 2023 known as UK Sports Institute the aim is to deliver support that enables sports and athletes to excel at elite level. They work with performance directors, coaches, and others within sports to identify where their expertise can best be utilised, and to deliver the services which will make a difference to a sport and their athletes. These services include:

- Sports science support (physiology, psychology, biomechanics, nutrition)
- Sports medicine and physiotherapy
- Lifestyle support services and financial advice
- Access to high quality facilities.
- Access to high quality coaching
- Undertaking cutting edge research and innovation.

UK Sport

The UK wide organisation responsible for delivering world class sporting success in conjunction with a range of partner organisations.
Programmes UK Sport are responsible for include:

- World Class Performance Programme
- Gold Event Series
- Talent Identification and Development

3.2.4.3 Ethics in sport

Amateurism

The views and principles of a person who engages in a sport for pleasure rather than for profit.

Deviance

Behaviour that falls outside the norms or outside what is deemed to be acceptable. There are two forms:

- **Positive deviance:** Behaviour which is outside of the norms of society, but without the intent to harm or break the rules. This can include an over adherence to the norms of society.
- **Negative deviance:** Behaviour goes against the norms of society and has a detrimental effect on individuals or society in general.

The Olympic Oath

- The Olympic oath is taken by an athlete from the host county, on behalf of all the athletes. Since 1972, a judge has sworn an oath alongside the athlete at the Games opening ceremony; and since 2012, so too has a coach.
- The first Olympic oath, at the Games of the modern era, was written by Pierre de Coubertin. It has been modified over time to reflect the changing nature of sports competitions. In 2000, in Sydney, for the first time, the oath explicitly included a reference to doping.

Sportsmanship

Conforming to the rules, spirit, and etiquette of a sport.

Gamesmanship

Bending the rules to gain an advantage.

Win ethic

The belief in winning at all costs. This may result in an increase in deviance and gamesmanship.

3.2.4.4 Violence in sport

Hooliganism

Disruptive or unlawful behaviour such as rioting, fighting and vandalism, usually in connection with crowds at sporting events.

3.2.4.5 Drugs in sport

Anabolic steroids

Artificially produced male hormones mimicking testosterone that promote muscle and bone growth and reduce recovery time. Often used by power athletes, eg sprinters.

Beta blockers

Drugs that are used to steady nerves by controlling heart rate. They have a calming and relaxing effect.

Doping

Defined by World Anti-Doping Agency (WADA) as the misuse of techniques and/or substances to increase red blood cell count.

Erythropoietin (EPO)

A type of peptide hormone that increases the red blood cell count.

World Anti-Doping Agency (WADA)

WADA's primary role is to develop, harmonise, and coordinate anti-doping rules and policies across all sports and countries.

3.2.4.6 Sport and the law

Duty of care

- A legal obligation imposed on someone who is responsible for a group of people.
- A coach has a duty of care for their performers which requires them to ensure 'reasonable' measures are taken to keep them safe.

Negligence

Conduct which fails to meet a reasonable personal standard, breaching the duty of care and resulting in foreseeable harm to another.

3.2.4.7 Impact of commercialisation on physical activity and sport and the relationship between sport and the media

Commercialisation

To manage or exploit (an organisation, activity, etc) in a way designed to make a profit.

Sponsorship

Provision of funds or other forms of support to an individual or event in return for some commercial return.

The media

Diversified technologies which act as the main means of mass communication. Media includes:

- Printed media, eg newspapers
- Broadcast media, eg TV and radio
- Internet/social media, eg Facebook
- Outdoor media, eg billboards.

3.2.4.8 The role of technology in physical activity and sport

Metabolic cart

A medical device used to precisely measure the oxygen you inhale and the carbon dioxide you exhale. These results can be used in indirect calorimetry to calculate respiratory exchange ratio (RER) (see 3.1.1.6 Energy systems)

Motion tracking software and hardware

- **Global positioning system (GPS)** is a form of motion tracking software which provides accurate worldwide location based on the reception of signals from multiple satellites. In sport it can be used to track distance and speed of movement.
- GPS is now widely accessible via a range of hardware including smartphones, watches, and units which can be included in the playing shirts of games players. These can usually combine GPS with other data such as heart rate to provide a clearer picture of performance.
- This can be used to **monitor fitness for performance** eg time taken to cover a set distance in a specific heart rate zone or monitor workloads for **injury prevention** eg knowing how far a player has run in a match so decisions can be made regarding substitutions.

Use of technology in data collection

Technology increasingly provides researchers, coaches, and athletes with **objective and quantitative data** (see 3.2.1.2 Preparation and training methods in relation to maintaining physical activity and performance for definitions of key terms relating to data collection). However, this data needs to be interpreted which can make the conclusions drawn and decisions made **subjective and qualitative data.**

For data collected using technology to be of use it must be **valid** and **reliable.**

When using technology in data collection it is vital that **data integrity** is maintained. This requires that:

- Data collected is backed-up securely.
- A password and antivirus software are used to secure the data.
- Efforts are made to reduce human error in recording/inputting such as using spreadsheets which only accept relevant values.
- The number of times the data is transferred, shared, or copied is limited.
- Data is never left unsupervised eg locking of screens when away from the station.

Video and analysis programmes

In sport, recordings of performance are increasingly used to analyse and improve performance, including **skill and technique development**. The use of video and analysis programmes can be divided into two fields:

- Notational match or **game analysis:** Analysis of individual or team performance based on a number of different performance indicators eg time in possession, successful passes, interceptions etc.
- **Biomechanics:** Analysis of the performance of a skill based on the movement/position of key points on the body eg head, arms, legs position. This often uses highly specialised technology to measure joint angles, force production, body rotation etc.

Version 2.0
October 2023