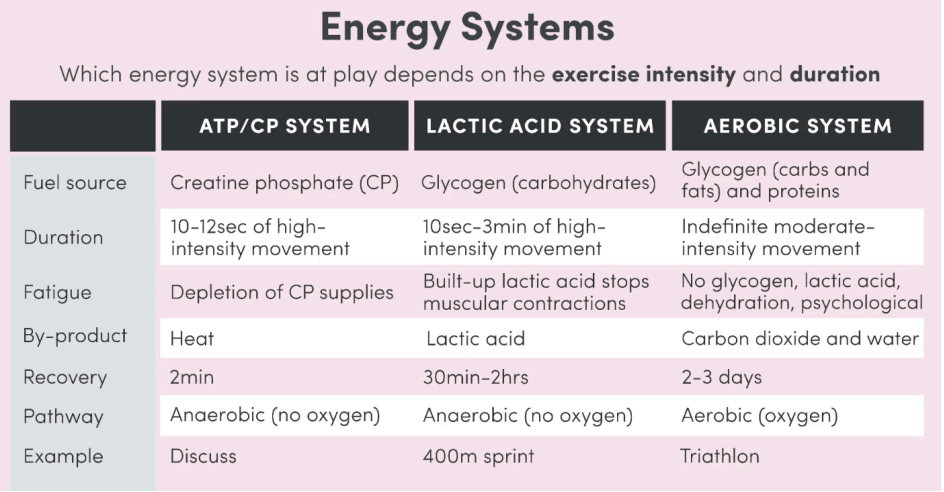
Link to practice responses:
https://docs.google.com/document/d/1DHwpgAX6mu82rqpp_AzVk-nu0fzpx5CzSp6oLJ8w_E4/edit?tab=t.0

IQ1

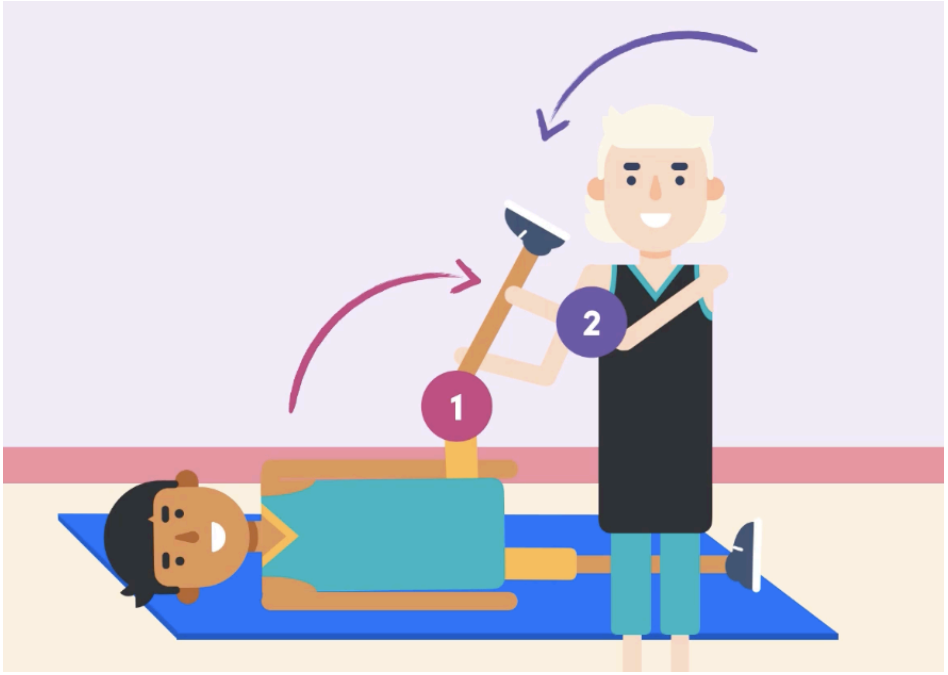
How does training affect performance?

Teacher Note: Students should be provided with opportunities to explore the concepts dealt with in this module through a variety of practical experiences.

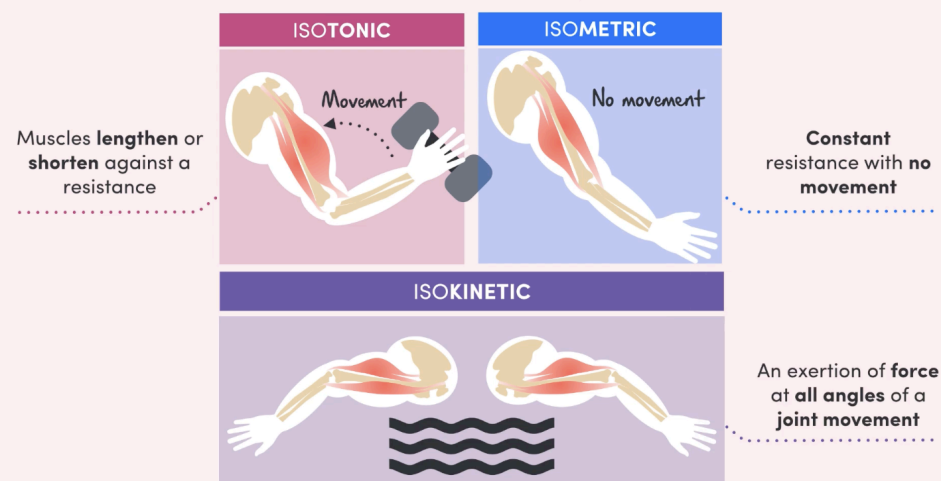
Students learn about:	Students learn to:
• energy systems – alactacid system (ATP/PC) – lactic acid system – aerobic system	• analyse each energy system by exploring: – source of fuel – efficiency of ATP production – duration that the system can operate – cause of fatigue – by-products of energy production – process and rate of recovery
• types of training and training methods – aerobic, eg continuous, Fartlek, aerobic interval, circuit – anaerobic, eg anaerobic interval – flexibility, eg static, ballistic, PNF, dynamic – strength training, eg free/fixed weights, elastic, hydraulic	• assess the relevance of the types of training and training methods for a variety of sports by asking questions such as: – which types of training are best suited to different sports? – which training method(s) would be most appropriate? Why? – how would this training affect performance?
• principles of training – progressive overload – specificity – reversibility – variety – training thresholds – warm up and cool down	• analyse how the principles of training can be applied to both aerobic and resistance training
• physiological adaptations in response to training – resting heart rate – stroke volume and cardiac output – oxygen uptake and lung capacity – haemoglobin level – muscle hypertrophy – effect on fast/slow twitch muscle fibres	• examine the relationship between the principles of training, physiological adaptations and improved performance

Syllabus Dot Point	Summary Notes
• Energy systems - Alactacid system (ATP/PC) - Lactic acid system - Aerobic system	**Energy Systems** Energy from ingested food is converted into usable energy (ATP), the breaking of the last phosphate bond releases energy. - Only a limited supply of ATP is readily available in muscles  **Energy Systems** Which energy system is at play depends on the **exercise intensity** and **duration** ATP/CP SYSTEM / LACTIC ACID SYSTEM / AEROBIC SYSTEM Fuel source: Creatine phosphate (CP) / Glycogen (carbohydrates) / Glycogen (carbs and fats) and proteins Duration: 10-12sec of high-intensity movement / 10sec-3min of high-intensity movement / Indefinite moderate-intensity movement Fatigue: Depletion of CP supplies / Built-up lactic acid stops muscular contractions / No glycogen, lactic acid, dehydration, psychological By-product: Heat / Lactic acid / Carbon dioxide and water Recovery: 2min / 30min-2hrs / 2-3 days Pathway: Anaerobic (no oxygen) / Anaerobic (no oxygen) / Aerobic (oxygen) Example: Discuss / 400m sprint / Triathlon
• Types of training and training methods - Aerobic	**Aerobic Training** Works on enhancing the aerobic energy system. Enhances cardiovascular and muscular endurance for long distance athletes (e.g. marathon runners, long-distance swimmers, triathletes). *Continuous Training* When an athlete does the same activity at the same intensity for a prolonged period of time (minimum 20 minutes). - Good for sports with maintained intensity over long duration (e.g. swimming) - Can become repetitive and hard to maintain interest in *Fartlek Training* When an athlete does the same activity for a certain period of time at different intensities. - Good for sports with inconsistent efforts (e.g. cross-country running or cycling) - Can still become repetitive over long periods of time *Interval (aerobic) Training* When the athlete works at a high intensity between 60-80% of their MHR and then switches to a rest period. Ratio is about 3:1 (work : rest) - Can be specifically tailored to specific sports by performing needed movements at suitable intensity - Can be exhausting for the athlete, and could create a motivational barrier *Circuit Training* Athletes do a range of different aerobic activities that are set up in a circuit.

	- Creates engaging and entertaining movements to keep athletes interested - Can require equipment and facilities which are inaccessible for some people
- Anaerobic	**Anaerobic Training** Enhancing the anaerobic energy systems, to: - Move faster - With more power - And prolong eventual fatigue from CP lack, or lactic acid build-up - Recover faster - (sprinting, weightlifting, boxing) *Anaerobic Interval* Athletes alternate between exercise and rest periods. Involves periods of extremely high intensity exercise with much longer periods of complete or active rest (than aerobic). - HIIT training can improve both ATP/PC and Lactic acid systems To enhance ATP/PC: - Short intervals (<10s) - Intense intervals (90-95% of MHR) - Long rest periods - Work:rest - 1:6 to 1:12 For Lactic Acid: - Longer intervals (10-45s) - Less-intense intervals (80-90% of MHR) - Shorter rest periods - Work:rest - 1:3 to 1:5 *Example: Sprint Interval Training (SIT)* Athletes alternate between periods of sprinting and periods of active recovery.
- Flexibility	**Flexibility** The range of motion we have around our joints. 1 - there are stretches for all different muscle groups 2 - can mimic exact movements in the sport 3 - it can reduce the risk of injury by giving us a greater risk of motion - Untrained athletes may injure themselves by stretching improperly *Static* The muscle is slowly stretched to a position (end point or limit) which is held for 10-30 seconds. - Is safe and used extensively in the rehabilitation of injury and warm-up/cool down phases E.g. pike stretch, and held splits

- Strength training	*Ballistic* Involves repeated movements such as swinging and bouncing to gain extra stretch past the normal range of motion. - Can be potentially harmful and should only be used by advanced athletes after an appropriate warm-up E.g. bouncing in the pike stretch to push our chest further towards the legs *Proprioceptive Neuromuscular Facilitation (PNF)* Lengthening a muscle against a resistance usually provided by a partner. - Incorporates static stretching, strength development using isometric contractions and periods of relaxation in a progressive sequence **STATIC → ISOMETRIC CONTRACTION → STATIC STRETCH**  - Disables the stretching reflex that prevents further flexibility - Should be incorporated into warm-up and cool down for added stretch safety - Can cause injury if done too quickly *Dynamic* Involves constant movement within the full range of motion at the targeted joint, to gradually warm-up muscle fibres and extend them through the range of motion, but not beyond. - The more the same motion is performed, the larger the range of motion becomes - Not as safe as static or PNF due to tension exerted by specific movements on muscles and across joints - Most preferred prior to games as it simulates in-game movements **Strength Training** - When we undertake strength training we put a lot of resistance against the muscles being used

- The muscle fibres tear
- Our muscles begin to repair tissue and form more muscle tissue, to prevent future muscle tear from the same exercise
- In order to continue this trend, resistance must be progressively increased



Strength training is important in sports where large amounts of force and weight are advantageous.

Weights

Involves the targeted muscles overcoming and resisting the load of a weight.

- Use ATP/PC and then LA systems

Fixed weights

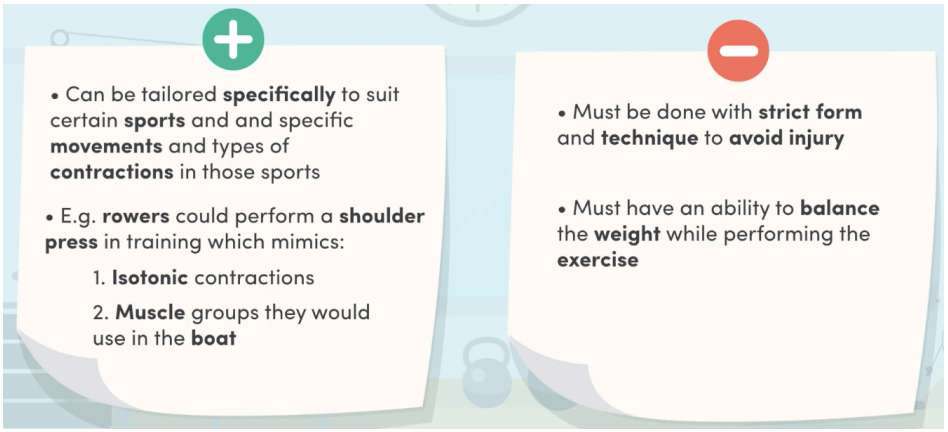
- Machine weights
- Good for beginners learning the correct technique
- Improves muscular strength and endurance
- Good resistance training for beginners
- Promotes good technique
- Safer than free weights
- Can be used for rehab and circuits

E.g. cable pull-downs, pec deck, leg presses

Free weights

- Dumbbells, barbells and hand weights
- Help strengthen major and surrounding muscles needed to stabilise the athlete
- For more advanced or experienced trainers (bodybuilders and power athletes)
- Improves strength and power through low reps
- Improves endurance through low reps
- Increased risk of injury

E.g. bench presses, squats, bicep curls



Elastics (resistance bands)
Large bands that can be attached to something stable or used by themselves in certain exercises to provide the athlete with resistance.

- Cheap and portable
- Provides a range of resistance (the further the band is stretched, the higher the resistance)
- Can be used for both isotonic and isometric contractions (useful for rehab or at home exercise)
- Improves muscle tone
- Limited strength and power gains, as there is a limit to resistance

E.g. squats, curls, sit-ups

Hydraulics
Specifically target isokinetic contractions.

- Uses water or air compression to create resistance throughout the whole movement
- Gravity does not assist in returning movements
- The higher speed and more power, result in greater resistance
- Often used in circuit training and rehab
- Very safe as it promotes good technique

E.g. chest presses, leg curls, breaststroke in swimming

- Principles of Training
  - Progressive overload
  - Specificity
  - Reversibility

Principles of Training

Progressive Overload
Gradually increasing the exercise load an athlete undertakes in order to see continuous improvements.

Specificity
Athletes have to train specifically to the energy system and skill requirements needed for their sport.
E.g. aerobic training (long-distance cycler) would have longer training periods, shorter rests, and focus on muscular endurance in the legs.

Reversibility
The loss of adaptations that athletes gained during training because of a prolonged break period. Adaptations are lost within a third of the time period which was required to train.

- Variety

- Training Thresholds

- Warm-up and cool down

Variety
1 - Prevents boredom and keeps athletes engaged and motivated to train
2 - Ensures athletes are training holistically, covers all muscle groups or components of fitness, and gives breaks to different muscle groups and energy systems.

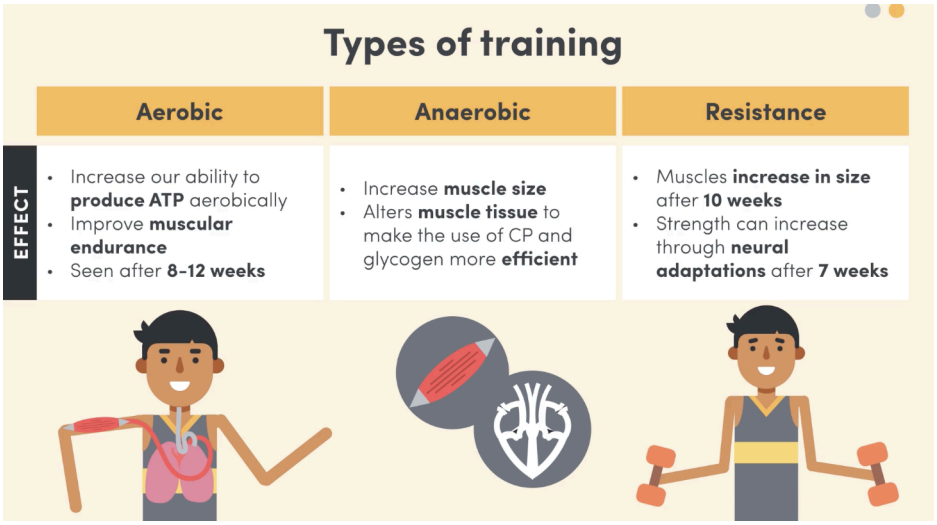
Training Thresholds
The 'zones' at which athletes need to train if they want to see improvement and adaptation in the necessary energy system.
- Training at a different percentage of their MHR to see improvements

Warm-up and Cool down
General warm-up - increasing blood circulation to enable athletes to move faster and more powerfully
Specific warm-up - athletes perform movements similar to those which are used in a sporting session

Cool down - lowers areas of the body raised in the warm-up, and prevents delayed onset of muscle soreness by removing accumulated lactic acid.

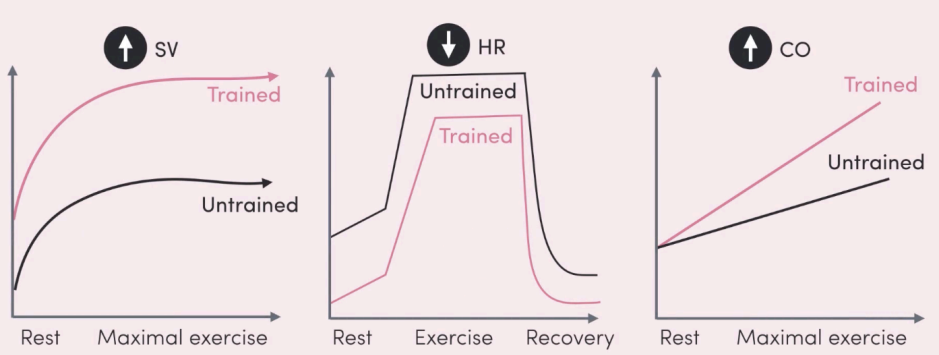
- Physiological adaptations in response to training

Physiological Adaptations in Response to Training
Chronic Adaptations - changes in the body that occur after a minimum 6-8 weeks of training, which allow athletes to train for longer and at higher intensities than before (until training is ceased)



Cardiac Hypertrophy
The size and strength of the heart increases through training (in particular, aerobic). The left ventricle specifically increases in size as it works to pump blood to the body.

- Stroke volume and cardiac output
- Resting heart rate



Heart rate and Stroke Volume

- The amount of oxygen needed at rest remains the same
- But trained athlete's hearts' (with a higher SV) will take less beats to meet these demands
- Also impacts recovery rates (trained athletes recover at a much quicker rate)

Cardiac Output

- More blood to the muscles (carrying O_2) allowing for higher intensity of exercise

- Haemoglobin level

Haemoglobin Levels

- Can increase up to 25% as a result of aerobic training

Increased amounts of RBCs allows for more oxygen to be taken to the muscles and more CO_2 to be removed

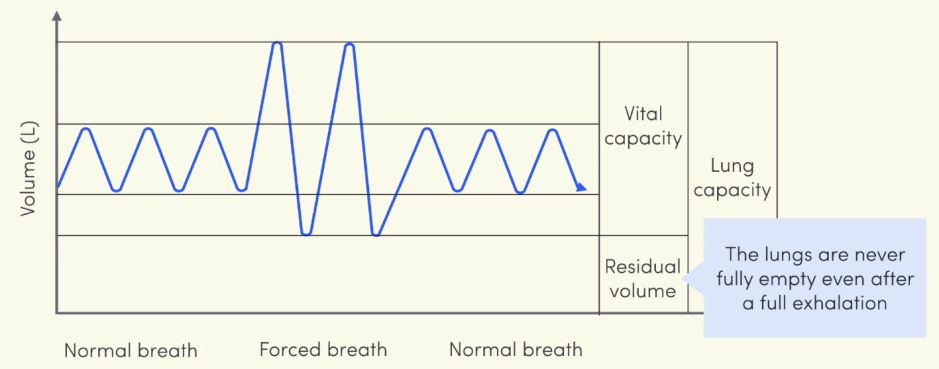
- Plasma also increases (more than RBCs) which reduces viscosity allowing the blood to flow easily

- Oxygen uptake and lung capacity

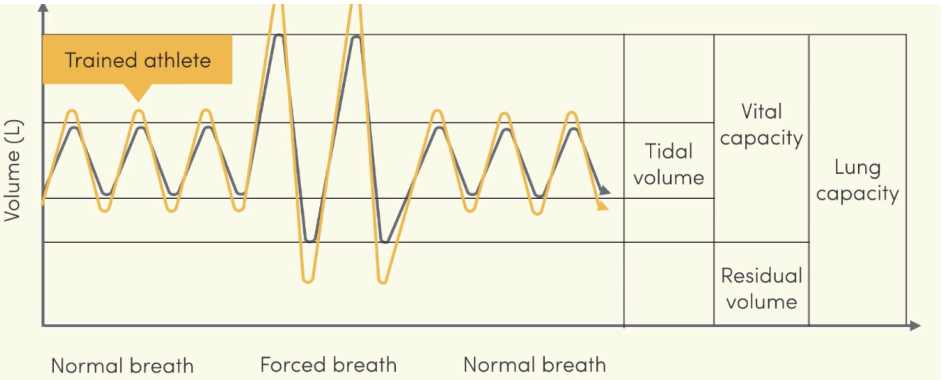
Lung Capacity

Lung capacity, vital capacity and tidal volume all increase as a result of training

- Through training, the breathing muscles grow in size and strength resulting in an enlargement of the chest cavity, which means the lungs can expand further

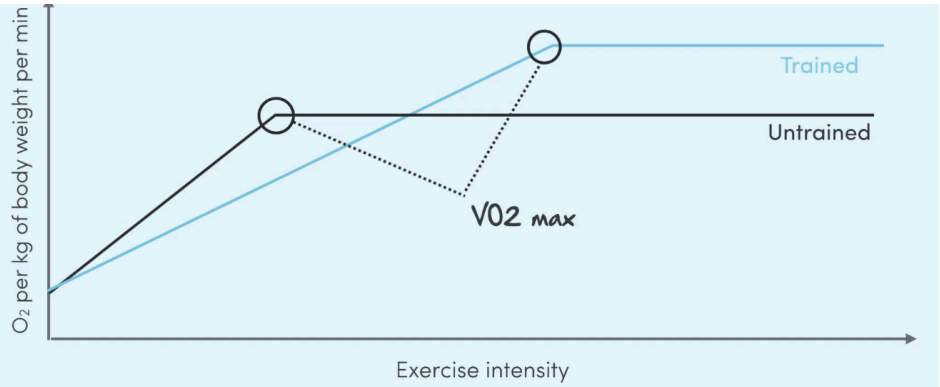


Tidal volume - the amount of air displaced between the environment and the lungs with each normal breath



Oxygen Uptake - VO_2 max

The maximum amount of oxygen (L) our body can gather and utilise through muscles or other cells



Increases due to:

- Higher haemoglobin levels
- Capillarisation
- Increased pulmonary diffusion

Effect:

- Enhances aerobic capacity
- Higher intensities of exercise can be maintained for longer

- Muscle hypertrophy

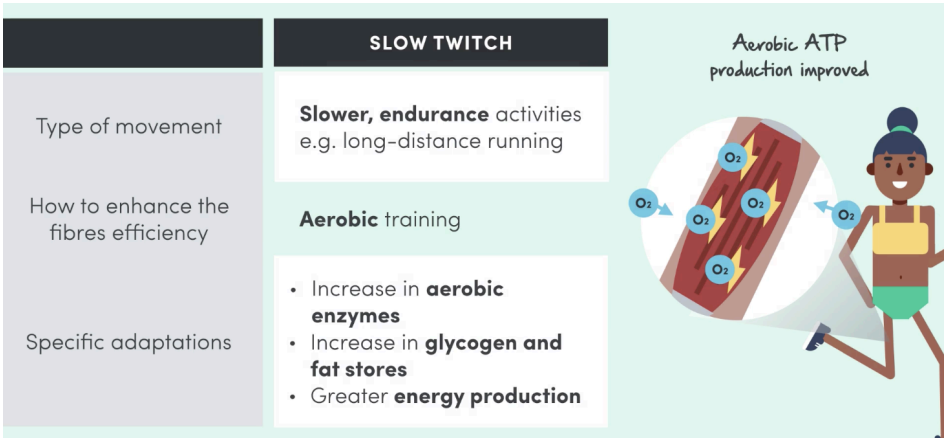
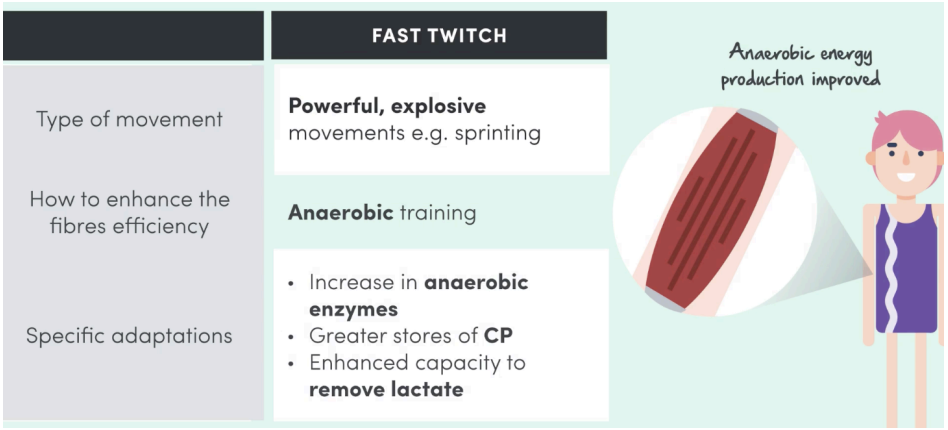
Muscular Hypertrophy

An increase in the size of a muscle. When muscles are put under stress, the fibres are torn and broken down. When they grow back, they are stronger than before.

- Particularly through anaerobic and resistance training, which involve high intensities and lots of pressure on the muscles
- Allows greater force to be exerted faster, increasing strength, power and muscular endurance

Process

- Increase in number of protein filaments
- Increase in number of muscle fibres
- Overall larger cross-section of muscle

- Effect on fast/slow twitch muscle fibres	**Slow-Twitch Fibres**  **Fast-Twitch Fibers**  All of the above will only occur with adequate rest in between sets and training sessions so that progressive overload can occur and overtraining is prevented.

IQ2

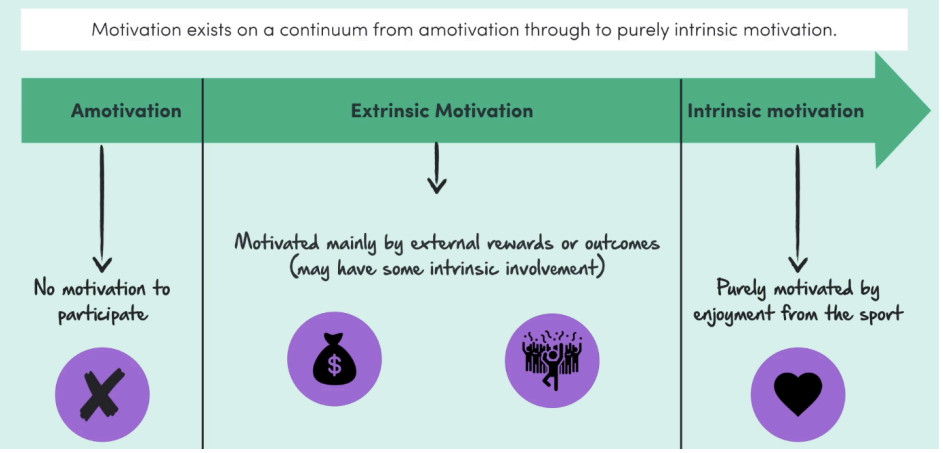
How can psychology affect performance?

Students learn about:

- motivation
  - positive and negative
  - intrinsic and extrinsic
- anxiety and arousal
  - trait and state anxiety
  - sources of stress
  - optimum arousal
- psychological strategies to enhance motivation and manage anxiety
  - concentration/attention skills (focusing)
  - mental rehearsal/visualisation/imagery
  - relaxation techniques
  - goal-setting.

Students learn to:

- evaluate performance scenarios to determine the appropriate forms of motivation, eg golf versus boxing
- explain the difference between anxiety and arousal in terms of the effects on performance
- research case studies of athletes from different sports and ascertain the nature of their motivation and the psychological strategies they employ.

Syllabus Dot Point	Summary Notes
• Motivation	**Motivation** The reason for an athlete's participation, training and improvement in their sport. Allows athletes to train and focus harder and enhance performance.
- Intrinsic and extrinsic	*Intrinsic* - coming from within the athlete. Important for lung duration sports where motivation must be sustained and constant, regardless of presence of external sources (e.g. a coach). *Extrinsic* - coming from external forces outside of the athlete, who must care about the forces in order for them to be motivating. 
- Positive and negative	*Positive* - motivation is driven by happiness, satisfaction or a reward, which motivates towards a good performance. - Easier to maintain over a longer period of time - Incentive to train harder to receive another award

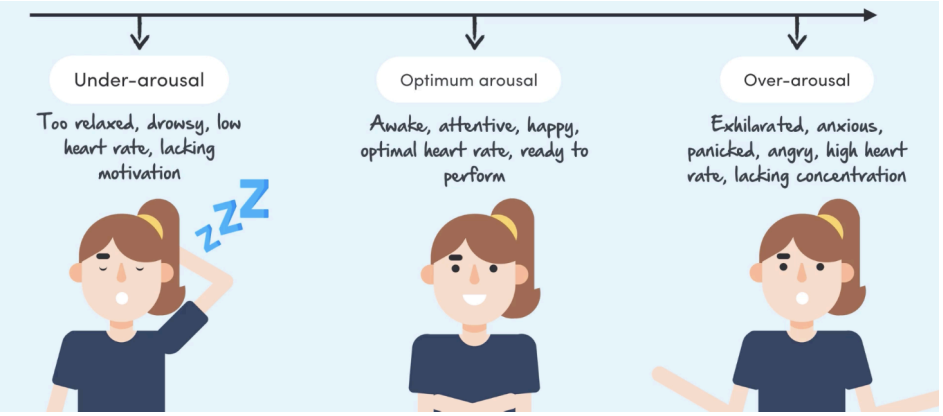
	Negative - motivation is driven by desire to avoid negative consequences or punishment, motivating away from a poor performance. - Athlete may give up in fear of further consequences **Classifying Motivation** Must be classified as both negative or positive, and intrinsic or extrinsic. E.g. Tennis player - may be negatively and intrinsically motivated to perform well, as they may be disappointed with themselves if they don't Marathon Runner - can be satisfied by achieving a personal best or goal, which is positive intrinsic Boxer - will be motivated to perform well in order to avoid being hit as a consequence of poor performance; negative extrinsic Golfer - could be motivated to perform well and win in order to achieve the prize money; positive extrinsic
● Anxiety and Arousal	**Anxiety** *Anxiety* - the negative mental state of worry and nervousness, which only has detrimental effects on performance.
- Trait and state anxiety	Trait and State Anxiety *Trait Anxiety* - is an inherent characteristic of a person. High levels lead to anxiety before and during competitions or games. - Leads to increased heart rate and nerve activity which can cause performance to suffer *State Anxiety* - arises in situations that evoke stress or nervousness. The more stressful the situation, the higher the state anxiety - High levels lead to increased heart rate and reduced focus which can cause performance to suffer
- Sources of stress	Sources of Stress - Occurs when a person experiences stress. Stress is triggered when people feel incapable of meeting certain demands - Stressors can be both internal and external Internal stress: come from within the athlete - Expectations - Past experience - Poor self-perception External: out of the athlete's control - Coaches - Competition - Weather - Crowd

- Optimum arousal

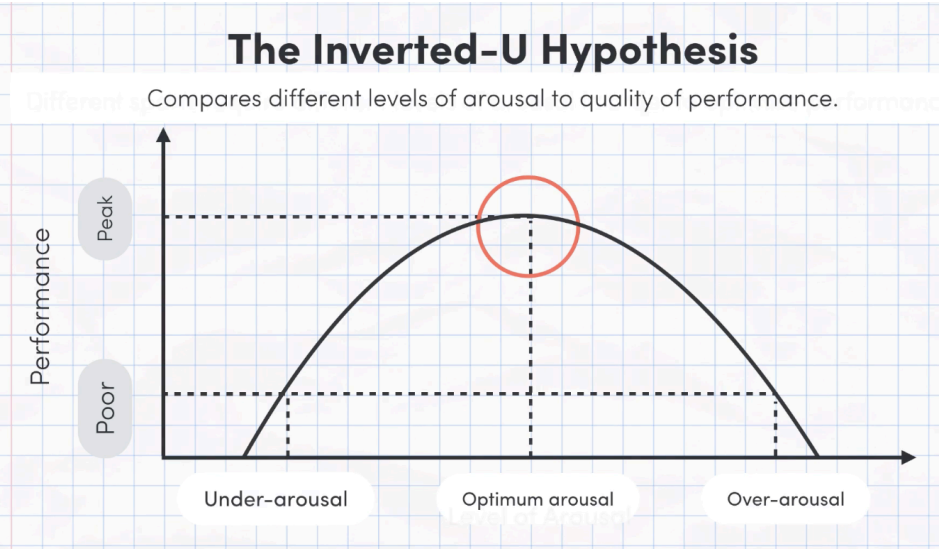
Arousal

Arousal - mental and physical readiness for a performance. Affects motivation, focus, heart rate and muscle activation.

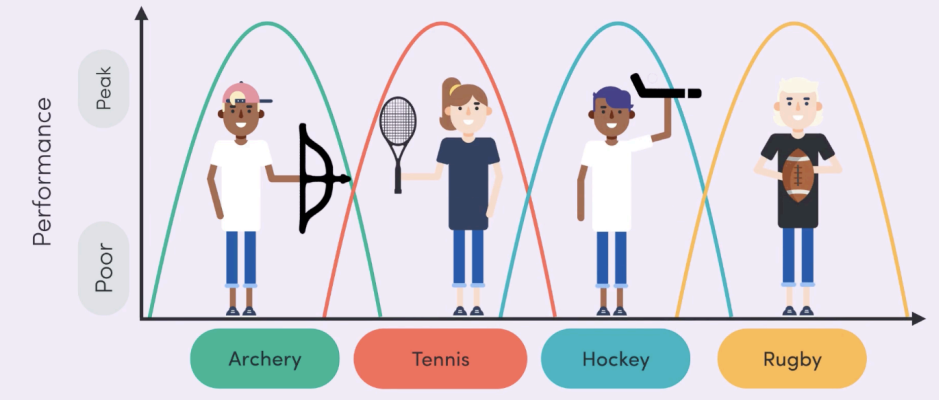
- Exists on a continuum



Optimum Arousal = Optimal Performance



This graph will look different for each athlete based on their performance needs. (e.g. high complexity = low arousal)



● Psychological strategies to enhance motivation and manage anxiety - concentration/attention skills (focusing)	**Psychological Strategies to Enhance Motivation and Manage Anxiety** **Concentration and Attention** <u>Concentration and Attention Skills</u> *Attention* - taking notice of something *Concentration* - focusing all of our attention on something in particular They allow us to think carefully about the task at hand for its entire duration; reduces anxiety levels by blocking out negative thoughts, and increases motivation by focusing attention on positive outcomes. *Foci* - the things we focus on *Types of Focus* Broad - concerned with a number of different foci at one time (mostly in team sports) Narrow - concerned with a small number, or just one foci (typically in individual sports with stable environments) *Internal Foci* - things that are related to and directly controlled by us *External Foci* - things that are beyond the space of the body <u>Concentration and Attention Strategies</u> *Selective Attention* An intentional narrow focus, which allows athletes to focus on specific aspects despite potential distractions. E.g. soccer player must practice selective attention in training so he can still score the penalty kick in a stressful game *Trigger Words* Words or phrases that bring focus back to the task at hand, helps athletes regain focus and stomp out negative/anxious thoughts. This can be customised to each athlete. E.g. saying calming phrases such as 'breathe' calm down, or motivating phrases such as 'its time!', 'ready, set, go!' to prepare for action. *Performance Segmenting* Using concentration and attention skills during breaks in the competition. It ensures the mind doesn't drift during these segments, that they are concentrated on their next move, prevents focus on self-doubt and maintains motivation through reward concentration.
- Mental rehearsal/ visualisation/imagery	**Mental Rehearsal, Visualisation and Imagery** *Mental rehearsal* - imagined mental practice of performing a task as opposed to actual practice. *Imagery* - the internal and visual creation or recollection of images and scenarios. *Visualisation* - creating and focusing on a range of positive mental images and experiences to achieve specific psychological benefits.

- Relaxation techniques

Mental Rehearsal	*Visualisation*
- Psychological skill - Must've experienced the skill before E.g. Alisa Camplin aerial ski jump - Most useful for self-paced - Always imagine success - Decreases anxiety and ignores distractions - Once the sensation is felt after rehearsal, immediately go perform skill (works best)	Differs - lack of reality 1 - imagining a happy place (beach, sun, warm) - Increases calmness and decreases anxiety 2 - imagining successful scenarios (crunch tackle, gold win) - Increases arousal Unique - can be used in training - E.g. imagining success scenarios while running on treadmill

Relaxation Techniques

Primarily help to regulate arousal and avoid/treat depression, high anxiety, raised emotions, altered heart/breathing rates, nervousness and lethargy.

Progressive Muscle Relaxation

Through relaxing muscles and releasing tension, there is a flow-on effect to the mind which can decrease anxiety, improve performance and allow for metal recovery.

1 - increased tension of a specific muscle by performing gentle isometric contractions

2 - after a few seconds, release tension and contraction, and focus on feeling of relaxation in the muscle

Controlled/Rhythmic/Deep Breathing

A form of breathing where a phase of the breath is extended. Ratio is usually 1:2 for inhale:exhale.

Music

Allows athletes to dissociate from distractions and improve their mood. Calming, slow music is helpful in sports with low arousal. But it should not be depended on as it may not be allowed in performance scenarios.

Meditation

E.g. yoga, tai chi, or sensory based meditations. Can relax the athlete from competition stress and promote good mental health and well-being.

- Goal-setting

Goal Setting

It increases our chances of actually achieving our goals

- Increases our motivation as there is something to work towards
- Improves concentration and attention and reduces anxiety
- Increases self-confidence when goals are achieved

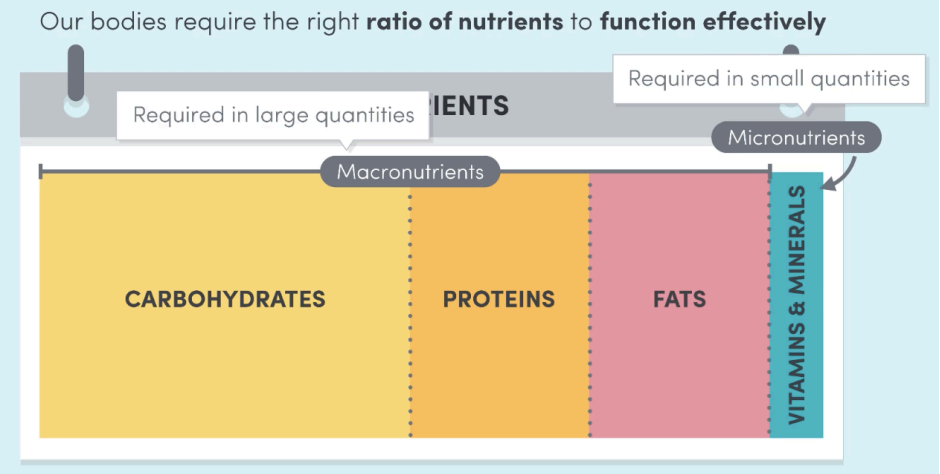
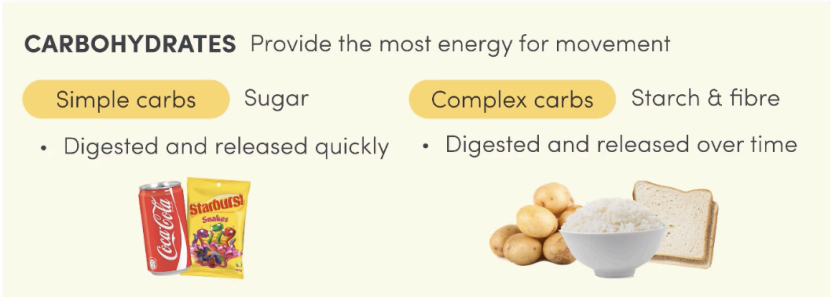
Types of Goals

	 Framework for Goal-Setting

IQ3

How can nutrition and recovery strategies affect performance?

Students learn about:	Students learn to:
• nutritional considerations – pre-performance, including carbohydrate loading – during performance – post-performance	• compare the dietary requirements of athletes in different sports considering pre-, during and post-performance needs
• supplementation – vitamins/minerals – protein – caffeine – creatine products	• critically analyse the evidence for and against supplementation for improved performance
• recovery strategies – physiological strategies, eg cool down, hydration – neural strategies, eg hydrotherapy, massage – tissue damage strategies, eg cryotherapy – psychological strategies, eg relaxation.	• research recovery strategies to discern their main features and proposed benefits to performance.

Syllabus Dot Point	Summary Notes
• Nutritional consideration	**Nutritional Considerations**  

Glycaemic Index (GI)

Ranks carbs out of 100 based on **how quickly** they are **digested and absorbed** into the blood as **glucose**

0 = causes no fluctuations to blood glucose levels


GI 38


GI 10


GI 50

100 = causes large fluctuations to blood glucose levels


GI 90


GI 89


GI 75

PROTEINS Assist in growth and development and repair muscle damage after exercise




FATS Provide energy, keep the body warm and insulate the organs




VITAMINS Assist bone, teeth and tissue growth

Vitamin C — Immunity

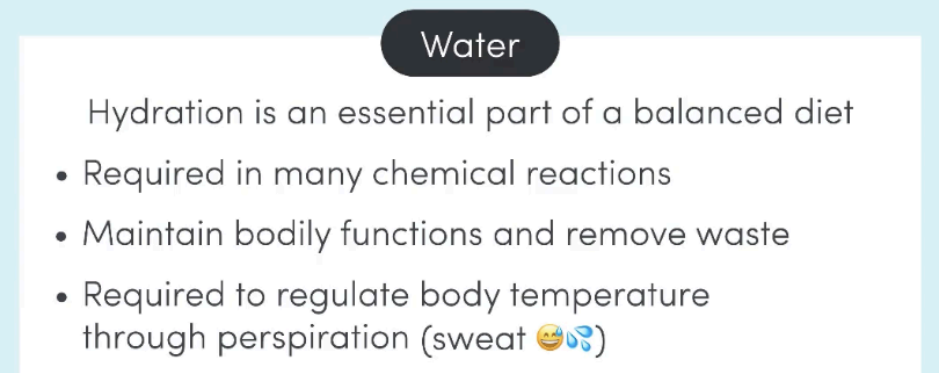
Vitamin D — Strengthens bones

MINERALS Keep tissues healthy and are required for chemical reactions

Calcium — Strengthens teeth, bones and nails, and assists with muscular contractions

Iron — Red blood cell production

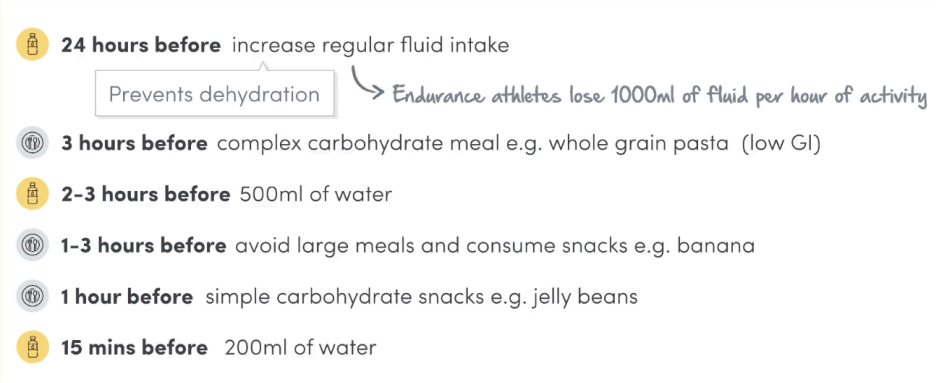
- Pre-performance, including carbohydrate loading



Pre Performance Nutrition and Hydration

Aim - to provide adequate energy and optimal hydration for the performance ahead (this can differ depending on the sport).

For Endurance Athletes

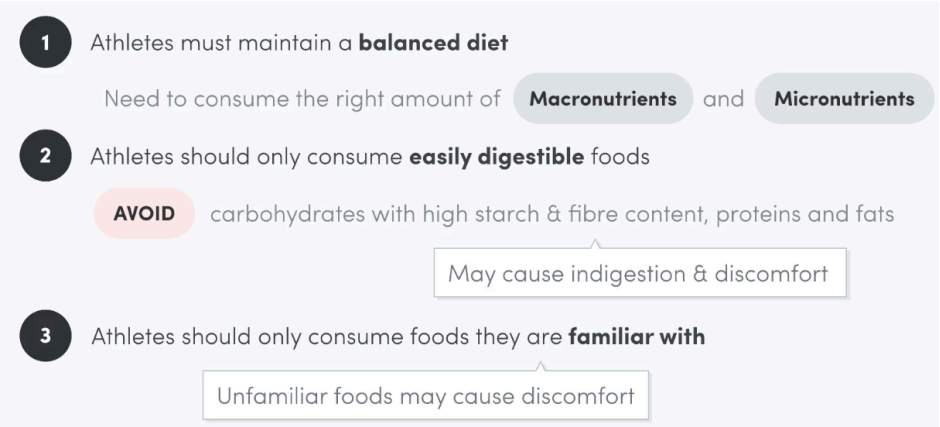


For Strength and power-based athletes - focus on protein intake at certain times to maximise muscle growth.

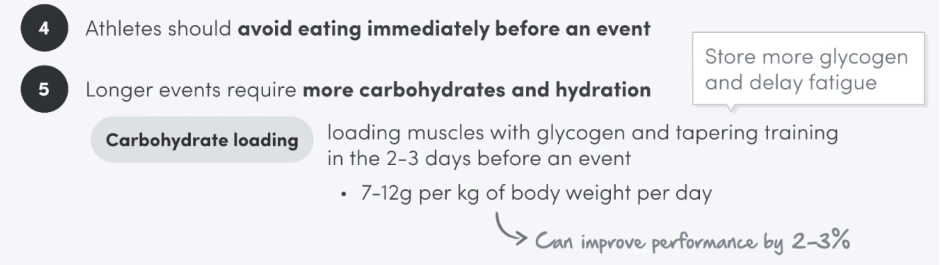
- 1 hour after working out, consume protein to repair muscle damage

Pre-performance focus is on regular protein consumption, not intake on event day.

Further Considerations



- During performance



During Performance

Aim - to maintain endurance and delay the onset of fatigue.

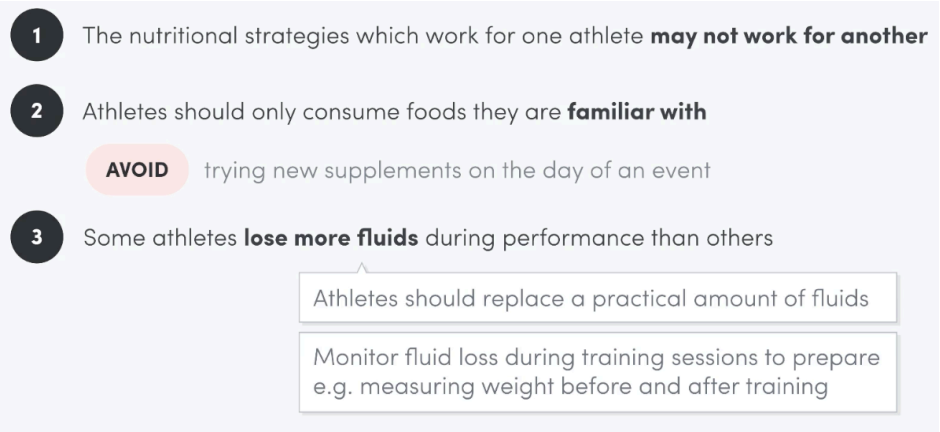
Hydration is essential for all athletes as most activities induce fluid loss.

Dehydration:

- Thickens blood (limiting blood supply)
- Increases body temperature (causing overheating and heat exhaustion)
- Affects concentration and skill execution

Strategies

Further considerations



- Post-performance

Post-performance

Aim - to return the body to its pre-performance state as quickly as possible, allowing them to get back to training at full intensity for the next performance.

Three R's of Recovery:

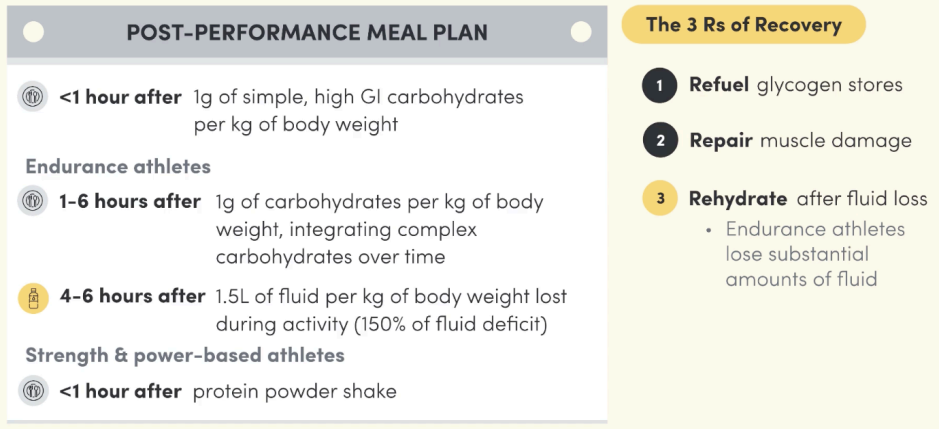
R - refuel glycogen stores

R - repair muscle damage

R - rehydrate after fluid loss

- Supplementation
- Vitamins/minerals

Strategies



Avoid

- Alcohol (inflames cells and increases soreness, along with poor nutrient absorption)
- Overhydration (reduces sodium concentration)

Supplementation

Performance Enhancement - any behaviour, method or substance that makes an athlete better at their sport in some way.

Substances include:

- Performance enhancing drugs (PEDs)
- Supplements

Used to:

- Enhance one or more elements of an athlete's physical processes or systems
- Eliminate constraints that might negatively impact performance

However these can can very harmful health effects

Supplements

Primarily used to enhance either the musculoskeletal system (strength, power, energy storage and quick recovery) or the cardiorespiratory (oxygen delivery ➔ intensity efficient).

Vitamins and Minerals

- Anything found in food sources
- Become a potential issue when certain substances are taken in amounts beyond what would normally be digested

	Vitamins	*Minerals*
Musculoskeletal	Assist in chemical reactions, allowing us to release and utilise energy from food	Allow water retention aiding in muscle contractions

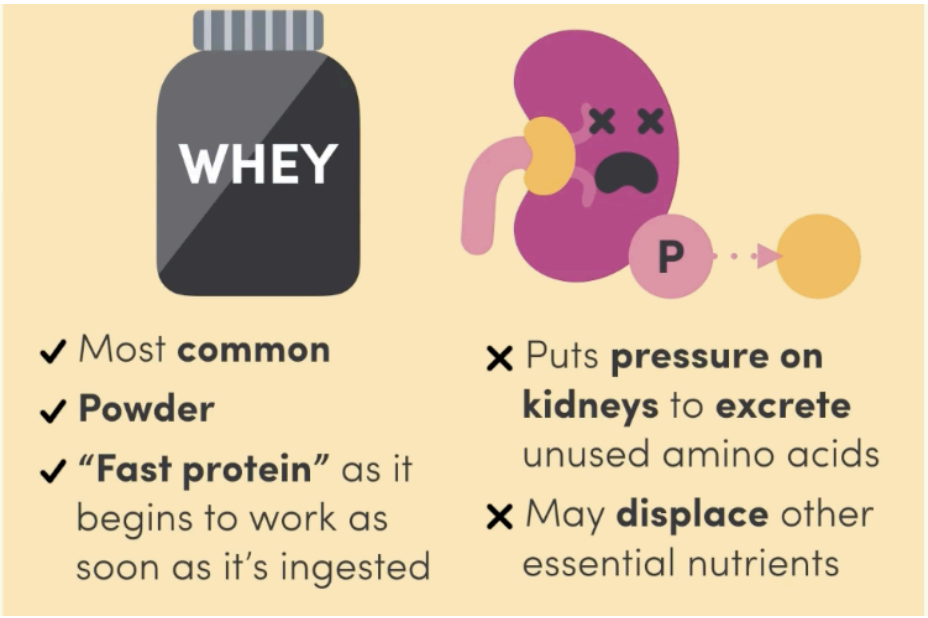
As a supplement - They are only performance enhancing if athletes have a deficiency, excess is excreted

- Protein

Protein

	Protein
Musculoskeletal	- Building blocks of muscles; repair muscle tissue and facilitate growth - Found in most meats and some plant products - Decreases recovery time and increases muscle hypertrophy

As a supplement - Allows athletes to train for longer at higher intensity with more power and strength



- Creatine products

Creatine

- Found in most meats
- Non-essential nutrient

	Creatine
Musculoskeletal	- Made in body to create CP for energy

As a supplement:

- Larger supply of energy
- Increases force and muscular power in sports that require short, sharp energy bursts
- Delays CP reduction and lactic acid build up so athletes can exercise for longer at higher intensities

Dubbed the "legal steroid" due to its multitude of benefits, but has many negative side effects:

- Increases water retention which can lead to weight gain
- Can cause cramps
- Can damage liver

- Caffeine

Caffeine

- Used to be banned as it was considered an ergogenic aid (turned fat into fatty acids for energy)

	Caffeine
Musculoskeletal	- Improves muscle contractions, increases time to exhaustion and decreases perception of effort and fatigue

As a supplement:

- Can enhance endurance and performance in endurance events

Negatives:

- Increases heart rate, anxiety, arousal, insomnia and causes a loss of fine motor skills

- Recovery strategies

Recovery Strategies

- Physiological strategies e.g. cool down, hydration

Physiological Strategies

- Returning the body to its pre-exercise state (metabolic processes, etc)

Cool Down (active)

Includes light aerobic activity for about 10-15 mins, followed by flexibility training.

- E.g. jogging or cycling for 15 mins, and then static stretches

Benefits:

- Prevents blood from pooling in the vein, which, if it occurs, can lead to blood restriction.
- Removes lactic acid and other waste products, which prevents delayed onset muscle soreness

Hydration

- Replacement of fluids during exercise
- Generally 150% of lost water; 1L of water for every kg of water lost during exercise
- Sports drinks can re-hydrate and also replace lost salts, aiding the circulatory system

Benefit: provides more volume of blood, which assists in the removal of waste products from muscles.

- Neural strategies e.g. hydrotherapy, massage

Neural Strategies

- Target the nervous system and release muscle tension

Hydrotherapy

<u>Contrast Water Therapy</u>

- Athletes alternate between hot and cold water

Benefits:

- Reduces muscle spasms, inflammation and pain
- Due to the temperature change, blood vessels dilate and contract, creating a pumping effect which aids in removing waste products in the blood

	<u>Hot Water Immersion</u> - Athletes immerse themselves in water above 37˚C Benefits: - Increases muscle and core body temperature, which accelerates blood flow; this can help repair soft-tissue injuries and reduce DOMS *Massage* - Reduces tension in the muscles and relaxes nerves - Increases blood flow and helps clear lactic acid and other metabolic by-products - Can help promote nutrient delivery around the body
- Tissue damage strategies e.g. cryotherapy	**Tissue Damage Strategies** - To restore muscle tissue after exercise (particularly used after strength training) *Cryotherapy* - Use of cold treatments on the muscles (ice-packs, ice baths, ice vests etc.) - Ice baths should be between 4-12˚C and used for 3-5 minutes at a time Benefits: - Reduces blood flow which decreases inflammation and spasms - Cold water can also release endorphins into the body and help reduce feelings of pain
- Psychological strategies e.g. relaxation	**Psychological Strategies** - Help athletes overcome the mental stress and anxiety of exercise in order to prepare for upcoming training or competition *Relaxation* - Decreases heart and respiration rates, which can decrease feelings of stress

IQ4

How does the acquisition of skill affect performance?

Students learn about:	Students learn to:
• stages of skill acquisition – cognitive – associative – autonomous	• examine the stages of skill acquisition by participating in the learning of a new skill, eg juggling, throwing with the non-dominant arm
• characteristics of the learner, eg personality, heredity, confidence, prior experience, ability	• describe how the characteristics of the learner can influence skill acquisition and the performance of skills
• the learning environment – nature of the skill (open, closed, gross, fine, discrete, serial, continuous, self-paced, externally paced) – the performance elements (decision-making, strategic and tactical development) – practice method (massed, distributed, whole, part) – feedback (internal, external, concurrent, delayed, knowledge of results, knowledge of performance)	• design a suitable plan for teaching beginners to acquire a skill through to mastery. The plan should reflect: – appropriate practice methods for the learners – the integration of relevant performance elements – an awareness of how instruction may vary according to characteristics of the learner – how feedback will be used as learners progress through the stages of skill acquisition
• assessment of skill and performance – characteristics of skilled performers, eg kinaesthetic sense, anticipation, consistency, technique – objective and subjective performance measures – validity and reliability of tests – personal versus prescribed judging criteria	• develop and evaluate objective and subjective performance measures to appraise performance

Syllabus Dot Point	Summary Notes
• Stages of skill acquisition	**Stages of Skill Acquisition**
- Cognitive	*Cognitive Stage* The initial learning of a new skill. - Characterised by a lot of inconsistency (lots of mistakes) - Athlete is not receiving any internal feedback, thus ongoing positive feedback comes from an external source e.g coach - Visualising the skill is vital to understanding its overall mechanics, thus demonstrations and visual explanations are important
- Associative	*Associative Stage* Improving technique and skill execution.

	- Includes lots of practice (repetition comes from working on technicalities e.g. timing, fluidity, sequencing) - Internal feedback (mental feedback on how you performed) and kinaesthetic sense (awareness of body's movement and position in space) - athlete begins to understand and improve the movement whilst doing it, and associate their movement with a positive or negative outcome - Less frequent errors (continual improvement means less mistakes)
- Autonomous	*Autonomous Stage* A high degree of accuracy and consistency. - Skills become automated due to a well developed kinaesthetic sense - Athletes are able to redirect focus from skill performing to other cues (e.g. in game cues from other players), training sessions can mimic pressurised games or competition scenarios - Feedback is almost entirely intrinsic, as they are able to detect and correct most of their errors (but coaches who have a scientific understanding of the sport are still able to aid in fixing biomechanical errors)
● Characteristics of the learner e.g. personality, heredity, confidence, prior experience, ability	**Characteristics of the Learner** *Personality* - Determines how we act in different situations e.g. learning a skill - Certain personality traits support the learning process e.g. all of the below traits are normally faster learners:

Confident learners	Motivated learners	Questioning learners
More willing to attempt new skills	Seek improvements and are less distracted	Gain a better understanding of the skill

Heredity
Genetic characteristics we inherit from our parents e.g. % of fast twitch fibres, somatotype, gender and height.
- E.g. someone with a high % of fast twitch muscle fibres may be more inclined to shot put and have better performance improvements
- Early success can enhance motivation to continue learning

Confidence
Belief in own ability.
- More likely to attempt new skills
- Less likely to be put off by experiencing difficulty
- This attitude can enhance determination and persistence

Prior Experience
Two different skills with similar movement patterns.

Positive transfer of learning: learning new skills is easier and faster e.g. serving in tennis and over-arm serve in volleyball
Negative transfer of learning: more difficult to learn new skills (conscious thought process), e.g. squash wrist actions vs tennis arm swing

Ability
Ease with which an individual is able to perform a skill.

- Heightened kinaesthetic sense
- Muscle group co-ordination
- Fast reaction time
- Greater sense of perception
- intelligence

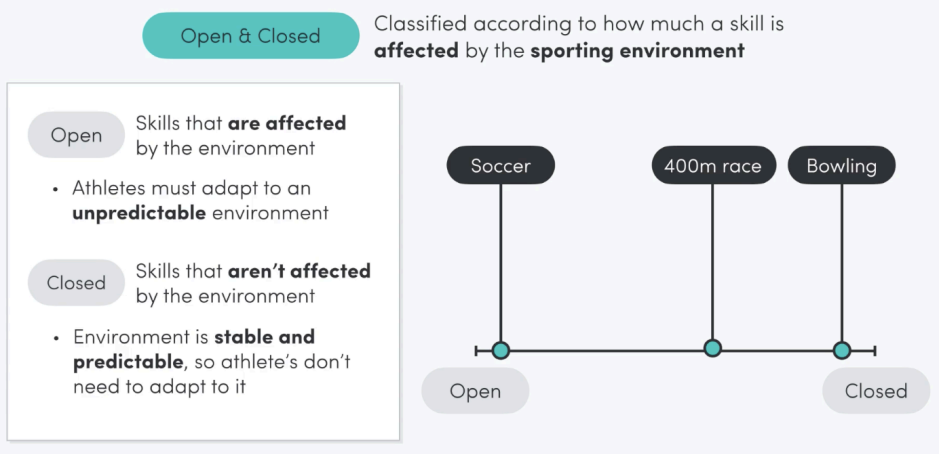
- The Learning Environment

- Nature of the skill (open, closed, gross, fine, discrete, serial, continuous, self-paced, externally paced)

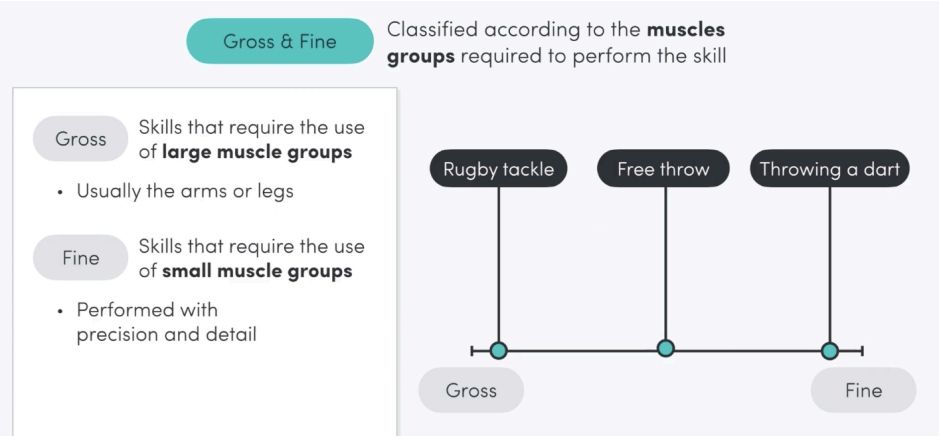
The Learning Environment

Nature of the Skill

- Most nature descriptors exist on a continuum



- Open: e.g. surfing in windy and choppy conditions
- Closed: e.g. hitting tennis returns in an indoor court with a serving machine



- Gross: e.g. shot put throwing
- Fine: e.g. dart throwing

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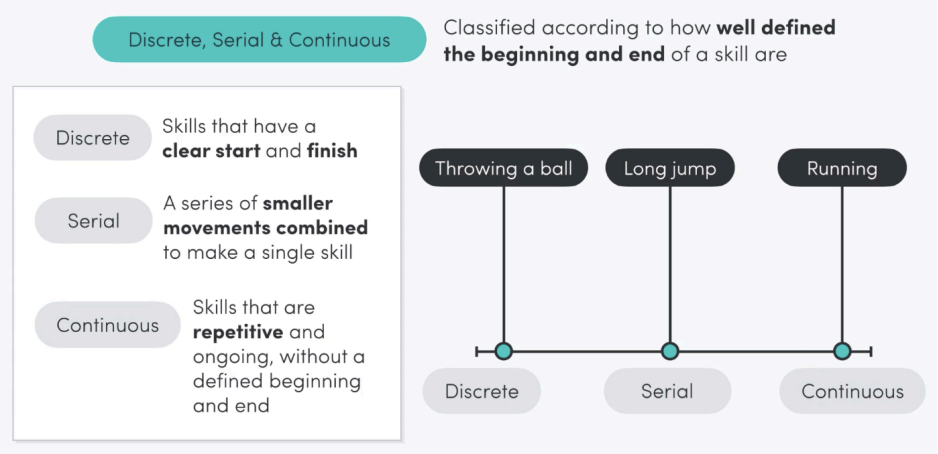
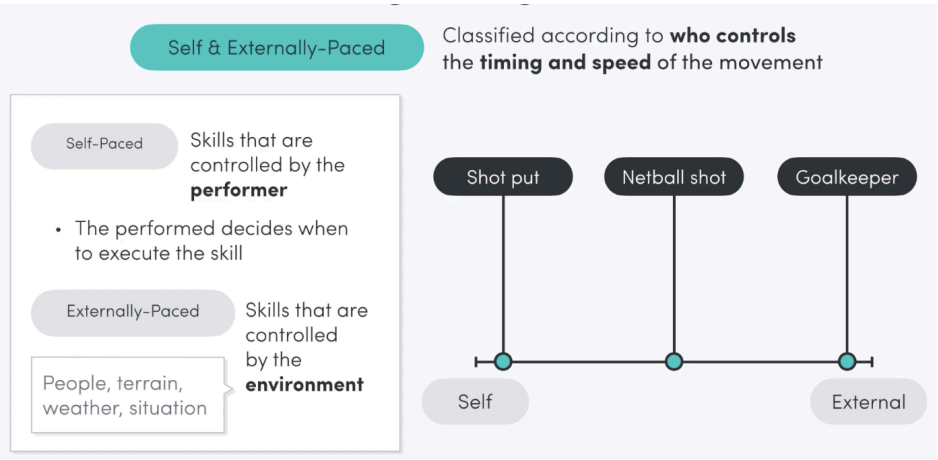


Discrete: e.g. shooting a basketball from the free throw line
Serial: e.g. triple jump (hop, skip and jump are separate)
Continuous: e.g. swimming, especially over 100m



Self-paced: e.g. pole vault or high jump
Externally-paced: e.g. returning a tennis serve or batting in cricket

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<td>- The performance elements (decision-making, strategic and tactical development)</td>
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<u>The Performance Elements</u>
<u>Decision Making</u>

The various decisions made by any athlete during a performance (e.g. which is the right skill to apply, and when it should be applied)

Learnt through experience in performance situations:

Observing highly skilled players in game situations
Questioning players about why they’re doing certain things
Gradual build-up to game speed execution
Variation and creativity to practice a range of different game situations

E.g. bringing in opposition to increase pressure, allowing decision-making
Game-centred approach - focus on the whole game (all components), focus on the thinking and learning rather than isolated skill development

<u>Strategic Development</u>

The way we play; where we should be and what we should be

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- Practice method (massed, distributed, whole, part)	doing at a particular time - The overall game plan; the objective E.g. to win <u>Tactical Development</u> - Utilising ways of gaining an advantage over an opponent - How the game plan is fulfilled E.g. 'double teaming' an opponent - Matures gradually through using drills and mini-games in match-like scenarios E.g. learn to identify specific cues, size up options and judge then react to actions ➔ For the development of both, athletes must improve technical efficiency in order to execute plays (through drills) and have an increasing understanding of the game to identify effective strategies/tactics (e.g. knowing the rules and requirements of the game prior to learning strategy). *<u>Practice Method</u>* - The different ways coaches make training as effective as possible <u>Massed and Distributed</u> *Work-to-rest ratio:* how much time is spent actively practising compared to how much time is spent resting *Massed Practice* - a skill is practised multiple times with a very short or no rest periods between each repetition - High work-to-rest ratio - No time is wasted - Requires highly motivated and competent performers (those lacking drive will fatigue quickly) E.g. practicing a tennis serve with a bucket of tennis balls for an hour - Ideal when practice can't be spread out - Suitable for discrete and simple skills; good for beginners - Best right before a game/performance - Can become boring or reinforce bad muscle memory *Distributed Practice* - skills are practised in shorter work periods with rest periods between each repetition, or broken into smaller parts - Low work-to-rest ratio - Well-suited for beginners who struggle to concentrate - Can be time consuming - i.e. Couch would implement 15 min skill practice blocks over 4 days - Works best when task is difficult/dangerous and fatigue could result in injury E.g. learning to dive from a handstand off of a 10m everyday for 15 mins over 4 days a week <u>Whole and Part</u>

- Feedback (internal, external, concurrent, delayed, knowledge of results, knowledge of performance)	*Whole Practice* - a skill is taught and practised in its entirety - Well suited to continuous activities or simple/single movements - Athletes gain a complete understanding of the skill - Requires concentration *Part Practice* - a skill is broken down into smaller parts, each practised in isolation, and then combined to form a complete movement - Well suited to beginners who can't concentrate for longer periods - Learners may struggle to envisage the skill in its entirety *Part-Whole-Part Method* 1 - demonstration of full skill 2 - extract and analyse segments when difficulty is experienced 3 - skill is reassembled and rehearsed as a unit *Feedback* Internal and External *Intrinsic* - feedback that comes from within the athlete (proprioceptive and kinaesthetic senses - awareness of body's movement and position in space), i.e. distinguishing between a skilled/less skilled performance - Only develops through practice E.g. goal-kicking - knowing you missed because you felt that you kicked the ball with the wrong part of your foot *External* - feedback that comes from external sources (e.g. coaches feedback, crowd cheering, video analysis) - More common and helpful for beginners who don't have an internal sense yet - More experienced athletes may utilise other external feedback (e.g. heart rate monitor, stopwatch) E.g. goal-kicking - coach tells you that you missed the goal because you didn't keep you head down Delayed and Concurrent *Delayed* - feedback occurs after a skill has been completed - Improves future performance E.g. coach's comment at the end of activity, during a break or after the game in video analysis *Concurrent* - feedback occurs while the skill is being executed - Most often internal (due to proprioceptive and kinaesthetic senses) but can be external too E.g. when a tennis player is serving, they realise that their ball toss is off direction, allowing player to stop the serve and improve the toss, rather than being forced into error by continuing their serve Knowledge of Results and Knowledge of Performance *Knowledge of Results* - feedback specific to the outcome of a performance - Measured success by an external source e.g. time, length, height, points

	E.g. a diver getting a high judge score, a basketball player seeing the ball in a basket after a jump shot, a successful goal kick in AFL etc. *Knowledge of Performance* - feedback specific to the execution of a skill - Analysed: focus is placed on the athlete's skill and technique development - Can be internal or external E.g. Coach showing a diver a video replay about her body position during a certain movement, or a basketball player may feel her shot execution is incorrect after shooting, due to their body position
● Assessment of skill and performance - Characteristics of skilled performers, e.g. kinaesthetic sense, anticipation, consistency, technique	**Assessment of Skill and Performance** *Characteristics of Skilled Performers* *Kinaesthetic sense* - awareness of body position - 'Feel' for movement - Allows performer to adjust movement during performance E.g. diver rotating too quickly pulls out of tuck earlier *Anticipation* - ability to predict what is likely to happen and then respond accordingly E.g. tennis: anticipate opponent is going to run to net so set up for a lob *Consistency* - ability to reproduce desired movement/outcome repeatedly E..g goal kicker with a high success rate *Technique* - efficient, effective, coordinated movement patterns E.g. 100m sprinter, where technique is vital for optimal speed and acceleration
- Objective and subjective performance measures	*Measures of Performance* Objective - No interpretation - Results are clear - Often involves the use of measuring instruments e.g. stop watch E.g. High jump, which uses a measured/metred height of a bar, which athletes must jump over, this is changed in subsequent rounds Subjective - Results are interpreted - Judgements are made about the quality of a performance - Personal feelings or opinions influence the judgements E.g. Gymnasts are judged by officials, which determine scores based on qualitative measures (e.g. perceived difficulty of skill)

- Validity and reliability of tests - Personal versus prescribed judging criteria	***Validity and Reliability of Tests*** Validity - Test measures what it is supposed to measure - Ensures that results are relevant E.g. 100m sprint test is not valid for measuring cardiovascular endurance Reliability - Test produces consistent results - Same test conditions each time E.g. a beep test done on grass on a cool day, vs a beep test done on pavement on a hot day - not reliable ***Personal versus Prescribed Judging Criteria*** Personal - Subjective - Based on feelings/impression - Judgements are influenced by preconceived expectations/attitudes - Better for performances in isolation E.g. surfing Prescribed - Objective - Established by sports organisations - Involves checklist, rating scales and degree of difficulty charts - Assigned elements to evaluate (e.g. in dance; costume, technique, difficulty) - Better for organised competitions E.g. Diving Competitions