PDHPE - Factors Affecting Performance

How does training affect performance?

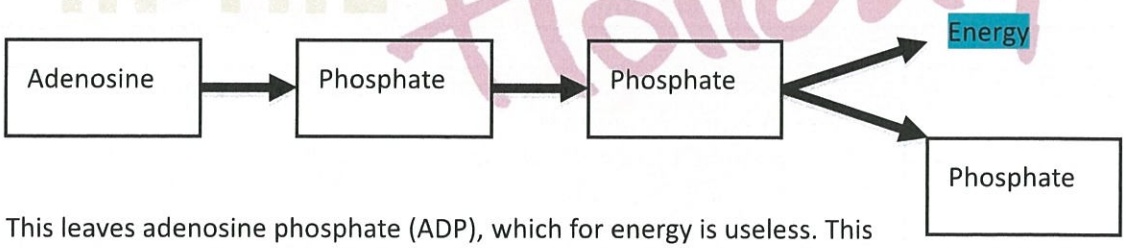
- **ENERGY SYSTEMS**

Energy is required by the body and is produced via the breakdown of food. The breakdown of nutrients produces a chemical called adenosine triphosphate (ATP). This is consists of one molecule of adenosine and three molecules of phosphate, joined together by chemical bonds. When these bonds are broken energy is released. There are three energy systems that the body uses to manufacture ATP. These include:

- *Alactacid system (ATP/PC)*
- *Lactic acid system*
- *Aerobic system*

- **Alactacid System (ATP/PC)**

ATP provides energy for activities that are no longer then 1-2 seconds. The energy is released by the breaking of the chemical bonds. The last phosphate molecule 'breaks off' to produce energy.



This leaves adenosine phosphate (ADP), which for energy is useless. This energy system relies on the fuel of creatine phosphate, made up of one creatine molecule and one phosphate molecule. These bonds also break which provides the energy for the separated phosphate molecule to join together with the ADP compound, which then returns to the form of ATP.

- **Lactic Acid System**

The lactic acid system is for activities lasting longer than 10 seconds; it is used to produce ATP. This particular system functions around the breakdown of carbohydrates to form glucose. Glycogen is the fuel used by the lactic acid system. The breakdown of glycogen leads to the manufacturing of two ATP molecules and pyruvic acid; pyruvic acid is then converted into lactic acid.

Breakdown of glycogen	+	2 molecules of ATP	Pyruvic acid	There is no oxygen present, so this is converted to	Lactic acid

→ - **Aerobic System** → →

The aerobic system provides the energy that is required for activities lasting 2-3 minutes. ATP is produced in the presence of oxygen. Continuing on from the 2-3 minutes of activity, the body is now able to supply the oxygen it requires.

- **TYPES OF TRAINING AND TRAINING METHODS**

When designing a training plan it is necessary to analyse the sport. The major energy systems and components of fitness must be considered. Most sports encounter both aerobic and anaerobic movements. Training can be categorised into four types:

- *Aerobic*
- *Anaerobic*
- *Flexibility*
- *Strength*

- **Aerobic E.G. Continuous, Fartlek, Aerobic Interval And Circuit**

Programs will vary in mode, duration, frequency and intensity, but all will involve the aerobic energy system. The mode of training refers to the type of activity e.g. swimming, rowing, cycling or running. The duration of the training depends on the intensity of the exercise and the fitness level of the individual. If it is training for purely health benefits, 20-30 minutes of moderate exercise, 5 days a week. If an athlete 6-12 training session per week, from 30 minutes-several hours.

AEROBIC TRAINING METHODS	
Type	**Description**

Continuous	- Continuous training means exercising non-stop for a minimum of 20 minutes up to several hours.
	- There are two types of training
	  ○ *Long slow distance*
	  ○ *High intensity continuous*
	- *Long slow distance*: training is usually at a low intensity. When building an aerobic base, marathon runners will focus on long runs. When in training the athlete will complete two long runs, which will emphasise the distance rather then the speed.
	- *High intensity continuous:* is at high intensity and is at the upper limit of the training zone. This particular type of training is very demanding.

Fartlek	- Fartlek training involves continuous exercise interspersed with 'sprints' of altering distances. - This type of training is less demanding than interval training, as the athlete determines when and how far to 'sprint'. Fartlek training includes a variety of speeds and a high intensity of training. - It is not a sport-specific training and it may increase the risk of injury. Although recommended for team sports e.g. rugby or netball

Aerobic Interval	- Interval training involves completing a number of prescribed bouts of exercise, each followed by a recovery period. - Interval repetition that is performed at a lower intensity will predominately train the aerobic system. - During exercise lactic acid is produced and oxygen debt results. During the recovery periods the heart and lungs work hard to pay back the oxygen debt and breakdown the lactic acid.
Circuit	Circuit training involves a series of exercises that are performed one after the other in a circuit with limited (or no) rests between exercises. It is a way to improve mobility, build strength and stamina. Circuits can be designed to improve general fitness or can be highly specialised to meet the specific needs of an athlete. Circuit training consists of 6-10 strength type exercises and can be performed up to three times in a training session. The strength type exercises can be interspersed with more aerobic-type activities. There are two types of circuits: fixed resistance circuits and individual resistance circuits.

- **Anaerobic E.G. Anaerobic Interval**

Anaerobic training does not call upon the use of oxygen. It is completed at a high intensity for short durations. By increasing the intensity or durations an athlete can improve their anaerobic threshold.

Anaerobic interval training

Anaerobic interval training is to be completed at 90% intensity. To develop anaerobic endurance, you must include sufficient rest or recovery between repetitions. If not enough rests are included the creatine phosphate (CP) will not be able to be replenished and the next repetitions will be completed utilising a greater amount of aerobic input.

- **Flexibility E.G. Static, Ballistic, PNF, Dynamic**

Flexibility is the range of motion available to a joint. An athlete is more likely to avoid injury if they are flexible and are able to perform at a higher level. There are four types of stretching that can be associated with flexibility.

Static stretching

Static stretching involves holding onto a stretch at its end point for up to 30 seconds. This type of stretch should be slow and gentle.

Ballistic stretching

Ballistic stretching involves stretching a muscle to its end point and then over-stretching it by bouncing. May be useful for some sports as it can closely imitate the speed of the movement required. However, for most sports it is unsuitable as it can lead to intra-muscle damage. Examples of sports are gymnastics, dancing and ballet.

Proprioceptive neuromuscular facilitation (PNF)

PNF stretching is the most preferred method of increasing flexibility. PNF stretching involves a gentle, static stretch, followed by an isometric contraction against a resistance (often a partner) and followed by another static stretch.

Dynamic stretching

Dynamic stretching involves the rhythmical movement of the major muscle groups to be used in the activity. The stretching movement is generally a slow, gentle repetition of the movements. Each movement should be repeated approximately 12 times with a gradual increase in the range of motion.

- **Strength Training E.G. Free/Fixed Weights, Elastic, Hydraulic**

Strength training involves the use of a resistance against muscular contraction to improve a person's muscular strength and muscle size. Ant strength training program should be specifically designed to meet the individual's needs.

TERM	DEFINITION	EXAMPLE
Lift	The description of how a weight is moved	Arm curl Leg press
Repetition	1 execution of a lift	Doing 1 arm curl
No. Of reps	How many executions of an exercise are performed repeatedly	10 leg presses
Set	1 group of repetitions	10 leg presses, followed by a rest period
Repetition maximum (RM)	The maximum amount of weight that can be lifted a specific number of times	5RM of 60kg means that the subject can lift 60kg only 5 times.
Training frequency	Number of times training is done each week	3 sessions each week
1RM	The maximum amount of weight that can be lifted in a single effort	Maxine can lift a maximum of 20kg in one lift
Training load	The resistance weight used. (Often expressed as a RM)	Load is 10kg for arm curls.

Free/fixed weights training

Free/fixed weights' training revolves around the use of repetition maximum (RM). RM refers to the maximum load a muscle can lift, a given number of times before it fatigues. Therepetition maximum can be altered, along with the number of repetitions and speed of lift, to develop different types of strength. For example, a forward in rugby would need to focus on the development of power, whereas a rower would need to also focus on muscular endurance. The program designed for each athlete would differ in the weight, sets, reps and speed of lift.

ADVANTAGES	DISADVANTAGES
- Easy to do - Cheap - Develops strength around the full range of movement - Can imitate movements specific to a sport - Overload is easy to administer	- Can produce muscle soreness - Rely on gravity so develop movements largely on the vertical plane

Elastic/resistance strength training

Elastic/resistance strength training involves the use of elastic bands or tubes to provide resistance. Different bands provide different levels of resistance, so everyone can find a level of resistance suitable to them. A sporting movement may require you to develop strength out to the side; this can be achieved using elastic resistance. Often used by elite athletes to enhance strength and power and can be used for rehab programs.

ADVANTAGES	DISADVANTAGES
- Easy to use, lightweight and portable - Cheap – one band can be used to train the	- It is difficult to measure the exact force of resistance

whole body - Develops strength around the full range of movement - Can imitate movements to a specific sport e.g. baseball hit. - Does not rely on gravity so can develop movements specific to a sport that do not occur only in the vertical plane - Exercises require a posture that engages the core muscles to stabilise the torso, so develops good posture at the same time - Better injury prevention	

Hydraulic strength training

Hydraulic strength training uses machines that provide an artificial resistance through fluid dynamics and the use of hydraulic oil. As the athlete moves though the range of motion, the hydraulic oil is pushed through the parts of the machine under high pressure. Faster and stronger movements by the athlete increase the resistance and workout. As soon as the athlete stops moving, the resistance also stops. Not specific to any specific muscles → suited to older people or people with an injury. For example, hydraulic running machine good for a 100m sprinter to develop leg power.

ADVANTAGES	DISADVANTAGES
- Very safe - No need for spotter or partner when exercising - Developing strength through a full range of motion - Resistance can easily be altered by how hard and fast you work - Hydraulics provide a smooth range of motion - Resistance is always matched to thestrength of the user, so suitable for all ages and all fitness levels - Works well for circuit training as weights do not have to be continually adjusted for different people	- Machines can be very expensive - Machines can take up a lot of space - Does not develop ligament and tendon strength as much as free weights because the machine provides stability of resistance. - Hard to find, as they are not as popular now. - Suited to beginners or people with injury.

- **PHYSIOLOGICAL ADAPTATIONS IN RESPONSE TO TRAINING**

In training the body begins to make physiological changes, which adapt to the increased demands. These changes will allow for improved efficiency of the body systems.

- **Resting Heart Rate**

Resting heart rate:is the number of contractions your heart makes in a minute when at rest.

An untrained person will have a resting heart rate of about 70 beats per minute, compared to a trained person who will have a resting heart rate of 40 bats per minute. An increase in stroke volume is the reason for the decrease in heart rate. More blood is pumped out of the heart and the same amount of blood is pumped into the muscles in the form of oxygen.

- **Stroke Volume And Cardiac Output**

Stroke volume:is the amount of blood ejected from the left ventricle during a contraction. It is measured in mL/beat.
The increase in stroke volume is due to the increased elasticity in the walls of the left ventricle, resulting in stronger more powerful contractions.

Cardiac output:is the volume of blood ejected by the heart per minute. It is determined by multiplying heart rate by stroke volume. It is measured L/minute.
Untrained individuals have a cardiac output of 15-20 L/min. For trained athletes cardiac output is 20-25 L/min. during exercise.At maximal exercise the increase in stroke volume leads to a large increase in cardiac output.
HR x SV = CO

- **Oxygen Uptake And Lung Capacity**

Oxygen uptake: is the amount of oxygen the body uses in 1 minute. It is measured in L per minute.
Increase in max vo2 is a result of increased cardiac output and the body's ability to extract more oxygen from the muscle during exercise. Oxygen uptake is affected the most from training.
Oxygen uptake also increases due to greater lung capacity and higher haemoglobin levels within the blood.

Lung capacity: is the amount of air that can move in and out of the lungs during a breath.
Total lung capacity remains relatively unchanged with sub-maximal training but may increase slightly with maximal training.
There are four lung volumes, these include:

TIDAL VOLUME	**The volume of air inspired and expired with each breath (approx. 500ml)**
INSPIRATORY RESERVE VOLUME	The extra amount of air that can be inspired over and above the tidal volume
EXPIRATORY RESERVE VOLUME	The extra amount of air that can be forcefully expired over and above the tidal volume
RESIDUAL VOLUME	The volume of air still in the lungs after a forceful expiration.

- **Haemoglobin Level**

Haemoglobin:is the protein part of the red blood cells that binds to, and carries around oxygen.

The body adapts by producing more red blood cells and haemoglobin and this increases the oxygen-carrying capacity. Training at high altitudes is another way to increase haemoglobin levels.

- **Muscle Hypertrophy**

Muscle hypertrophy: refers to the increase in the diameter of a muscle i.e. "bulking up".

This occurs when both the muscle fibre size and connective tissue between the fibres increase as a result of resistance training. This enable the body to generate more force and power and will improve performance.

- **Effect On Fast/Slow Twitch Muscle Fibres**

Slow twitch fibres (type I): are responsible for posture and skeletal support.
They are more involved in endurance activities as they generate tension for a longer period of time. Marathon runners tend to have 80% slow twitch fibres.

Fast twitch fibres: are referred to as type IIa and type IIb fibres. They are required for greater amounts of force for a shorter period of time.
Elite sprinters tend to have 80% fast twitch muscle fibres. Type IIa rely on both aerobic and anaerobic energy for contraction and type IIb relies solely anaerobic energy for contraction.

How can psychology affect performance?

- **MOTIVATION**

Motivation is the reason for doing something. Performance can be directly related to motivation. Motivation provides us with direction and an intensity or purpose. The level of motivation will vary with each athlete and each athlete will have various different goals.

- **Positive And Negative**

Positive motivation: is the recognition, praise and reward of good performance.
Negative motivation: is the feedback received by an athlete when particular behaviour is being perceived by coaches, parents or friends as being unacceptable or sub-standard.

If motivation techniques are used incorrectly, they can lead to a decline in performance. Challenges are positive and motivating where as threats is negative and destructive in the long term.

- **Intrinsic And Extrinsic**

Intrinsic motivation:refers to the motivation that comes from within the individual.
Extrinsic motivation: occurs when the individual's internal state is modified by sources originating from outside the person.

Most children and adolescents participate more as a result of internal motivation then other factors. An example of intrinsic motivation is the athlete who continues to finish a race – despite knowing that there is no chance of winning.

- **ANXIETY AND AROUSAL**

Anxiety disrupts and unsettles behaviour by lowering the individual's concentration and affecting their muscular control. Anxiety reflects a person's feelings, and is a heightened level of emotion that causes discomfort both physically and psychologically. There are two types of anxiety; trait and state.

- **Trait And State Anxiety**

Trait anxiety: refers to a general level of stress that is characteristic of each individual. Trait anxiety varies how individuals have conditioned themselves to respond and manage the stress. Increased levels of anxiety can be controlled by the use of relaxation techniques e.g. progressive muscular relaxation.

State anxiety: refers to a heightened presence of distress in response to a particular situation. E.g. shooting a target or throwing a basket.
When the risk of failure is high, it can contribute a degree of physical and mental paralysis preventing performance that is routine and has been repeated many times in practice situations.

- **Sources Of Stress**

We feel stress building within us, produced by adrenalin, which readies the body for action. The body will react to a perceived situation as if it's real because the mind in responding to neurologically to situations does not differentiate between the real and imagined experience. Thinking about something that may make us uncomfortable, can bring about symptoms such as increased heart rate and sweating. Factors that produce stressors are called stressors. These can develop from:

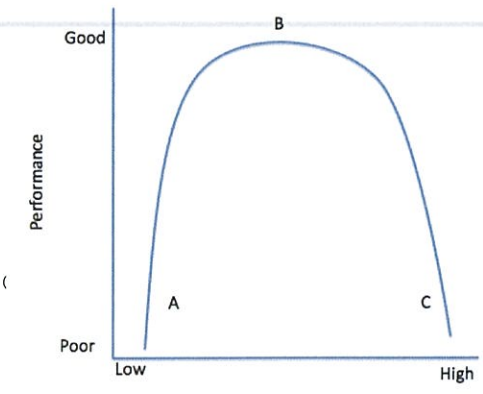
- *Lack of sufficient income*
- *Family problems*
- *An inability to get along with others*
- *Illness and misadventure*

In practice and competitive sporting environments, they can develop from:

- *Personal pressure* – individual pressure imposed by the desire to win, achieve or fulfil goals.
- *Competition pressure* – pressure exerted by opponents on the field of play.
- *Social pressure* – pressure from coaches, parents, peers and others who are held in esteem by the athlete
- *Physical pressure* – the pressure of having to perform learned skills under the demands of competition.

- **Optimum Arousal**

Arousal refers to the level of anxiety before or during a performance. While anxiety is predominately a psychological state, arousal is essentially a physiological process. Arousal is a necessary ingredient in sports performance.
The inverted U hypothesis illustrates the connection between arousal and performance. If an individuals level of arousal were at a, then they would be considered as under-aroused. As an athlete's interest heightens, they move into the



arousal zone and attain an optimal level of arousal at the peak of the curve (B). Levels of arousal in the C area of the curve are excessive. If an individual were working in this area, then their feelings would be characterised by anxiousness and apprehensiveness.

- **PSYCHOLOGICAL STRATEGIES TO ENHANCE MOTIVATION AND MANAGE ANXIETY**

- **Concentration/Attention Skills (Focusing)**

Concentration is the ability to focus and maintain attention on appropriate cues for the duration of an event. There are two forms of distraction external and internal.

- *External distractions* – are noise in the crowd, movement in peripheral vision, and unwelcome comments from an opponent.
- *Internal distractions* – are your own thoughts: worrying about the mistake you just made, anger at a referee's decision and over analysing a performance.

There are a number of strategies that athletes can use to assist their concentration levels.

- *Music* – calm an athlete and aid in concentration
- *Cues* – verbal, visual or physical and have a specific meaning to the athlete
- *Set routines* – a set routine will include preparation phase, focus phase, and execution phase
- *Distraction training* – deliberately introducing various types of distractions into training
- *Positivity* – advantages or positives in all situations on what they need to do next
- *Practice in refocusing* – regaining focus after a lapse in concentration
- *Changing focus* – identifies main distractions and determines how to reduce these by changing what they focus on.

- **Mental Rehearsal/Visualisation/Imagery**

Mental rehearsal and visualisation both use imagery to improve performance.

Visualisation: involves the athlete to relate specifically to pictures in their mind. Imagining what the skill or parts of the skill will look like from their perspective.

Mental rehearsal: also involves images an athlete may form of skilled performance, combined with good physical practice.

Mental rehearsal involves more than just picturing the activity, it includes all the surrounding activity that goes with the actual performance, spectators or noise made from the crowd or weather conditions. There are several pieces of advice for effective mental rehearsal:

- *Vivid detail* – closer the images are to reality, the better the transfer
- *Relaxation* – combining relaxation and imagery
- *Video* – seeing video edits of their successful performance
- *Observe* – observe and mimic others who perform well
- *Control*
- *Realtime*
- *Setting*

- *Realisticexpectations*

There are two types of imagery – internal and external.

- *Internal imagery* – is like having a camera on your head, so you see what you would normally see when executing the skill.
- *External imagery* – is where you are watching yourself complete the task as if on video recording.

Internal imagery may be more effective for overall performance; external imagery can assist with learning a new skill or correcting technique.

- **Relaxation Techniques**

Athletes who are inclined to states of over-arousal require strategies, such as relaxation techniques, to calm them and lower their arousal levels. The body responds by lowering breathing rate, heart rate and blood pressure, this allows the athlete to have more control over their movement and gain greater focus. There are a number of strategies used to relax, finding one that the athlete is comfortable with and the produces the desired effect.

Progressive muscular relaxation

This relaxation technique involves actively contracting specific muscles and then relaxing them. This allows the athlete to focus on feeling tension and lack of tension within the muscle. After this the muscle are in a more relaxed state.

Centred breathing

Centred breathing allows an athlete to clear their mind, relax and focus on what they have to do. The technique involves:

- *Breathing evenly and deeply from the abdomen*
- *Breathing in through the nose and out through the mouth*
- *Keeping shoulders relaxed as the stomach goes in and out*
-

It is particularly useful for closed-skill sports or events, such as pole vault or tennis serve.

Meditation and self-hypnosis

Meditation is the process of focusing your attention on a single thing for a period of time. By excluding outside thoughts, this concentration allows the body to relax. Self-hypnosis used to assist with deep relaxation. Involves the use of affirmations and positive statements.

- **Goal-Setting**

Goal setting for performance can provide motivation, commitment and direction. By having short-term and long-term goals the athlete will be more likely be motivated/aroused to strive for these goals. Goals serve a number of purposes – focus, motivation and direction and production of better results. They might be based upon technical, tactical, psychological or physiological factors. They might be set in the short term or in the long term.

- *Short-term goals*– can be achieved over a short period of time. They should be realistic and appropriate and provide feedback about immediate performance accomplishments.
- *Long-term goals* – should reflect where the end point of training might be. Focus on what is possible in a few months time or even years

When setting effective goals they should always use the SMART principle.

Specific
- Be specific and exact in what the goal should be

Measureable
- Define what needs to be done to meet the goal

Achievable	• A large goal should be divided into small goals → this will improve the chance of reaching the final goal • If the goal is not going to be achieved, then reset the goal or adjust it so it can be achieved. • If an athlete does not have control, it will be difficult to achieve → the athlete should focus on the process or performance rather than the outcome
Realistic	• Make sure the goal is set within reach → also allow the goal to be met and still be able to be challenged. • The goal could act as a negative motivator for the athlete. • If the goal is too simple there is no feeling of achievement if it is met.
Time	• The athlete will monitor the goal and if it is to be met earlier on the timeline then the goal needs to be re-evaluated. • Without a timeline there is a tendency for the athlete to procrastinate or get bored

How can nutrition and recovery strategies affect performance?

- **NUTRITIONAL CONSIDERATIONS**

One major recommendation is that athletes should increase their carbohydrate intake. This is essentially because carbohydrates are broken down into glycogen, which is the fuel, used by both the lactic acid and aerobic energy systems. Carbohydrates should constitute 70% of an athletes diet. This increase in carbohydrate intake should be in the form of complex carbohydrates such as bread or pasta. Athletes should decrease their fat intake. Water is very important as an athlete loses a great deal of fluid in any training or competition.

- **Pre-Performance, Including Carbohydrate Loading**

Food and drink consumed 1-4 hours prior to competition has several functions:

- *Prevents hunger*
- *Ensures the athlete is well hydrated*
- *Provides fuel for muscle glycogen stores*
- *Restores liver glycogen content* – especially if an event is in the morning as stores are depleted during sleep
- *Psychological preparation* – an athlete might feel more confident if they follow the same routine prior to competition.

The carbohydrates you eat pre-performance should be low-fat, low-fibre and low-moderate protein as they are less likely to cause stomach upsets. Examples of these foods are:

Three to four hours prior to performance	One to two hours prior to performance	Less than one hour prior to performance
- Cereal and low-fat milk - Baked beans on toast - Pasta with tomato sauce - Baked potatoes	- Fruit smoothie or milkshake - Cereal bars - Fruit flavoured yoghurt - Sports drink	- Fresh fruit - Cordial - Sports drink - Energy bars

The depletion of carbohydrate stores is a major cause of fatigue during physical activity. For optimal performance, an athlete should attempt to build up their muscle and liver stores before the event. There are two primary ways to increase muscle glycogen stores:

- *Increase carbohydrate intake*
- *Taper (decrease) your exercise and training load leading into the event.*

Carbohydrate loading

Carbohydrate loading is a nutritional strategy that aims to maximise the muscle glycogen stores leading up to competition. It is often misused or misunderstood by athletes and coaches.

To maximise glycogen stores, an athlete must taper exercise 72 hours prior to competition and eat a diet, which is extremely high in carbohydrates.

Carbohydrate loading for non-endurance events

In non-endurance events, muscle glycogen stores are maintained by 24 hours of rest from training and a regular amount of carbohydrates.

Carbohydrate loading for endurance events

Tapered training for 72 hours prior to the event and in this time eating a high carbohydrate diet.

- **During Performance**

The most important nutritional factor during competition is fluid intake. Dehydration is a concern during any physical activity. Athletes should aim to drink 150-250 ml every 15 minutes.

In events of less than 30 minutes

- Hydrate well before the event
- Fluid intake during the event does not benefit performance, as it does not become available to the body for 30 minutes.
- Fluid intake during the event will increase a dry mouth and perceived exertion

In events of 30-60 minutes duration

- Begin the event well hydrated
- As a general rule, replace fluid every 15 minutes by drinking 150-250 ml of water

In endurance sports

- Begin the event well hydrated
- Replace fuel regularly
- Consume 30-60g of carbohydrates per hour of exercise
- Avoid carbohydrates that delay the stomach emptying. For example, foods high in fat or fibre.

- **Post-Performance**

Post-performance nutrition is concerned with the restoration of liver glycogen stores, the repair of muscle tissue and the replacement of the fluid and electrolytes that were lost through sweat. Eating carbohydrates immediately after exercise assists with muscle glycogen stores, protein assists with muscle damage repair and water and sports dinks assist with rehydration.

Energy bars, cereal bars, fruit salads and sports drinks are all suggestions for post-performance snacks. The meal on the night following performance should also be a high-

carbohydrate, protein-containing meal to continue restoration of muscle tissue and glycogen stores.

Rehydration is very important and the fluid lost during exercise must be replaced quickly. Cool drinks are easier to drink in larger amounts. Sports drinks and fruit juices have the additional benefit of replenishing carbohydrate stores at the same time as fluid replacement.

- **SUPPLEMENTATIONS**

Supplementations are any additions to an athlete's regular diet that aims it achieve a particular nutritional goal.

PROS	CONS
- May be an increase in performance - Assistance to meet nutritional goals - Placebo effect (psychological effect) - Direct performance enhancement	- Expensive - Side effects - No guarantee - Diet decreases - Weight gain - Become dependent on them

- **Vitamins/Minerals**

Vitamins are required in only very small quantities in the body. They do not contain energy, but they function as catalysts that help the body use energy nutrients.For example:

- *Vitamin A, B, C, D and E*

Minerals are inorganic substances found in the body that are necessary for it to function adequately. For example:

- *Iron*
- *Calcium*

	PROS	CONS
Vitamins	- Cheap, plentiful and regulated	- Expensive and wasteful - Potentially dangerous - Contribute to muscle and joint pain and headaches
Minerals	- Makes bones strong and healthy - Weight loss - Found naturally	- If no iron, diminished haemoglobin levels affect performance because the muscle cells are deprived of oxygen

- **Protein**

Protein's primary importance to the body is its structural to role in holding the cells together and in the growth, repair and maintenance of body tissue. Athletes believe that protein supplements are important because of their muscle building qualities. For example:

- *High in protein* – milk, red meat, almonds, fish, eggs, legumes, soy
- *Supplements* – endura optima powder, BSC bar, whey powder.

PROS	CONS
- Helps build muscle mass - Replacement of depleted nutrients - Beneficial for strength athletes, body building and endurance athletes - Helps resist disease - Essential amino acids for bodily functions - Better recovery time	- High fat content of high protein diets can result in obesity - Eliminating protein can interfere with kidney functioning - Very expensive - Additives that increase the risk of some cancers

- **Caffeine**

Caffeine is believed to be performance enhancing. It is also known to have beneficial effects on mental performance.For example:

- *Coffee, coke, tea, hot chocolate, chocolate*
- *V → (energy drinks)*
- *GU → (sports gels).*

PROS	CONS
- Increases alertness - Increases muscle endurance - Greater anaerobic metabolism - Effects on cardiac muscle - Alterations to central nervous system, to amend perceptions of fatigue - Metabolises fats	- Over arousal which in habits good sleep patterns and jeopardises sleep - Increase in heart rate

- **Creatine**

A muscle fuel derived from Amino acids and stored in skeletal muscle → a source of phosphate to regenerate ATP.For example:

- *Monohydrate*

PROS	CONS
- Muscle hypertrophy more easily achieved - Benefits athletes undergoing resistance training) anaerobic training) - Benefits people who have low reading – low starting levels of creatine → benefit more from supplementation	- Weight gain - Large doses – health risk → possibility of developing renal disease - Long term of consequences unknown - Over use could potentially have an overall effect on kidney/liver function

How does the acquisition of skill affect performance?

- **STAGES OF SKILL ACQUISITON**

The process of learning new motor skills can be categorised into three stages:

- *Cognitive stage*
- *Associative stage*
- *Autonomous stage*

- **Cognitive**

Cognitive stage: the early identification and understanding of a skill to be learned.

Most of the learner's activities during this stage will be in the mind – watching, thinking, analysing, reasoning, judging and visualising. At this stage, the learner is developing an in-depth understanding of the skill to be acquired.

- **Associative**

Associative stage: focuses on practising the movement patterns of the skill.
Practice will increase the learner's ability to perform the skill or task. Constructive criticism is a key ingredient in the associative stage to pinpoint areas of improvement while also enhancing the learner's confidence. Errors will become fewer and smaller as learner's confidence and abilities grow.

- **Autonomous**

Autonomous stage: revolves around executing a skill automatically without having to stop and think about what to do next or how to do it. It is an advanced level of performance referred to as reflex. The individual can now perform the many subroutines with ease and poise.

Practice is still important at this stage, because the quality of execution at the autonomous stage can vary greatly. Improvements will be minor technique enhancements to assist in execution.

For example, an elite tennis play – knows how to serve, but they will continually practise their service in an effort to gain any slight edge over their competitors through accuracy and speed.

- **CHARACTERISTICS OF THE LEARNER**

There are countless variables at play in skill acquisition, including:

  - *Personality*
  - *Heredity*
  - *Confidence*
  - *Ability*

To avoid becoming discouraged at a lack of development, learners must understand the factors determining their suitability for a particular sport or skill, and use this information to make good decisions about the skill they choose to learn.

Personality

By understanding an athlete's natural personality, a coach is more able to assist them in their skill acquisition. An understanding of personality types will assist in their decisions, as a combination of personality types in a team is generally beneficial.
There are four broad types of personalities:

  - *Driver* – know what they want and how to get it
  - *Expressive* – enthusiastic, and are good motivators and communicators
  - *Amiable* – very kind and sympathetic people who avoid conflict
  - *Analytical* – very detail-orientated

Heredity

Heredity: is the genetic characteristic a person inherits from their parents.

By using knowledge we have of our genetic make-up, we can better decide on the sports or skills to pursue. The following are some of the genetic factors that can affect athletic success:

- *Body types and shapes*
- *Muscle fibres*
- *Gender*
- *Ability to visualise*

Confidence

For any individuals learning a new skill, having confidence in their own ability is extremely important. It is critical that a coach or teacher provides constructive criticism accompanied by positive feedback to assist the athlete in feeling good about the process. This will mean the have a better chance of keeping their confidence levels high.

Ability

An athlete who shows ability shows ease and precision in executing a skill or task. They underpin many skill performances, and assist an athlete to grasp a new skill with ease, moving through the stages of skill acquisition quickly and effortlessly.

- **THE LEARNING ENVIRONMENT**

The type of skill to be learned, the performance elements, the practice methods and the feedback protocols shape this.

- **Nature Of The Skill**

Skills can be classified according to four broad categories, although most skills fall into multiple areas. These categories are:

- *Stability of the environment (open and closed skills)*
- *Precision of movement (gross and fine motor skills)*
- *Distinctiveness of beginning and end points (discrete, serial and continuous skills)*
- *Feedback control (self-paced and externally paced skills)*
-

Open and closed skills

Open skills: are those that occur in an unstable and predictable environment for example, soccer.

Closed skills: are those that occur in a stable and predictable environment. For example, darts.

Gross and fine motor skills

Gross motor skills: are skills that use the larger muscles as the primary basis of movement for example, a rugby tackle.

Fine motor skills: are skills that use the small muscle groups for example, darts.

Discrete, serial and continuous skills

Discrete motor skills: are skills that have a distinct beginning and end for example, hitting a ball.

Serial motor skill: are a combination of discrete skills sequenced together for example, a lay-up in basketball.

Continuous motor skill: have no clear beginning or end for example, swimming.

Self-paced and externally paced skills

Self-paced skills: are those in which the performer controls both timing and the speed/force of an action for example, tennis serve.

Externally paced skills: are those in which another athlete, or the environment, has control over the timing and speed of the skills execution for example, a gym routine is paced to music.

- **The Performance Elements**

The structure of the learning environment will influence the opportunities an athlete has to develop the key elements of their skill performance – their decision-making, strategic and tactical abilities.
If the coach continually does the 'telling' and owns the process, the athlete becomes reliant on the coach.
Instructional methods
Two instructional methods that can be used to encourage athletes to improve the performance elements of a skill, including decision-making and strategic development.

Method	Description
Guided discovery method	The guided discovery method includes incorporating activities that require athletes to become more independent. In this approach, the coach asks in-depth questions to guide the athlete.
Problem-solving method	In the problem-solving method, the coach: - Establishes the problem, knowing there may be a variety of solutions - Encourages the athlete to be responsible for finding the solution - Implements individualised or group based work - Works on the cognitive processes of the learner

Strategies and tactics
Before heading into a game or event, an athlete must create a strategic plan in advance and tactics to put the strategies to work.
Athletes at the cognitive or associative stages of skill acquisition are only concentrating on the execution of their own skills.For an athlete to be able to execute strategies and tactics, they must be in the autonomous stage of skill acquisition.

- **Practice Method**

It is important to consider what type of practice method best suits the situation to ensure positive outcomes for the athlete and the coach. Coaches need to consider a range of factors when deciding on the practice methods to use with an athlete.
There are two main variables in practice methods:

- *Mass vs. distributed practice*
- *Whole vs. part practice*

Massed vs. distributed practice
Massed practice: is a practice method in which a skill is practiced until it is learned, without taking a break. Good for athletes with high levels of fitness, experience and motivation, fresh and rested and who have limited time.
Distributed practice: is a practice method in which practice is interspersed with rest breaks. Good for athletes with lower levels of fitness, experience and motivation and who fatigue more quickly.

Distributed practice is more beneficial for skill development, as massed practice can result in poor performance due to fatigue and the negative feelings towards the experience.

Whole vs. part practice

Whole practice: is a practice method in which the whole skill is practised at the same time, rather than being broken down into component parts. Develops a kinaesthetic sense of the skill and can better transfer this learning into competition. Tennis technique may not be fully developed.

Part practice: is a practice method in which parts or subroutines of a skill are practised individually. Suitable for more complex skills, where breaking down the skill will provide better chance of success. For example a tennis serve.

- **Feedback**

Feedback is a critical component in the successful acquisition and development of a skill, regardless of the skill level of the learner. It provides the learner with knowledge about how to improve the performance.

Internal feedback: is generated from within an athlete, allowing them to correct their own mistakes.

Externalfeedback: is generated from outside an athlete e.g. coaches and crowds.

Concurrentfeedback: is received from the body during the performance e.g. an aerial skier may have their coach yelling out when they are in the air.

Delayedfeedback: is received after the performance of the skill is complete e.g. through a video

Knowledgeofresults: is feedback about the outcome or success of an athlete's performance. Comes from external sources, such as a coach informing an athlete of the result, or form an athlete seeing the scoreboard.

Knowledgeofperformance:is feedback given on how well the skill was executed. It will generally come from an external source, although internal kinaesthetic sense can provide it also.

- **ASSESSMENT OF SKILL AND PERFORMANCE**

- **Characteristics Of Skilled Performers**

There are enormous differences between a skilled performer and a learner. Some of these differences can be seen in technique, while others revolve around the strength of character of the individual.

Anticipation and timing

They can anticipate what will happen next, before it actually happens. This gives them an advantage over other participants as they can position themselves quickly to counteract their opponent's moves. Timing their move is also critical to their success. For example, in men's doubles diving, this needs to be in time with each other to achieve a good result.

Consistency

A skilled performer doe not execute a skill successfully one day and appallingly the next. Once an athlete has progressed to the autonomous stage of development, the physical execution of a skill becomes so automatic that is consistently repeated.

Kinaesthetic sense

A skilled performer also has a kinaesthetic sense about their movements during a game or event. They are so finely in tune with the physical, muscular side of the execution that they

can correct errors while the errors are occurring. For example, the movement between the two divers must kinaesthetic to each other.

- **Objective And Subjective Performance Measures**

Objective performance measures: are those that can be recorded independently of the individual observer. For example, the multi-stage test.
There are no arguments or grounds for interpretation and so protests are minimal, even at lower levels of sport. Objectivity is a form of reliability.
Subjective performance measures: are those that are based on individual judgements and opinions.
These measures do run with point scores in a similar way to objective measures, but it is the allocation of these scores to athletes by judges that can be questioned. Points are allocated based on complexity of a skill and how well it is performed.

- **Validity And Reliability Of Tests**

Having a valid and reliable test of successful performance in a sport is critical to the survival of that sport.
Validity: refers to the extent to which a test is measuring what it is meant to measure. For example, a marathon runner would take the beep test but it would be an invalid test to do the stork stand.
Reliability: refers to its ability to indicate consistency between two measures of the same skill. For example, running the beep test under different weather conditions with 3 different students.

- **Personal vs. Prescribed Judging Criteria**

Officials involved in sports that are assessed using subjective performance measures are always looking for ways to improve the validity, reliability and objectivity of their measures. There are two types of judging criteria:

  - *Personal* – are the ideas and expectations an individual holds about how to measure a performance. For example, having a high sense of good judgement after a gym routine.

Prescribed – are measurement standards established by a governing body or organisation for a sport. For example, specialised judges having a different opinion on the routine.

PDHPE - Core 2 Notes

PDHPE CORE 2 Notes – Factors Affecting Performance

How does training Affect Performance?

Energy Systems

The ability to do work. Primary energy source is ATP.

3 energy pathways – Aerobic, Lactic Acid and ATP/PC

1. **Alactic/ATP/PC/Phosphate system (1st Anaerobic system)**

Supplies of ATP limited, only enough supply for one muscular contraction. The explosive muscular contraction causes ATP (adenosine triphosphate) to split to ADP (adenosine diphosphate)

Source of fuel: CP (Cretin Phosphate) stored in cells

Duration: 10-12 seconds **Intensity of effort:** Explosive activity, high intensity (85-100% max effort)

Rate of recovery: 2 minutes to fully replenish **Cause of Fatigue:** Results from inability to continually supply cretin phosphate

By-products: Heat and energy **Efficiency:** Rapid but limited (not very efficient but acts instantly)

2. **Lactic Acid System (2nd Anaerobic system)**

Following 10-12 seconds of ATP/PC system, body begins to use lactic acid system. Produces energy without oxygen.

Source of fuel: Carbohydrates – Glucose (in blood) and Glycogen (in storage form)

Duration: 30 sec at 85% max effort. Can last 3-4 minutes at 70-80% and up to 30mins at 60% or less. This system is used from approx. 30sec into exercise to 3 min.

Cause of fatigue: The build up of lactic acid in muscles
Rate of recovery: Takes approx. 30 mins to 1 hour to break down the lactic acid

Efficiency: Rapid but limited. Has adverse product.

Intensity of effort: Up to 85% max. effort.

By-products: Lactic acid and heat.

3. **Aerobic System**

Activity lasting longer than a few minutes requires oxygen to maintain muscular contractions.

Source of fuel: Glucose, fat and in extreme cases protein are used to produce ATP in the presence of oxygen.

By-products: Hydrogen and carbon dioxide

Efficiency: Extremely efficient in its metabolism of fuel, can continue for long periods of time at lower intensities. Is not rapid in beginning like other systems.

Cause of Fatigue: Glycogen stores depletion.

Duration: From Approx. 3min to many hours.

Rate of recovery: Up to 48 hours depending on length and intensity

Note: The three systems do not work independently of each other, but at times one will be more dominant than the others. All three combine to make the human body an efficient user of energy.

Types of training and training methods

1. Aerobic training (with oxygen)

Generates adaptations that improve the aerobic energy system as its main source of energy. 5 aerobic training types

- **Continuous:** Continuous effot lating at least 20 mins. HR must rise above aerobic threshold. (60-80% of max) e.g. cycling, swimming, jogging.
- **Fartlek:** (speed play) – varied speeds and intensities. Engages both aerobic and anaerobic systems. Effort determined by %of HR but also feel of training. Beneficial for sports where sprints, stops, jogs etc demanded. E.g. soccer, basketball.
- **Aerobic Interval training:** Alternating sessions of work and rest. Can be repeated no. of times, can work both aerobic and anaerobic systems. Rest usually short e.g. 20sec for limited recovery, increasing stress on aerobic system. In type can work hard, avoid fatigue, have competition intensity.
- **Circuit training:** Can make improvements in aerobic capacity, muscular strength/endurance, and flexibility. Moving from one station to another. Greatest benefits with progressive overload principle. Can be made sports specific.

2. Anaerobic training

- **Anaerobic interval:** High intensity work with limited recovery to develop improvements in anaerobic energy systems. At max intensity (85-100) but shorter duration. Develops endurance, power, strength, tolerance to lactic acid. Short anaerobic: less than 25 sec, does ATP/PC systems, Med. Anaerobic: 25sec to 1 min, develops lactic acid system. Long anaerobic: 1-2 min, develops lactic acid and aerobic systems.

3. Flexibility training

Essential for prevention of injury, increased range of motion, improved circulation + healing + coordination, decreases soreness and tiredness, removal of waste.

- Static Stretching: Muscle slowly stretched to position of discomfort and held 10-30 sec. Safe, used for warm-up / cool-down, injury rehab, flexibility.
- Dynamic stretching: Uses speed + momentum to perform movements experienced in game. Reduces tiredness, gets muscles warm. E.g. arm windmilling, kicking with legs.
- Ballistic stretching: Bouncing but not recommended as can cause injury. Can activate stretch reflex (involuntary motion) which can tear muscle. E.g. bouncing to touch toes
- PNF (Proprioceptice neuromuscular facilitation). Lengthening muscle against resistance. Static stretching and strength development. An isometric contraction and period of relax in lengthened position. E.g. lying on back and partner pushing legs back.

4. Strength training

Causes adaptations in muscles for improved strength, power, helps injury rehab, muscular endurance. Generally uses resistances. Causes muscle hypertrophy (growth of cells)

- Free/fixed weights: body has to lift weights to improve certain muscle groups
- Hydraulic: Resistance felt through entire movement, gravity does not assist, does not risk weights falling.
- Resistance bands: Bands provide resistance with properties of tension.

Types of training in sports – Comparison

100m sprinter: Anaerobic interval/circuit, high intensity, long rest periods, many reps. Strength + power → fixed/free weights; low reps, explosive actions. Flexibility → static, dynamic, PNF. All major muscle groups trained.

Endurance Cyclist: Aerobic continuous, Fartlek, circuit (60-80% intensity), Flexibility: static, PNF, dynamic. Strength: endurance, power, high reps with low resistance. Concentration on leg muscles, low rest times.

Principles of Training

1. **Progressive overload:** Gains in fitness will occur when training load is higher than normal, and progressively increased causing adaptations to be made. When adapted to new load, increase it again.
2. **Specificity:** Training to be specific to sport. Greater gains made when activity of training resembles movements in competition.

Reversibility: If training ceases, gains made previously can be lost. Greater the gains, greater the potential losses.

3. **Variety:** Same drills can lead to boredom, loss of motivation. Need new skills and techniques to be tested/learned. Must ensure still specific. E.g. to improve cardio can use jogging, swimming, cycling. Cross training also beneficial.
4. **Training Thresholds:**
   Aerobic: level of intensity sufficient to cause a training effect. Approx. 70% of max. HR
   Anaerobic: Level of intensity in exercise where training effect is caused on anaerobic system.
   Between these thresholds is aerobic training zone (see sheet). (above aerobic and below anaerobic)
5. **Warm-up and cool-down:**
   Reduces risk of injury, increases body temp. prepare for exercise mentally, stimulate cardiovascular system. Warm up should include aerobic activity, callisthenics (e.g. jumping up and down), skill rehearsal, stretching after warm.
   Cool down follow competition or training session; purpose to minimise muscle soreness, remove waste, cool down, replenish body systems, improve circulation.

Aerobic Training	Principles of Training	Resistance Training
Increased distance + time, increased intensity, harder movements.	Progressive Overload	Increased loads, reps, weights, lower rest times, more sets.
Specific to competition, using certain muscle groups, energy systems	Specificity	Specific muscle groups trained
3-4 times in solidify and gain	Reversibility	Need 3-4 times a week to solidify improvements
Other training types, circuit, fartlek, cross training	Variety	Different weights, plyometrics, circuit, using body as weight
60-80% max HR, in aerobic training zone	Training Thresholds	Increase in difficulty, do with lactic acid in body, less rest times.
General aerobic, flexibility, calisthenics, lower intensity.	Warm-up/Cool-down	General aerobic, stretching muscles used, calisthenics.

Physiological adaptations in response to training

Body will make many adaptations in response to training, some immediately visible and others taking up to 12 weeks to realise benefits. Following will occur

1. Resting Heart Rate

A trained athlete will have a lower resting HR due to efficiency of cardiovascular system. Highly conditioned can have as low as 30bpm. Body will recognise start of training earlier to have higher HR in training and lower HR quickly after training finished. E.g. 75 untrained to 65 trained.

2. Stroke Volume (amount of blood ejected in single contraction by L. ventricle. mL/beat)

Long term effect of training is an increase in SV. Higher at maximal exercise, blood volume can also increase during training. With training, ventricle enlarged and contractions are more powerful, so less are needed. E.g. untrained 100mL per beat, trained 160mL per beat.

3. Cardiac output (amount of blood pumped by H per minute) (HR x SV = CO)

E.g. untrained, 15-20L per minute and trained, 20-25L per minute and can go up to 40L. Means heart is more efficient, better trained has better CO because of stroke volume (as their HR is actually lower than untrained)

4. Oxygen uptake

Maximal 02 uptake or V02 max regarded as best test of cardiovascular endurance. High VO2 shows superior oxygen delivery system and contributes to max performance. Expressed in mL of O2 per kg of body weight, per minute.(mL/kg/min) E.g. 45mL/kg/min 17 y.o guy → 52mL/kg/min with training.

5. Lung Capacity

Oxygen absorbed in lungs, total lung capacity about 600mL for males, less for females. Vital capacity increases slightly (amount of air can be expelled). Residual volume (air that cannot be moved out) shows a slight decrease.

6. Haemoglobin level (substance in blood that binds O2 and transports it round body)

Hmgn in red blood cells. Hmgln levels increase in training → increases oxygen carrying capacity. Can increase from 800gm to about 1000gm per 100mL of blood. 20% increase

7. Muscle Hypertrophy

Size of muscles become larger due to increase in mass and cross-sectional area. Growth results in increases in: actin and myosin filament, myofilorils, connective tissue.

8. Effects of Fast and Slow twitch fibres

ST (slow twitch, or type 1): slowly contract for long periods of time (red tibres) For endurance activity.

FT (fast-twitch, or type 2): Reach peak tension quickly and for power/explosive movements (white fibres)

Benefits to slow twitch muscle fibres: hypertrophy, capillary supply increase (rate of exchange up), mitochondrial function (energy factories of cells increase in no. and size), myoglobin content (transporting O2 up), oxidative enzymes (level of o.e up)

Further adaptations for fast twitch fibres: ATP/PC supply and efficiency increase, glycolytic enzymes increase, better toleration of lactic acid.

PDHPE CORE 2 Notes – Factors Affecting Performance

How can Psychology Affect Performance?

Mental preparation is just as important as physical preparation for improving performance.
Factors: motivation, relaxation, arousal, concentration, rehearsal, anxiety.

Motivation

The driving force within us. Motivation pushes individuals beyond comfort zone to produce superior performance.

- Positive motivation

When driven by previous reinforcing behaviours (winning awards, success, praise, money etc) Coaches must continually strive to find unique ways of reinforcing desired behaviours. E.g. incentives, progress charts. Positive effective for long term.

- Negative motivation

Improvement because of fear of consequences. E.g. work hard in fear of being dropped from the team or shouted at. Negative can lead to long term mental damage, lack of confidence, lack of creativity, fear of wrong choices. Can be effective in short term but in long term damaging.
Neg → punishment. Pos. → Reward.

- Intrinsic motivation

From within individual. Serve to drive, succeed, accomplish etc by performing at best level. Self-sustaining because is self-reinforcing and personal achievement becomes a reward. Can help with motivation when no one is paying attention e.g. to train harder or further physical attributes.

- Extrinsic motivation

Individuals motivated by some factor outside of self. Comes from reward e.g. money, recognition, praise, trophy. May be necessary to motivate athletes to new levels.

Examples of motivation

Working hard on technique to be better than other players – P,I

Watching passing so don't get yelled at – N, E

Only performing for spectator applause – P, E

Trying so that the person doesn't feel bad about themselves – N, I

Different motivation types are effective for different sports. E.g. for golf → Positive and Intrinsic most effective because will need to practise heaps without external recognition and will have long term drive if doing it for reward.

Boxing meanwhile can use negative as well as extrinsic because fear can cause heightened emotions, arousal, adrenaline etc good for fighting. Also will fight in front of people and motivation to get recognition can be rewarded.

Anxiety and Arousal

- Anxiety

A psychological process characterised by a fear or apprehension in anticipation of confronting a situation perceived to be potentially threatening.

- Trait Anxiety:

How each individual responds to stress. Varies from person to person; what will prompt anxiety in one person may not generate any emotion in another. Most people can be calmed/controlled by relaxation, reassuring, planning, positive comments.

- State Anxiety:

Heightened presence of distress in response to a particular situation. Again will vary from person to person. E.g. high pressure penalty kick

- Sources of Stress

Internal: e.g. self-esteem, self-expectations, level of preparation, fear of failure, will to succeed, attitude to situation.

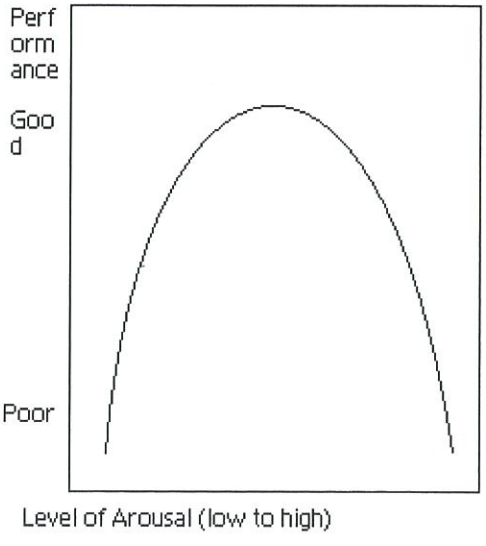
External: Reaction to opposition, focus on event, planning, aspects of environment, skills, media, expectations, crowd.

Under control: Athletes reaction, mental state, attitude to opposition.

Not under control: Injury, illness, media, environment. (some overlap for example media is external and not under control)

- Arousal

Different from anxiety. Arousal is essentially a physiological process. Levels vary with athletes, generally the more anxious, the less arousal needed.



Skills + performance → successful when level of arousal is optimal. Inverted 'U' pictured – shows performance against level of arousal.

At left – low level arousal and performance

Middle top – high level arousal and performance – balance of motivation, ability to control.

Right – excessive arousal, poor performance caused by anxiousness, tension, mental confusion.

Psychological Strategies to Enhance Performance and Manage Anxiety

- Concentration / Attention skills (focussing)

Focussing on process rather than result. Focussing also, only on aspects that you have direct control over. Athletes need to know what to focus on at particular times and adapt to changing situations. E.g basketball free throw shot and blocking out crowd

Need to maintain established routines, self-talk and avoiding negative thoughts.

- Mental Rehearsal + Visualisation + Imagery

Used to enhance competition performance and skill acquisition. Mental repetition of a movement to increase familiarity and comfort in performing a motion. Skill is pictured before being performed.

Mental rehearsal has chance for 'perfect practise', and elevates to level of arousal needed. Helps also to exclude distractions, + thoughts for success.

- Relaxation techniques

Series of techniques that seek to control body's response to stress and control arousal. Common techniques used: progressive muscular relaxation, mental relaxation, self-hypnosis, meditation, centred breathing.

- Goal Setting

Should be smart. Specific, Measurable, Action Oriented, Realistic, Timely (short or long term)\

Goals will help motivate to achieve, while giving less anxiety in that the level of achievement is given and focus can be central to the goal. Actions to be taken are known and athlete knows the goal is achievable.

PDHPE CORE 2 Notes

How can Nutrition and Recovery Strategies affect performance?

Nutritional Considerations

- Pre performance

Nutritional Considerations

- Nut. Balance essential for optimal physical performance.
- Specific roles of both Carbohydrates and Hydration 2 most important considerations.
- Type of foods consumed before competition affects energy production and use.

Fluid is important → cooling heated muscles, temp. Regulation, dilutes toxic wastes, aids O2 transport, removal of CO2, prevents dehydration.

Nutritional strategies: (include what types of foods and amounts, when to eat/drink, how to carbload)

Types of foods:

Food high in fat, protein and fibre → longer periods to digest. If solid food is difficult to digest, then liquid meals can be used.

Advised to eat complex cards with low GI (e.g. pastas, cereal, breads, fruits) as they provide energy release over longer periods of time. Should not eat new foods prior to competition.

- During Performance

In endurance events, need for carbs, electrolyte replacement , depends on intensity, duration, humidity, clothing type, individual sweat rates.

Electrolytes are salts, minerals, such as sodium, potassium, calcium, magnesium that important → body functions such as chemical breakdown + nerve conduction.

Nutritional Considerations:

Aim to conserve muscle glycogen and maintain blood glucose levels. Carb supplementation needed to avoid glycogen depletion. Liquid carbs feeding delays glycogen depletion up to 30 mins.

Glycogen supp. Not needed → low duration/low intensity

Adequate hydration to be maintained. Fluid replacement plan needed > don't wait till thirsty to drink.

Important for hydration: Hydrate before, during, after. Drink every 15-20 min in exercise, water/sports drinks reccmd, ensure acclimatised to conditions, avoid excess fat, salt, alcohol.

- Post-performance

To return body to pre-event state as quickly as possible. Through proactive recovery (refuelling and rehydrating until state obtained)

Best achieved – high intake carbs and high intake high GI foods + drinks.

Foods that digest quickly = high GI, elevate blood sugar levels (e.g. lollies, sports drinks)
Foods that digest slowly = low GI, do not cause swings in sugar blood levels. (e.g. porridge, pasta)
Low GI best for pre-event, high GI for during and after.

- Comparison of special dietary requirements of Football vs Netball

Similarities: Need to carb load, high energy diet, lots of hydration, planned meals and snacks, high energy fluids (e.g. sports drinks and milkshakes), alcohol not recommended. During performance rehydrate, after performance organise hydration, snacks, meal directly after match.

Differences: Netball – iron deficiency an issue so extra iron should be incorporated into diet. Should eat iron rich foods (red meat e.g.) and foods that help iron consumption. Football – Focus more on bulking up and gaining muscle; protein rich foods to be incorporated into diet as well as extra carbs, vitamins and minerals.

Supplementation

Found in many forms, however not needed with a balanced training diet. Only if have deficiencies.

- Vitamins/Minerals

Vitamins: Inorganic compounds, essential to maintaining bodily functions. Required for chemical reactions that assist enzymes in breakdown of food.

Excess intake of vitamins can be dangerous. Although some can be executed by urine, some interfere with absorption of others and can cause fatigue or muscle/joint pain.

Minerals: Inorganic substances found in body that are necessary for body to function properly. **Iron** and **Calcium** most commonly deficient in athletes. If deficient in iron → haemoglobin levels down and affects performance and can cause health problems. Also can cause 'sports anemia' with low iron. Lots of iron in lean meat, grain products, dark/leafy veg.

Most risk of iron deficiency: endurance athletes (sweat loss), females (menstrual blood loss), vegetarians (lack of red meat), adolescent males (growth spurt)

Calcium deficiency more related to health than energy supply. Calcium sources; dairy products, fish, leafy/green veg.

Most at risk calcium deficiency: Females → insufficient dairy, or menstrual cycles ceased.

- Protein

Minimal role in energy production (only used in extreme circumstances). Well-balanced Western diets will have ample protein. No strong evidence for protein suppl benefits.

Strength athletes, endurance athletes + adolescents in growth spurts may gain benefit from protein suppl. Generally require 1 gram per kg of body weight per day.

- Caffeine

A diuretic (increases amount of fluid passing from body). These diuretic properties contribute to dehydration. Caffeine though has performance enhancing (**ergogenic aid**) and can mobilise fat stores earlier in endurance events for energy release, leads later to a glycogen sparing.

- Creatine Products

Produced by body cells and from food intake. Converted into Creatine Phosphate → assists resynthesis of ATP. Effective in explosion events e.g. weightlifting

Suppl. Supported by many athletes, many researchers found little if any benefit, as body does not store excess amounts of Creatine. Can increase muscle size and appearance through increased water retention. Large doses of creatine can have negative health effects, especially to do with renal (kidneys)

Recovery Strategies

Aim to ensure athlete can resume normal training and competition within given time span. Active rest regarded as most beneficial – allows physiological and physiological revitalisation. Recovery important → avoid overtraining.

1. Physiological Strategies

Focus on removal of metabolic by-products, nutrition plan to replace lost fluids and energy. Cool down used to remove waste, prevent muscle soreness, stretch, remove lactic acid, prevent blood pooling.

Nutritional plan addresses fluid and solid intakes. Includes diet of coming days → regarding fluids and solids.

2. Neural Strategies (aim to relax muscles, recently popular)

Hydrotheraphy: use of water to relax, smooth, assist metabolic recovery. Allows active, low impact exercises, and can be used in conjunction with cryotherapy in some cases to promote blood flow.
Massage: Prior to or after event. Extends cool-down, mental relaxation. Can relieve muscle tension/soreness, eliminate toxic by-products, promote flex. Prepares for next performance.

3. Tissue Damage Strategies

T. damage can be minor to more long term.

Cryotheraphy: cooling to treat injury or quicken recovery from performances. Ice most often used → cryotherapy slows down tissue inflammation, prevfents build up of waste.

RICER principle used, sometimes without R so it is just ICER. Ice on and off every 10 min for 40 mins. Can have repetition periodically for 2 days.

Ice baths are used and rely on body's blood vessels to contract (vasoconstriction) in ice. When emerged, blood vessels enlarge so O2 rich blood goes to muscles for recovery.

4. Psychological Strategies

After hard exercise → psych. Recovery is needed (emotional and mental). Some methods are specific while some are simple e.g. reading or watching TV

If there is mental/physical tension → not full recovery. Sleep considered main psychological and physical recovery strategy but if not mentally relaxed sleep will not be as effective.

Some use strategies like: Progressive muscular relaxation, yoga/deep breathing, mental relaxation techniques.

PDHPE CORE 2 Notes

How does the acquisition of skill affect performance?

Stages of Skill Acquisition

Acquisition of skill is a gradual development process that requires our cognitive (thinking process) working with our physical abilities.

1. Cognitive Stage

Player gains understanding of task required, conceptualisation (mental picture) is essential
Demonstrations important with important points highlighted, but info overload must be avoided
Learner will encounter problems depending on difficulty, feedback→ crucial, should be continuous and positive.

Movement drills in this stage to improve coordination and feel for movement.

2. Associative Stage

Emphasis on practising correct technique and repetition. Some errors removed but not all, feedback still essential.

Mind and muscles get trained → muscle memory. Fluency + smoothness develop as **Kinaesthetic sense** improves. Learners can remain at this stage long periods of time.

3. Autonomous Stage

Ability to automatically execute skill – properly sequenced and performed instinctively
Temporal patterning →blended, fluent, smooth. Able to adapt skill to in-game decision making without having to think about the execution of the skill.

Can recognise and correct own errors.

Characteristics of the Learner

Speed at which learners acquire skills depends on a no. of factors Use CHAPP acronym

Confidence – Heredity – Ability – Personality – Prior Experience

1. Confidence

Belief in one's own ability. Critical in motivation to learn, creativity, and energy. Confident people can help self and others, can approach situation with feeling of ableness.

2. Heredity

Genetic characteristics inherited (gender, height, conceptual ability) → Unchangeable, and can limit dimensions of potential. Relative % of fast/slow twitch fibres makes one more suitable to certain events. Somatotype is also big factor.

Ectomorphy (linearity), Mesomorphy (muscularity), or Endomorphy (roundness) are the three types.

3. Ability

Ease with which an individual is able to perform a movement or routine. Incorporates a range of factors such as sharpness, perception, intelligence etc. Some learners able to recognise patterns, skills, concepts etc. Also called 'natural talent'.

4. Personality

Individual's characteristics of behaving. Traits such as willingness to learn, determination, dedication, consistency, reliability will help learning process.

5. Prior Experience

Easier to learn a skill if similar movements have been done successfully.

The Learning Environment

- Nature of the skill - (skills can be classified according to specific criteria)
-

1. Open and Closed

Open skills in an environment that is unpredictable and dynamic. Uncertainties – weather, opposition, playing surface, tactics, teammates. May need to modify techniques to adapt to changes. (e.g. surfing)

Closed skills occur in stable and predictable environment. Generally self paced, easier to learn. (e.g. ten-pin bowling.)

2. Gross and Fine

Gross requires use of large muscle groups. E.g running. Fine requires small muscle groups e.g. darts

3. Discrete, Serial and Continuous

Discrete has a beginning and end that is distinctive. E.g. golf swing
Serial has sequence of smaller movements (2 or more discreet) assembled to make a skill. (e.g. conversion)

Continuous has no distinct beginning and end. E.g. running.

4. Self Paced and Externally Paced

Self-paced where performer determines speed and execution e.g. tennis serve
Externally paced where an external source determines timing e.g. batting in cricket

- Performance Elements

Include decision making, strategic development and tactical development. A game-centred approach needed to develop performance elements. Approach focuses on whole game and components within it.

1. Decision-making

Best improved by having to make decisions in performance-like pressure situations. Best achieved through observation, questioning, whole, part, specific roles, variation, creativity.

2. Strategic and Tactical Development

Refers to way we play, what we should be doing, decisions should be made. Tactical awareness about ways of gaining an advantage over opponent. 3 principles are **Technical efficiency, understanding and skill execution**. (need to be practised in game situations)

- Practise Methods

1. Massed and Distributed

Massed involves a continuous practise session with short rest intervals e.g. shoot 50 baskets then rest 1 minute. Massed works best with fresh , motivated athletes who might be unable to attend lots of sessions.

Distributed involves broken practise session with intervals of rest or alternating activities. E.g. shoot 10 baskets, do dribbling. Can work with not highly motivated people, when fatigued, when task is tiring and difficult. Promotes variety.

2. Whole and Part

Whole is practising skill in entirety. Generally used for easy or simple skills. Part practise involves breaking it down into smaller components or sub-routines. Used for complex skills with beginners. Combination is sometimes used so see whole skills then break it down. E.g. lay up

- Feedback

Info about how skill is being performed or was performed. 3 main functions

Provide basis for correcting aspects that need improvement. Motivate and encourage performer. Reinforce what I being done correctly. Types of feedback:

1. Internal: Comes through senses inside body. Movement is felt and relayed to brain, as adjustments made if necessary. Helps develop kinaesthetic sense for movement.

2. External: Outside sources. E.g. coach or someone who saw skill
3. Concurrent: Received during performance of skill. E.g. handstand
4. Delayed: Received after skill is executed. E.g. after soccer shot.
5. KR (knowledge of results): Outcome of movement. Suggests how skilful movement is. E.g. goal was scored.
6. KP (knowledge of performance): Information about movement during execution and way skill was performed. Quality of execution of skill. Can be external off internal

Feedback essential in improving performance. Best work s immediately and positive.

Assessment of Skill and Performance

- Characteristics of Skill and Performance

1. Kinaesthetic Sense

System of sensitivity that exists in muscles and their attachments. Skilled performer → well-developed K. sense. Allows them to feel movement as they perform it. Can even make corrections while performing movement.

2. Anticipation + Timing

Able to predict what may happen in specific situations. E.g. speed of ball, where it will land, when kick will be effective. Allows more time to respond, anticipation is also necessary for externally paced activities. E.g. basketball, cricket.

3. Consistency

Skilled performers → high quality consistency. Can repeat desired movement in high-pressure situations. E.g. tennis, golf

4. Technique

Good technique will be carried out in a safe, effective, efficient, and aesthetically pleasing manner. Movement will have better chance of being successful, will withstand pressure better, and less chance of injury if technique is proper.

- Objective and Subjective Performance Measures

Measurement is the process of using numeric info to assess a particular physical ability, presented in the forms of times, scores, distances, guidelines. Greater accuracy of measurements means more reliable data.

Subjective observation: Judgement of performance based on feelings, opinions, impressions.

Objectivity: Extent to which a measure or test is independent of observer. Runs on continuum from highly objective to slightly objective. High jump highly objective while fencing requires interpretation so is subjective.

Observations can be made using:

Checklists (style, technique, technical correctness, sequencing execution.

Measurement systems: Measuring tapes, electronic timers.

E.g. Basketball shot. Objective: 2 points scored. Subjective – defence was out of position.

Established criteria: Set of procedures, rules, guidelines.

Rating Scales: Degree of difficulty that awards marks for difficult movements.

- Validity and Reliability of tests

Validity: Honesty of a test, degree to which it measures what it is supposed to measure.

Techniques used to enhance validity include: judgement about test item, using already validated but similar tests as indicator, accuracy in prediction, ensuring test items contain component being validated. Use of range of measures strengthens a tests validity.

Reliability: Ability to be repeated with consistent, accurate results.

- Personal versus Prescribed Judging Criteria

Personal Criteria: Preconceived ideas or expectations of an individual. E.g. coach to select his team. Spectators also use these criteria to judge teams based on feelings.

Prescribed Criteria: Established by sports org and form basis for assessment for competitions in that sport or activity.

Will absorb elements of subjectivity into a more objective framework. Use of checklists, rating scales, etc. help to accurately convert appraisal into measurements such as scores. Judges are prescribed with criteria produced by sports org.