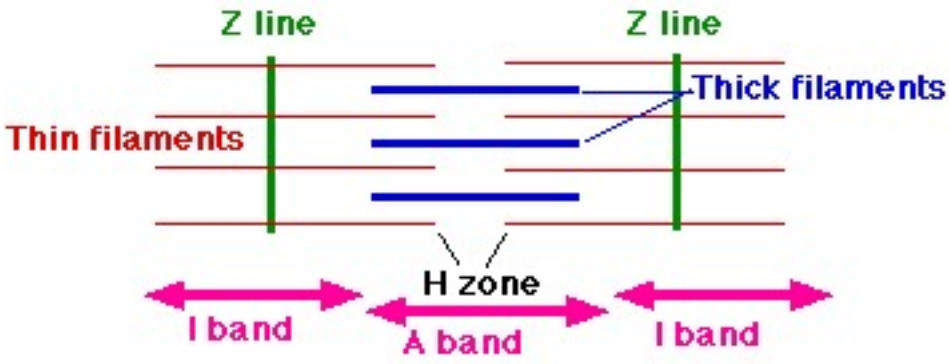
FUNCTIONAL ANATOMY

Structure of Skeletal Muscle:

- skeletal muscle surrounded by **epimysium**
- Skeletal muscle made up of bundles of muscle fibres called **fascicles** surrounded by **perimysium**
- Each fascicle contains individual muscle fibres, surrounded by **endomysium** Muscle fibres arranged into myofibrils, running parallel to each other and along the length of the muscle fibre
- Myofibrils contain a chain of **sarcomeres** which are composed of **actin** and **myosin** filaments responsible for creating movement

Role of Myosin, Actin and the sarcomere in the sliding filament theory:

1. Neuro-muscular junction is activated (acetylcholine) so that calcium is released from the muscle
2. Calcium initiates cross bridges to find ATP
3. Cross bridges form- myosin heads pull on actin molecule
4. Sarcomere shortens and muscle contracts



Force-Velocity:

- if a muscle contraction is required at a fast pace, the force it exerts decreases
  - Decreases with increased velocity of shortening
- More force required = slower movements required to give sarcomeres time to fully contract, therefore larger force produced (isometric = greatest force produced)

Force-Length:

- Length of a muscle and the angle at the joint has an impact on the force that can be generated
- Optimum muscle length and joint angle = different for every part of the body and optimal position is near the middle of joint range
  - This allows maximum attachment of the myosin cross-bridges with the actin

Axons:

- Long thread-like part of a nerve cell along which impulses are conducted away from cell body to other cells

Dendrites:

- Short branched extensions of a nerve cell, along which impulses are received from other cells at synapses and are transmitted to cell body

Central Nervous System:

- Complex of nerve tissues that controls the activities of the body.
- Comprises of brain and spinal cord

Peripheral Nervous System:

- Nervous System outside the brain and spinal cord

Spinal Cord (Functions):

- conduit for motor information which travels down the spinal cord
- Conduit for sensory information which travels up the spinal cord
- Coordination centre for certain reflexes

Motor Neurons:

- nerve cell forming part of a pathway which impulses pass from the brain or spinal cord to a muscle or gland

Motor Unit:

- The motor neuron and the fibres it stimulates

All of Nothing Principle:

- The strength of a response of a nerve cell or muscle fibre is not dependant upon the strength of the stimulus.
- If a stimulus is above a certain threshold, a nerve or muscle fibre will fire.
- Either full response or none at all

Characteristics of Fast and Slow Twitch Fibres:

FUNCTION	SLOW-TWITCH I	FAST-TWITCH IIA	FAST-TWITCH IIB
Speed of Contraction	Slow	Medium	High
Force of Contraction	Low	Medium	High
Resistance to Fatigue	High	Medium	Low
Aerobic Capacity	Very high	Medium	Low
Anaerobic Capacity	Low	High	Very High
Energy Pathway	Aerobic	Aerobic/Anaerobic	Anaerobic
Recruitment Order	First	Second	Third
Fatigue Level	Low	Medium	High
Activity Suited	Endurance	800m Runner	Sprinter
Mitochondrial Density	High	Medium/High	Low

BIOMECHANICS

Newtons Three Laws:

1. An object will stay at rest and an object in motion will stay in motion unless acted upon by an unbalanced force
2. The rate of change of acceleration to a body is proportional to the force applied to it, and inversely proportional to the mass of the object. (F=MxA)
3. For every action, there is an equal and opposite reaction

Momentum:

- the amount of motion possessed by a moving body
- P= Mass(kg) x Velocity(m/s)

Law of Conservation of Momentum:

- total momentum of two objects before and after impact are equal
  - Occurs in situations where a perfectly elastic collision takes place ie. one where no energy is lost to sound and heat
- Momentum of one object is transferred on contact to the other object, resulting in no change in total momentum (transfer of momentum)

Newtons 3rd Law in relation to the Conservation of Momentum:

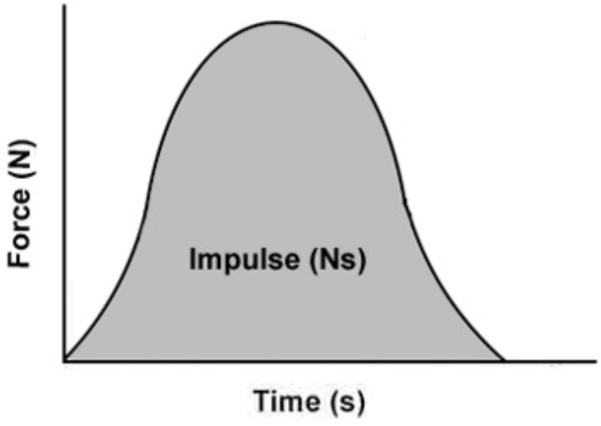
- It explains that when collisions occur, an equal and opposite force occurs resulting in a transfer of momentum from one object to the other
  - Eg. Baseball bat is swung towards ball- both the bat and ball posses a certain amount of momentum before collision. Upon collision, ball explodes away while bat rapidly decelerates during follow through. Total momentum between the two objects = remained the same, most has been transferred into the ball sending it flying away.

Newtons 2nd Law in relation to the Conservation of Momentum:

- The rate of change of momentum of an object is directly proportional to the resultant force applied and is in the direction of the resultant force
- Resultant force is equal to the rate of change of Momentum

Impulse:

- Refers to the change in momentum of an object
- Impulse = force x time
  - Force= mass x acceleration



    - Time = the length of time over which the force is applied
- Longer the force can be applied to an object and the greater the size of the force applied, greater the objects impulse

Coefficient of Restitution:

- Measures elasticity of the collision between an object and a given surface
    - Measures how much energy remains in the object after a collision on scale 0-1
- COR = 1 -> perfectly elastic collision eg. Ball dropped at given height and rebounds to same height after colliding with ground
- COR = 0 -> perfectly inelastic collision eg. When ball is dropped, it doesn't bounce at all

Factors affecting the Coefficient of Restitution:

1. Equipment and materials
2. Condition of the balls
3. Type of equipment eg. Baseball wooden bat: lower COR than aluminium
4. Type of condition of playing surface eg. Clay court (high COR) vs grass court (low COR)

Angular Momentum:

- Momentum = linear -> Angular Momentum = Angular
- Angular velocity: velocity or speed of rotating object
- Moment of Inertia: resistance of a rotating object to change its state of motion
- Angular momentum = angular velocity x moment of inertia

Angular Momentum- Moment of Inertia:

- If body's mass is close to the axis of Rotation, Rotation = easier to manipulate
    - Moment of Inertia = smaller and results in increase in angular velocity
    - Moving mass away from axis of rotation slows down angular velocity
- MOI = mass of the object x radius of rotation
    - Mass of the object = mass
    - Radius of rotation = how the mass of the object is distributed about the axis of rotation
    - ie. by moving the mass of the mass of the object further away from the axis of rotation, you are increasing its radius of rotation and hence increasing its moment of inertia

Levers:

- 3 main parts

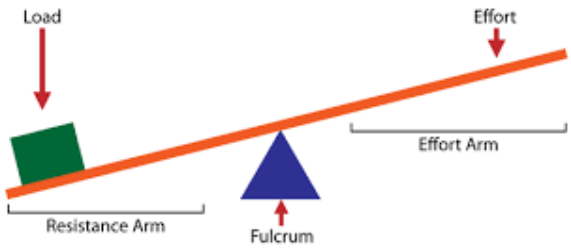
1. Weight or resistance to be moved
2. Axis or Pivot point
3. Application of force to move the weight or resistance

- Functions

1. Increase application of force by making the FORCE arm longer than the RESISTANCE arm
2. Increase speed of movement by making the FORCE arm shorter than the RESISTANCE arm

- Anatomy
  - Fulcrum/Axis: point around which the lever rotates
  - Effort/Force arm: the distance between the fulcrum and the point at which the force is applied
  - Resistance arm: the distance between the fulcrum and the centre of resistance
  - Input (effort) force: force exerted ON the lever
  - Output (resistance) force: force exerted BY the lever

First Class Lever:



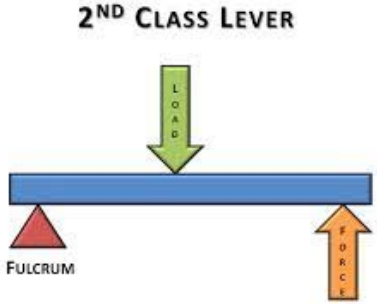
-Eg. See saw: effort comes from person pushing down whilst resistance comes from person on the other end

-Point of application of force in relation to axis/fulcrum will determine mechanical advantage provided by 1st class lever

- Farther force is applied to fulcrum, easier to move
- Closer force is to fulcrum, greater effort needed to move object

- 5kg weight can be balanced with 100kg weight by moving 5kg weight 20 m further way from axis than 100kg weight

Second Class Lever:

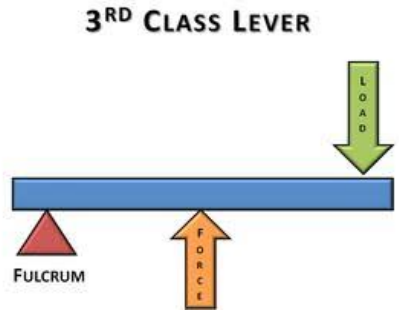


-Very rare in human body

-Eg. Wheelbarrow- large force arm ensures increased strength to an object can be applied

-Eg. Push-up

Third Class Lever:



-most common Lever in human body: mechanically built for speed

-Large resistance arm ensures increased speed can be obtained

-Human body: muscle attachment= application of force, joint= axis/fulcrum, weight/load= resistance

- effective when using striking implements (golf club)
- Increasing length of resistance arm, possible to generate greater velocity of striking surface -> greater force transfer onto ball

Torque:

- opening door = requires turning force which is a force being applied around a pivot
- Magnitude of turning force called torque: T=FxD
  - T= Torque
  - F= Force
  - D= Distance the force is applied over measured in metres
- Longer the moment arm, greater the rotational force produced
- Eg. Wheelchair basketball = acceleration is key. Outer rim = very large, creating a bigger moment arm and hence the potential to create increased torque

Fluid Mechanics:

- Study of forces that develop when an object moves through a fluid medium

Fluid Resistance:

- As object moves through a fluid, it disturbs it
- Greater the disturbance, greater the transfer of energy from object to fluid
- 2 factors affecting:
  - Density
  - Viscosity

Drag:

- A force acting opposite to the relative motion of any object moving with respect to a surrounding fluid
- TOTAL DRAG = SURFACE DRAG + FORM DRAG + WAVE DRAG

Form Drag:

- Resistance created by pressure differential between front and back of an object moving through a fluid
- Factors Affecting:
  - Cross sectional area (CSA) of object: eg. Cyclist upright vs crouched position
  - Velocity of object: higher speeds, greater levels of form drag
  - Surface roughness: rougher surfaces cause air to cling to surface for longer periods, causing a later separation point and hence less drag
  - Shape of object: round ball vs oval ball

Surface Drag:

- Friction produced between fluid and surface of a moving object
- Factors Affecting:
  - Relative velocity of moving object
  - Relative roughness of surface object: why athletes wear tight fitting clothes in speed skating, cycling etc as it leads to reduced surface drag
  - Viscosity of fluid
  - Surface area of object

Wave Drag:

- Resistance formed by creation of waves at the point where air and water interact: major form of drag acting on a swimmer
- Factors Affecting:
  - Relative velocity of the wave
  - Technique: more streamlined- less wave drag, underwater- less wave drag
  - Open water vs closed conditions

Fluid Flow:

- Fluids in motion (gases and water)

Turbulent Flow:

- Irregular Flow that is characterised by tiny whirlpool regions. Velocity of this fluid = not constant at every point

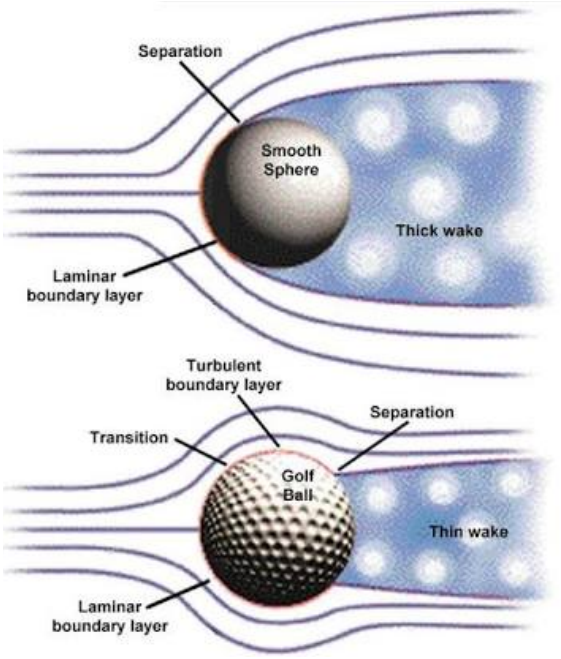
Laminar Flow:

- Flow of a fluid when each particle of the fluid follows a smooth path, paths that never interfere with each other

Boundary Layer:

- Thin layer of air surrounding or "attached" to the ball
  - Laminar: smooth flow, large turbulent pocket at back of the ball
  - Turbulent: rough Flow, small turbulent pocket at back of ball

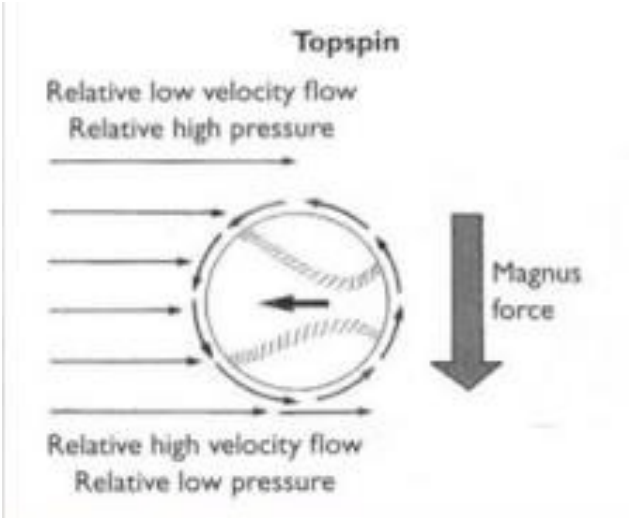
- Separation: where boundary layer breaks away from ball
  - Earlier boundary layer separates, greater the pressure gradient between front and back of ball (leads to increased Drag)



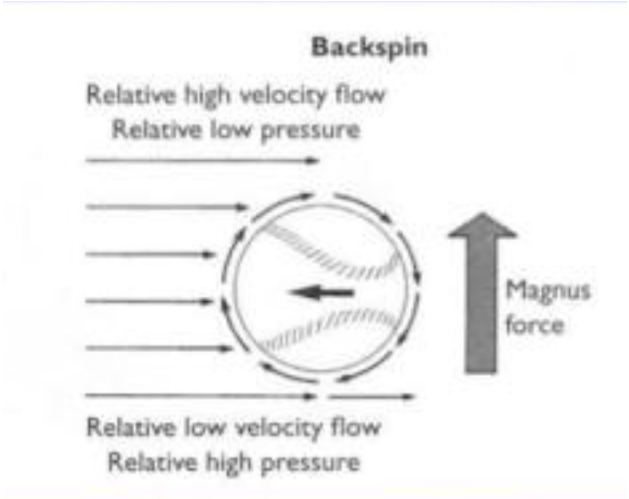
Magnus Effect:

- eccentric force (off centre)
- Term used to describe the effect of rotation on an objects path as it moves through a fluid
  - Applies Bernoulli's principle to explain the effect spin has on trajectory or flight path of an object

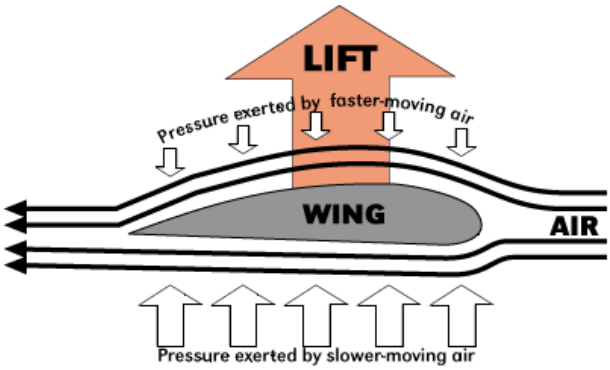
Top Spin:



Back Spin:

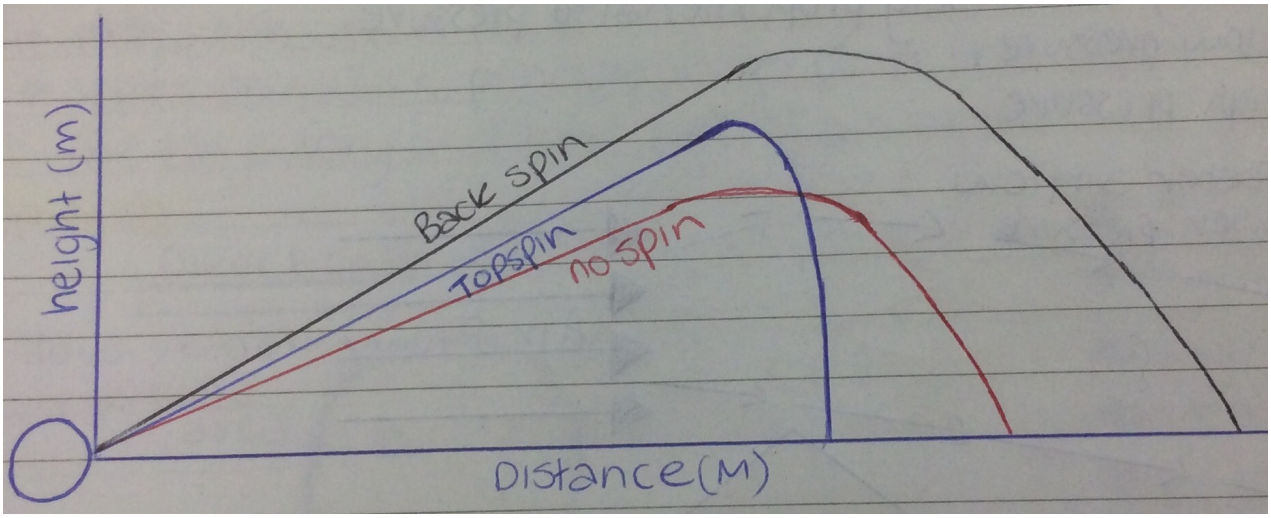


Bernoulli's Principle:



- States that velocity is inversely proportional to pressure
  - High velocity-low pressure
  - Low velocity-high pressure
- Throwing a discus: To maximise distance, athlete must find the appropriate angle which will create sufficient lift whilst still presenting a relatively small CSA to help minimise drag. Too little angle (flat discus) and it will not have sufficient time in the air. Too much angle and the discus will have too much lift.

Effect of Spin on Trajectory of a Ball:



Practical applications of Spin in Sport:

- Golf: side sin allows players to work ball around corners
  - Back Spin allows players to attack the green, ensuring ball approaches flag from a steeper angle
- Tennis: top Spin allows players to hit ball with greater force whilst reducing risk in game play
  - Back Spin can be used as defensive option, allowing player to regain court position or as attacking option (drop shot)
- Soccer: back spin used by players to kick the ball a greater distance by increasing the amount of time the ball is in flight
  - Side Spin can be used to great effects when shooting on goal and passing to team mates

Applications of Biomechanics Principles:

- Coordination Continuum:
  - Power based activities- athlete adapts a sequential approach to ensure maximum velocity is transferred
  - Maximise number of body segments by adopting side on position to target to ensure legs, shoulders, hips etc. are used in execution of movement
  - Sequentially accelerate each body segment: each segment beginning to move as preceding segments reaches maximal velocity to ensure optimum momentum transferred onto ball
  - Big body parts move first and small body parts last to ensure optimum momentum passed onto ball at point of release
  - Follow through towards target to ensure safe dissipation of force and ensures no deceleration of final segment at point of release
- Balance
  - Ensure you have a large stable base to ensure all segments rotate around a stable base
- Force-Motion
  - Throwing and striking activities: greater contribution made to the horizontal component compared with vertical component as height of release > landing height. Will ensure maximum distance achieved
- Inertia
  - Used to describe amount of resistance to a change in an objects state of motion
  - Ball being thrown will continue in flight until gravity/other force (being caught) gets acted on
- Optimal Projection:
  - Demand of task is to maximise distance:
  - Maximise velocity: through biomechanical principles
  - Maximise height of release: without sacrificing velocity of release
  - Angle of release: with all other factors equal (ie. wind conditions) throw/strike at an angle of approx 40-43° to maximise distance due to height of release>landing height
- Force-Time (impulse):
  - Adopting side on throwing/batting position and extending arm/bat during preparation phase, it allows for maximum distance and time for summation of momentum, as force can be applied over maximum possible time
- Range of Motion (ROM):
  - Larger ROM at the shoulder joint ensures velocity of bat and ball can be developed over a larger distance resulting in greater transfer of momentum onto the ball

- Spin:
  - Application of back-Spin to ball, optimises ball time in flight (result of Magnus effect) and therefore maximises distance achieved

EXERCISE PHYSIOLOGY

Relationship between energy demands and nutritional requirements during physical activity:

- Phase of Activity
  - Pre Competition
  - During exercise
  - Recovery
- Nutritional considerations
  - Balanced diet
  - Fats
  - Glycemic index
  - Carbohydrates
  - Proteins
  - Fluid replacement

Balanced Diet:

- contains a healthy amount of macronutrients
  - Proteins, fats, carbs, essential minerals and vitamins and water
- By consumption of these minerals, it ensures the body:
  - Meets energy demands
  - Allows tissue growth and repair
  - Provides energy for metabolic function

Daily Energy Requirements:

- amount of energy consumed is dependant upon a number of factors
  - Age of individual
  - Sex of individual
  - Level of physical activity
  - Periods of growth
- To meet bodies energy demands, it's important we adjust diet accordingly
  - For normal males approx:
    - 55-60% carbohydrates
    - 25-30% fats
    - 10-15% protein
  -

- For athletes involved in heavy endurance training approx:
  - 70% carbohydrates
  - 15% fats
  - 15% proteins

Protein:

- functions
  - Growth of muscle tissue
  - Repair of muscle tissue
  - Production of red blood cells, hormones and antibodies
  - Contribution to ATP production when carbs and fats stores are depleted (extreme circumstances)
- Eg. Meat, fish, poultry, eggs

Fats/Lipids:

- represents body's most plentiful source of potential energy
  - 80kg male (15% body fat) = 12kg (12000g) fat
  - Energy yield - 38kj per g = 452000kj
- Fats (stored as triglycerides in muscle cells and broken down into Free Fatty Acids) = major energy source during rest (60%) and light to moderate exercise with little input during intense exercise
  - Body takes a long time to breakdown fats and body tends to not use them when energy demand is high
  - Trained athletes are more able to break down fats

Carbohydrates

- when ingested, they're converted to blood glucose leading to a rise in insulin
  - Excess blood glucose is converted to glycogen
- Energy yield: 17kj per g
  - Supplies energy during rest, low to moderate intensity activity and high intensity exercise

Carbs: Glycemic Index (GI)

- ranking of carbs based on their immediate effect in blood glucose levels
- Measured on scale of 1-100
  - Low GI foods: apple and peanuts
  - Moderate GI foods: corn, white pasta and sweet potatoes
  - High GI foods: honey and white bread

High GI foods:

- break down quickly during digestion - immediate effect on increasing blood glucose
- Best consumed during and immediately after physical activity
  - During exercise: rapid absorption and release of energy into blood stream
  - Immediately after: muscles most responsive to topping up fuel supplies

Low GI Foods:

- break down slowly during digestion - gradual release of glucose into blood stream
- Best consumed as part of pre-event meal and after event
  - Pre-event: slower release of glucose helps keep blood glucose levels topped up
  - After exercise: assists with repletion of muscle and live glycogen stores

Hydration Considerations:

- body loses water via breathing, sweating and urinating
- To ensure dehydration doesn't occur, recommended intake of water is 2L
  - Pre-exercise: 300-400ml just prior (prime stomach) and 600ml 3-4hrs before
  - During exercise: approx 200ml every 15 minutes
  - Post exercise: for every 1L lost, consume 1.5L

Pre-event meal:

- costume digestible foods - low in fat and fibre
- Increases glycogen levels leading to glycogen sparing
- Consume 1-4hrs prior and low GI foods

During the event meal:

- sport up to 60mins can be field from stored CHO and fats
- Events lasting longer than 60mins, CHO = important
  - Prevents low blood sugar
- Consume 30-60g of high GI CHO per hour

Recovery meal:

- immediately after exercise, muscles are most responsive to topping up glycogen stores

Environmental conditions and performance - participation in the heat:

- Body faced with challenge of maintaining core temp (37°C)
  - Conduction: heat exchanged by 2 objects in contact
    - Factors Affecting rate:
      - Difference in body temp between 2 surfaces (heat flows from hot to cold)
      - Surface area (increased surface area = increased heat loss)
      - Thermal conductivity of material (metal=good conductor of heat)
  - Convection: heat exchanged with a flowing fluid
    - Heat carried away from body by air or water currents

    - Layer of warm air which surrounds our body = continually displaced by cold air when air temperature is lower than skin temperature
        - Air flow = slow - heat loss is minimal
        - Air flow = fast - heat loss is increased
    - Accounts for 12% of heat loss
- Radiation: heat transferred from warmer body to cooler surroundings
    - When exposed to sunshine, people absorb radiant heat energy when surroundings are hotter than their core temp
    - Accounts for 60% heat loss
- Evaporation: cooling of the body as a result of vaporisation of sweat
    - Most effective in dry conditions
    - At rest: accounts for 25% heat loss, in hot conditions: 80% of heat loss
- Body's preferred mechanism is dependant upon 3 factors
    - 1. Environment
        - If ambient temperature is above the body's core temp, evaporation = only method of heat loss
        - Forced convection - heat loss via convection will only occur if windy
        - Humidity = 100% - no heat loss via evaporation
    - 2. Age
        - Children don't sweat as much as their sweat glands are not as developed as adults
    - 3. Physiological state
        - Rate of heat production
        - Hydration state

Dehydration

- occurs when the amount of water leaving the body is greater than the amount taken in
- Water is lost by:
    - 1. Breathing
    - 2. Sweating
    - 3. Urination

Rest and Exercise in the Heat

- at rest in the heat, heart rate and cardiac output increase
    - Allows blood to be sent to peripheries resulting in increased radiative heat loss to the environment
- When exercising in heat, the body is forced to deal with 2 forms of heat: <u>double heat load</u>
    - 1. Metabolic heat created by working muscles

- 2. Environmental heat in hot conditions
- As a result, it creates a competition for blood flow
  - 1. Muscles and vital organs require blood flow to sustain energy for metabolism
  - 2. Skin flood flow is required to transport heat to the environment to keep core temperature cool. This blood flow cannot deliver its oxygen to working muscles, impacting on performance

Cardiac Drift

- body delivers blood flow to the skin and away from the working muscles to increase heat loss via evaporation
  - Increase in sweat = decrease in blood plasma volume
- Cardiovascular drift is the result
  - Attempt to maintain cardiac output = HR increases
  - Increase in HR = smaller than decrease in SV -> cardiac output reduced
  - Skin blood flow decreased and oxygen sent to working muscles is decreased, placing extra strain on the body to maintain exercise levels
- Reduction in blood flow to working muscles = increase in lactic acid
- Reduction in blood flow to skin = decreased sweating, inhibiting body's ability to lose heat via evaporation -> leads to rise in core temperature and negatively affects performance

Trained Endurance Athlete

- impact of cardiac drift as a result of dehydration, on cardiac output

Performance State	Heart Rate (BPM)	Stroke Volume (ml)	Cardiac Output (L)
Rest	60BPM	100ml	6L
Sub maximal exercise, optimal hydration	150BPM	140ml	21L
Sub maximal exercise, dehydration	165BPM	115ml	19L (approx)

Humidity

- amount of water vapour that exists in the air
- More humid = limits the bodies ability to lose heat via evaporation
  - Increased fish of overheating

Exercising in Cold Weather

- shivering: involuntary contractions of muscles, mainly of the skin, in response to the chilling effect of low temperatures
  - Helps body increase heat production

Performance in Cold Weather

- shivering = early glycogen depletion
- Increased sub-maximal VO2 at given exercise intensity
- Fine motor skills deteriorate
  - Caused by reduced sensation in hands and feet (vasoconstriction)

Risk of Dehydration

- inhaled air = very cold and dry
  - Needs to warmed and humidified = lots of fluid lost to respiration
  - Reduced sensation to thirst -> reduced voluntary intake of fluids

Hypothermia

- occurs when body's temperature drops below 35°C
- Situations that can cause the body to lose more than it can generate include:
  - Prolonged exposure to cold, wintery conditions
  - Being in cold water for a length of time
  - Being out in windy weather in wet clothes

Altitude

- reduction in pressure of O2 entering lungs = reduced pressure difference = less O2 diffusing from alveoli to the blood
  - Reduced pressure different at altitude causes less O2 to be transported to tissues = reduced exercise performance

Altitude Training - Acute Adaptations

1. Increased pulmonary ventilation
   - 'absolute' amount of O2 available in air = reduced -> body will hyperventilate
2. Increased heart rate during rest and sub-maximal exercise
   - increased HR = attempt to increase amount of O2 getting to working muscles
3. Decreased plasma volume to increase concentration of haemoglobin

Chronic Adaptions

1. Increased haematocrit (% RBC - Increased RBC)
   - cause increased haemoglobin concentration as RBC contains haemoglobin
2. Increased mitochondria, aerobic enzymes, capillaries and myoglobin

Returning to Sea Level after altitude

- increase recovery between sessions = required following exercise bouts at altitude
- Extended tapering period in less up to major competition = required to enable athlete time to peak
- Training intensity = decreased given strenuous nature of conditions
- Strict fluid replacement regime as less humid conditions = greater risk of dehydration

How altitude affects performance

- endurance athletes = negatively affected
  - Less O2 uptake (hypoxia) and lower pulmonary diffusion = reduced ability of body to provide O2 to muscles via aerobic pathway
  - Low humidity at altitude -> greater dehydration risk

Legal and Illegal performance enhancement strategies

- athletes seek to gain advantage over opponents by manipulating or supplementing their diet to:
  - Enhance training adaptations
  - Improve performance
  - Improve recovery

Ergogenic Aids

- any practise of substance, legal or illegal used to improve performance: 5 categories
  - 1. Physiological aids: altitude training, acclimatisation
  - 2. Nutritional aids: CHO loading, caffeine
  - 3. Mechanical aids: improved biomechanical efficiency eg. Equipment
  - 4. Pharmacological aids: substances illegal when used to improve performance eg. Beta blockers
  - 5. Psychological aids: activities done to improve mental strength

Anabolic Steroids

- increase performers size and strength through facilitation of muscle development and improved rate of tissue repair
- Benefit in sports requiring strength and power as athletes are able to train harder and more frequently
- Possible side effects: acne, liver damage, depression, aggression, infertility

Stimulants (amphetamines, cocaine, pseudoephedrine)

- increases awareness, aggression and masks fatigue, improving anaerobic performance
- Possible side effects: anxiety, insomnia, dependence, restlessness

Caffeine

- advantages:
  - Acts as an analgesic reducing the perception of effort and therefore increasing the time to exhaustion in short distance events
  - Stimulates CNS -> increasing alertness, reaction times, and arousal levels
  - Creates glycogen soaring effect through the oxidation of free fatty acids
- Disadvantages
  - Potent diuretic

    - May cause an unnecessary loss of fluid pre-exercise, having a negative effect on athletes ability to regulate temperature
    - Irritability, insomnia, headaches, muscle twitching

Periodisation

- planning (well in advance) of training variables to achieve optimal performance at the most crucial times
    - Involves varying the volume and intensity of training

Annual Plan

- training program spread across the whole year
    - Ensures optimal performance at the right time

Macrocycles

- annual plan broken into 4 phases
    - Preparation, competition, evaluation and transition
    - These are then broken into macrocycles

Mesocycles

- form a macrocycle -> each mesocycle has specific goal
- Between 4-12 weeks long

Micro cycle

- 3-10 days long
- Make up mesocycle

Pre-season training

- 6-12 weeks
- General:
    - Training designed to improve aerobic base
        - High volume with low intensity
        - Continuous, interval and fartlek training
        - Flexibility
        - Fitness testing
- Specific:
    - Emphasis towards practising game specific skills and strategies
        - May need to be personalised
    - Reduced volume, increased intensity

In-season training

- focus at training moves to match specific intensities, durations and tactics
    - Principle of specificity = crucial
- Fitness maintained

- Recovery sessions = critical
- Contains peaking and tapering = critical to allow sufficient recovery
  - Training wave

Off-season training

- training volume and intensity significantly reduced -> allows for full physical and psychological recovery
- Aerobic fitness = maintained
- Monitor nutrition to ensure return to participation close to playing weight

Tapering

- decreasing volume of training whilst maintaining intensity or increasing intensity athlete does to all body recovery time
- Physically: long enough to allow repair to tissue damage
- Mentally: help athlete reach ideal performance state
- Usually done after block of hard training
  - Allows performer to be physically and mentally fresh and decreases chances of over-training and/or burnout

Recovery

- Physically: it is required to overcome the fatigue caused by physical activity, to repair body tissue eg. Muscle damaged during activity and to replenish energy stores
- Physiologically: it is needed to allow the athlete to enter the next contest or activity in an optimal mental state
- Recovery includes:
  - Nutritional recovery: where the body's energy stores are refuelled by consuming high carbohydrate foods and isotonic drinks. Protein is also consumed to promote muscle tissue repair
  - Physical recovery: aimed at regenerating the physiological capacities of the athlete. Including:
    - Hydrotherapy
    - Sport massage
    - Stretching
    - Hyperbaric oxygen therapy
    - Rest
- Psychological recovery: aimed at returning the athlete to an optimum mental state
  - Start immediately after the game with a debriefing which provides all players a chance to express their thoughts and feelings about the just completed performance

- Physical recovery strategies:
  - Cool down (active recovery): helps reduce muscle soreness and aid recovery
  - Replenishment of Glycogen Stores: dependant upon duration and intensity of exercise performed, the aim is to maximise replenishment in the first 1-2hrs following exercise with 1-2g/kg body mass when muscles are most responsive to storing glycogen
  - Replenishment fluids and electrolytes: consume approx 1.5L of fluid for every 1kg body mass lost
  - Rest: sleep routines very important- try and wake up at the same time each day, lie down only when you are sleepy
  - Hydrotherapy: includes movement in water or alternate use of hot/cold ice baths. Non weight beating activities effective in removal of waste products. Ice baths operate on principle of increasing blood flow by constructing and dilating blood vessels
  - Massage: aids recovery physically and physiologically. Should occur 1-2hrs after training or competition. Helps relax the muscles and helps clear away lactic acid by increasing blood flow

Maintenance

- the body cannot continuously be overloaded - it needs time to recover and is normally during the competition phase of the season that the maintenance phase takes place
- During pre-season, the body is constantly overloaded in an attempt to;
  - Develop an aerobic base
  - Increase strength
  - Increase speed/agility
  - Increase power
- During the season, it is important athletes maintain these fitness levels whilst increasing recovery to ensure they are physically fresh for games. Achieved by:
  - Reducing volume and increasing or maintaining intensity at training

Overtraining

- Occurs when an athlete has been repeatedly stressed by training to the point where the rest periods between sessions are no longer adequate for recovery to occur. As a result, training no longer leads to performance improvement
- Frequently occurs in athletes who are training for competition or a specific event and train beyond the bodies ability to recover in the time available. Imbalance between work and rest

- Common in young people who are training with several teams at once eg. School, club, district, state
- The signs and symptoms of overtraining vary from player to player. Some players who do not have overtraining syndrome can also display similar signs and symptoms which makes diagnosis difficult
- Common causes:
  - Workload too high
  - Lack of variety in sessions
  - Insufficient recovery from injury
  - Too many competitions requiring maximal efforts
  - Incorrect application of progressive overload
  - Insufficient recovery methods
- Preventing overtraining:
  - Well planned programme incorporating rest
  - Look for variations in players mood, behaviour and performance
  - Individualise training programmes
  - Variety in training sessions
  - Train at different venues
  - Keep well hydrated
  - Balanced diet

Injured Athletes

- modifications to the training program must be made to ensure the athlete prevents any further injury
- Critical that the athlete minimises the amount of detraining that occurs during the injury phase
  - Cross training = very effective means of resting injured body parts whilst still maintaining some level of physical activity and cardiovascular fitness
  - Athletes may participate in specialist activities which allow injured body parts to rest whilst still maintaining fitness in non-injured areas
- DRABC
  - Prevents secondary incidents from arising by controlling dangers
- STOP
  - Fast on field assessments to determine if there's an injury
- TOTAPS
  - Used to specifically assess the injury off the field
  - Outline basis for management plan

Peaking

- The characteristics of an athlete peaking include the following:
  - Injury free
  - Improved rate of recovery
  - Optimal cardiovascular, muscular and energy systems
  - Responds automatically to demands
  - Increased self-confidence
  - Ignores irrelevant cues
  - Mentally relaxed whilst still alert
  - Ideal technical efficiency
  - Tactically prepared
- Getting into the IPS requires an individualised approach and keeping a journal can help players get into this state more often if they record details such as;
  - When and where the game was played
  - How they felt before the game
  - What they were thinking before, during and after the game
  - Did they perform anything in particular that might have contributed towards getting into the IPS
  - How much sleep did they get before the game
  - Any other influencing factors
- Before an important event, athletes can refer back to their journals to see what factors may have contributed to their IPS and try and replicate these factors leading into the contest
- The performer should consider emotional (arousal), mental and physical characteristics of their IPS and record them
- A performer may see a particular trend developing which helps them get into the IPS and can try and replicate that for each performance. Getting into the IPS is easier to do when the task requires performance to be at an optimum level to achieve a challenging but attainable goal

MOTOR LEARNING AND COACHING

Transfer of Learning

- The effect that past experiences have on the learning of a new skill

1. Skill to Skill

- occurs when a skill developed in one sport has an influence on a skill in another sport. This influence can be positive (promotes learning) or negative (inhibits learning)
  - Proactive Transfer: previously learnt skill affects the skill currently being learnt eg. Player learning to throw a basketball would pick up the skill faster if he knew how to throw a cricket ball
  - Retroactive Transfer: learning a new skill affects a previously learned skill eg. A netballer with poor footwork spends time working on a "fast-feet" ladder and her footwork in netball improves.

2. Theory to Practise

- the Transfer of theoretical skills into practise
  - Coaches devise game plans, tactics and strategies for opposing teams and individual players
  - Can involve analysing their own strengths and weaknesses and those of their opposition before coming up with a plan, which in theory, will maximise their chances of success
  - Players devise theories/plans into the game situation
  - Can also include developing specific strategies to deal with various game specific scenarios

3. Training to Competition

- Refers to the transfer of skills developed in training into a competition situation
  - Coaches must plan and implement training sessions which replicate the demands of the game. This includes the development of appropriate skills, energy systems and the decision making process
  - Players should be exposed to game specific situations at training to allow them to develop their information processing and decision making mechanism. This increases the likelihood of players making the correct decisions when under game pressure

- Correct decision making is critical to successful performance and must be developed using game-like drills and simulations at training
- Specific practise can result in significant improvement in game performance

Effects of Transfer of Learning

Positive Transfer of Learning

- occurs when skills and/or informations gained from a previous learning experience helps with the learning of a new skill
- The two skills are often similar in some way eg. Free throw in basketball and netball goal shooting

Negative Transfer of Learning

- Occurs when the Learning from a previously learned skill negatively impacts on the learning of a new skill
- The skill can seemingly have a similar action but there are critical differences in technique eg. Squash and tennis are both racquet sports but with critical differences; squash involves wrist, tennis does not

Zero Transfer of Learning

- Occurs when the Learning of a new skill is not affected either positively or negatively by previously learned skills
- There is no transfer of Learning between golf and football as the skills are completely unrelated

Transfer of Learning and Improved Skill Execution

- Athletes who have been exposed to a wide variety of movement experiences from a variety of sports benefit by being better able to:
  - Recognise and select relevant cues from the environment
  - Process information received faster and more accurately
  - Have more responses available to select from
  - Better execute the selected response

Scope and Sequence

- Analyse movement skills of self and others to identify errors, provide feedback, and suggest corrections to improve performances

Movement Analysis

- how can athletes improve performance?
- How do you analyse human movement?
- What benefits can be gained from analysis of performance?
- What tools can be used to gather information about an athletes performance?
- How can videos and checklists be used to analyse performance?

Types of Movement Analysis

1. Laboratory Testing

- Performance is analysed in laboratory conditions so that various factors can be varied or manipulated
  - Computerised analysis can be used
  - Cameras can be very close for better observation

2. Field Testing

- An athletes performance is analysed at training in normal surroundings eg. The underwater observation of the "pull phase" in a swimming stroke can be observed during the course of a training session

3. Competition Phase

- An athletes performance is analysed while performing during competition

Two Methods of Movement Analysis

- Quantitative Analysis
- Qualitative Analysis

1. Quantitative Analysis: uses numbers- body skin folds, blood lactate levels, angle and speed of release, instantaneous velocity, acceleration rate etc

- Is OBJECTIVE (based on facts)

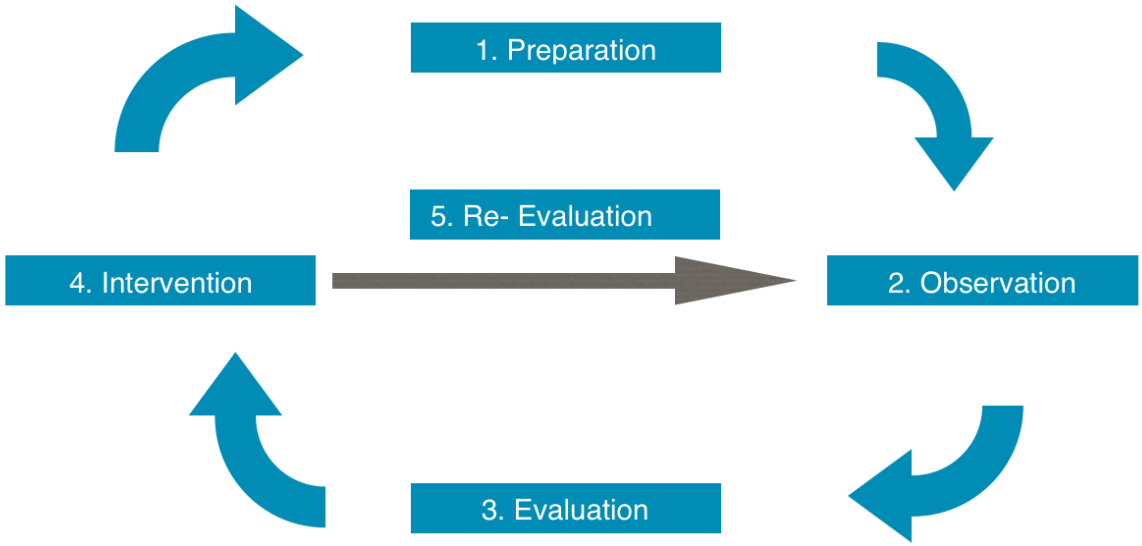
- Achieved using objective measurements
- Analysis using numbers eg.
  - Metres (distance)
  - Seconds (time)
  - Metres/second (Speed)

2. Qualitative Analysis: Refers to a description of the movement without using numbers. To work successfully, it needs to follow a systematic approach involving 5 stages: <u>Knudsen - Morrison Model of Skill Analysis</u>

- Is SUBJECTIVE (based on opinion)

- Achieved by observation and is subjective
- Good
- Short
- Poor
- Heavy

Knudsen - Morrison Model of Qualitative Analysis



1. Preparation Phase: Coach is concerned with the process of developing a prerequisite knowledge base about the particular skill

- The coach must know the points of technique required to produce the skill correctly .
- A checklist could be made up outlining key points of technique prior to analysis

1. Preparation to perform the skill
   - All movements that prepare the athlete for the performance of the skill
   - This includes backswing, run up, stance, grip, wind up
2. Execution of the Skill
   - Begins when preparation ends and finishes at contact / release of the ball
   - This includes initiation of sequential actions of the downswing, application of force to the ball
3. Follow through
   - Refers to all movements after the execution phase

2. Observation Phase: involves the systematic gathering information about the performance of movement

- Decide on best way to observe and gather information about the skill
  - What is the best angle/method to observe the skill - front on, side on or from behind?
  - Direct observation or video?
  - Observe/record several trials to get more accurate results
  - How close to the subject are you going to be - influenced by what you are looking for eg. Court movement vs Technique

3. Evaluation phase: Identity the strengths and weaknesses of the performer. Identify methods which can be used to improve the performance

- List the weaknesses in order of priority for correction - which ones need immediate attention and which ones are less critical - which ones affect performance and which ones don't
- Large changes to technique need a longer time to rectify and may be done during the off season
- Technical flaws which do not impact on performance may not always be addressed
- Coach needs to be aware of the "cause - effect relationship" when evaluating performance
  - A golf drive has been sliced. The cause of this slice needs to be identified so it can be rectified. Coach would analyse;
    - Club head path
    - Angle of the club head at impact
    - Hand/wrist movement

4. Intervention: Involves providing feedback and corrections to the performer, usually under practise conditions, to improve performance

- Key functions of feedback provided are to;
  1. To motivate the performer
     - A coach can provide feedback which motivates the performer to continue to strive for improvement or to re-assure the performer that progress is happening
     - Motivational feedback must be realistic
  2. To change performance
     - Feedback given to the performer aimed at changing the current level of performance
     - It is information provided to the performer on what needs to be changed for future attempts
     - Positive feedback should be included in the feedback as should some words of encouragement
  3. To reinforce Learning
     - Feedback can be used to reinforce learning or performance which increases the chances of the behaviour being repeated
- During this phase, the coach provides the performer with <u>visual, verbal and proprioceptive cues and strategies</u> to improve the identified problem areas
  - Visual Cues
    - Coach demonstrates the correct technique

- May involve showing performer what he is doing and then what he should be doing
- Coach emphasises 3-4 key points of technique for player to concentrate on
- May involve video feedback

- Verbal cues
  - Single words or shore phrase to focus the performer on a particular aspect of the skill
  - Coach provides verbal cues that performer can use to improve
  - "Gooseneck" for goal shooting in basketball/netball
  - "Low and slow" for golf putting
  - Too much information can confuse performer and result in decreased performance
- Proprioceptive cues
  - Coach physically moves the performer through the desired movement patterns to make them aware of how the movement should feel eg. Coach rotates the performers shoulders to the desired position

5. Re-evaluation

- Observe the performer implement the changes made in a similar context to initial observation
- Did they make a difference or is further intervention needed

Scope and Sequence

- Design coaching/training activities to improve performance in selected skills including shaping, chaining, static-dynamic, simple-complex

Types of Practise

- A coach can use several methods / strategies to teach and improve the skills of the performers
  - Simple and Complex
  - Shaping and Chaining
  - Static and Dynamic
- Most coaches will use training methods somewhere between the two ends of each continuum

The Basic Coaching Process

- The basic process of teaching/coaching a skill is a 4 step process

1. <u>Introduce the skill to be learned</u>
   - Get athletes attention
   - Make sure they can all see and hear
   - Explain name of skill and how/when it is used

2. Demonstrate and explain the skill
   - Demonstrate the skill to the athletes
   - Point out 2 or 3 key points of technique required for successful performance
   - Check the group understands what is required by asking questions of them
3. Practise the skill
   - Begin practice the skill as soon as possible after the demonstration
   - Practice should be fun and motivating
   - Needs to be appropriate to skill level of the group
4. Correct errors/provide feedback
   - Learners are provided with feedback about their performance
   - Learners practice some more and try to incorporate the feedback received

Types of Skill

1. Simple Skills
2. Complex Skills

Simple skills:

- Are straightforward
- Typically require little practise to learn
- Require little cognitive ability
- Consist of a limited number of component part
- Limited decision making required
- Taught as a whole

Complex skills:

- Are more difficult to learn
- Require repeated practise to learn
- Require more cognitive ability
- Consists of many component parts
- More decision making required
- May need to be broken down to be taught

Teaching Simple Skills

- Simple skills are learnt quickly and easily
- Can be taught in two ways

1. Limitation method
   - Coach demonstrates, learner copies
   - Minor adjustments made as needed
   - Learning made via observation

2. Demonstration/explanation/practise/correction method
   - Coach demonstrates and explains the skill
   - Learner practices
   - Feedback and correction is provided
   - More practice follows
   - More feedback and correction ect

Teaching Complex Skills

- Complex skills are more difficult to learn and may need to be broken down and being learnt
- Taught by either "chaining" or "shaping"

1. Shaping

- Learning a simplified or incomplete version of the skill
- Coach demonstrates the skill
- Performer practices simplified version
- Feedback/correction provided
- Add "missing" components
- Further practise - increase speed/accuracy
- Add "missing components"
- Use skill in game-like situations
  - Eg. Basketball Lay Up
    - 1 step lay up
    - 2 step lay up
    - Dribble to lay up
    - Run at basket, receive pass and lay up
    - Run at basket, receive pass, step defender, lay up

2. Chaining

- Break the skill down into component parts
- Start by teaching the first part - practice until perfect
- Add next part - practice until perfect
- Add next part
- Add next part etc
- No progression until previous part is perfect
  - Eg. Cricket
    - Grip, stance, backswing, forward swing, contact, follow through

Using Static and Dynamic drills to Develop Skills

- Coaches develop skills by using static and Dynamic drills

Static Drills:

- Performer practices skill while in stationary position
- Can concentrate on technique without attending to other factors
- Limited decision making
- Predictable (closed) environment
- Beneficial when learning a new skill
- Eg. Water polo players passing the ball forward and backwards to each other

Dynamic Drills

- Performer is moving
- Environment becomes less predictable (open)
- Increased decision making required
- Drills become more game related and more difficult
- Used to extend skill development
- Eg. Water polo players passing the ball in a game specific environment

Scope and Sequence

- Evaluate the use of different leadership styles to suit audience needs

The Authoritarian Coach

- Tends to make all the decisions
- Very strict style of coaching
- Coach believes he has the knowledge and experience to impact on the players
- Role of the players is to attend to, and respond to, coaches commands
- Less confident players are intimidated
- Effective when team is winning
- Less effective if team is losing

Characteristics:

- Intense energy
- Well organised
- Demands attention to detail by the players
- Punish those who make mistakes
- Winning is the only goal
- Confrontational when challenged

The Democratic Coach (co-operative coach)

- Maintains open communication with players
- Players involved in decision making

- Players feel they have a degree of ownership of the team
- Positive and negative feedback used to re-enforce and promote learning
- Very good for inexperienced players
- Enjoyment is important
- Liked by players
- May not provide enough motivation for some performers

Characteristics:

- Tends to be very flexible
- Strives to create an atmosphere of mutual respect
- Concerned for the welfare of the players

The Casual Coach

- Relaxed and easy going who establishes an informal learning environment
- No pressure on the players to perform
- Tends to be less organised and prepared
- Works best with experienced players who can make their own decisions
- Offers guidance and advice when asked
- Limited improvement
- Inexperienced players unsure of what to do
- Serious players often find this coaching style unsatisfactory

Characteristics:

- Provide little instructions and minimal guidance in organising activities
- Creates relaxed atmosphere, there's lack of general direction
- Coach exerts little influence on the players

Combined Coaching Styles

- Coaches can change their coaching styles depending on the needs of the team, the situation they are facing and the stage of the season
- Coaches can mix their coaching styles to suit the time of season or when dealing with different players

Casual:

- Coaching style can be used briefly in the PRE-SEASON to see who "steps up" and which players show leadership traits. Also used in the OFF-SEASON

Autocratic:

- Coaching style can be used in the PRE-SEASON phase as the coach establishes his authority and control over the group

Democratic:

- Style can be used during the IN-SEASON and FINALS as it incorporates the team in decision making but the coach has the final say

General Trends in Leadership

- Relationship between leadership styles and positive outcomes shows;

1. Males tend to prefer more autocratic decision making process
2. Athletes involved in individual sports tend to prefer a more democratic leadership style
3. Coaches who's main aim it to win, particularly at a higher level, tend to be authoritarian in their approach
4. Coaches whose focus is fun and enjoyment tend to adopt a more casual approach
5. Coaches who want to help athletes develop their potential and at the same time enjoy themselves, tend to be democratic
6. Players from certain cultural backgrounds expect an autocratic approach
7. Players from some other cultural backgrounds expect a democratic approach
8. Females prefer more democratic processes than males

Scope and Sequence

- Explain the process of using tools such as checklists and video to analyse and reflect on self and others' performance in physical activity e.g.. Strengths and weaknesses, mental vs physical performance, error correction

Analysing Technique Using Checklists and Video

Checklists:

- Can be used to determine the technical and tactical ability of performers
- Is made up of identifying the key criteria for successful performance. The athlete performs the skill and information about the performance is recorded on the checklist
- Player and coach use the information gathered to improve performance

Checklist for golfers stance/setup:

CRITERIA FOR CORRECT STANCE	CRITERIA MET?	COMMENT
Feet shoulder width apart		
Front foot rotated towards target		
Knee bend		
Straight back		
Weight on balls of feet		

- Coach observes the golfer in the stance/setup position and completes checklist
- Feedback is provided to the golfer outlining positives and negatives

Video Analysis:

- Can slow movement down to 500 frames per second for more accurate analysis. A performer can observe his performance broken down into fractions of a second allowing him to observe strengths and weaknesses of his performance
- Many athletes respond better to visual feedback than verbal. A combination of both is ideal. Coaches use visual feedback to support their verbal feedback
- Viewing performance in slow motion or freeze frame allows the performer to observe when and where errors occur and make changes as required

Providing Feedback from Video and Checklists:

- Coaches and athletes use information gained from the checklists and video analysis to recognise areas which require improvement and to recognise areas of strength
- Improved technology has made it possible to provide more accurate feedback by using split screens and overlying to allow performers to compare themselves with elite athletes
- Video footage of the performer can be 'paused' for closer analysis
- Coaches should try and recognise more positives than negatives to encourage and motivate the performer while at the same time recognising there are areas for potential improvement
- Coach develops training drills to address areas of deficiency
- Checklists and video analysis can be kept and be reflected back on to determine if there is change in performance over time

Using Checklists and Video to Analyse Physical Versus Mental Performance

- many athletes can perform very well at training or in situations where there is little pressure and making mistakes does not have consequences
- Under match pressure, the same players make unforced errors, cannot execute their skills with the same degree of proficiency and make decisional errors
- Coach can devise checklists to determine the mental strength of the athlete to identify the circumstances with negatively affect the mental state of the athlete and the conditions under which the athlete performs optimally
- It is important for a player and coach to be able to determine if a change in the level of performance is a result of physical or physiological factors
- Coaches need to be aware of weaknesses and the circumstances under which these weaknesses come apparent
  - Does the player make unforced errors due to scoreboard pressure
  - Does the player make unforced decisional errors when the game is close
  - Is the player distracted by external factors

- Coaches need to implement a psychological skills training program to overcome the identified problems

Using Checklists and Video for Error Correction

- Players and coaches should keep a record of all checklists and videos so as to monitor improvement over time. The checklists and videos are a reference point for a player to compare changes in technique
- By comparing past performance with current performance, an athlete is able to determine if there has been an improvement in the areas previously identified as being in need of correction or if further remedial work is needed
- Overlaying/split screen with an elite level performer can also highlight areas to be corrected

Scope and Sequence

- Analyse learning and skill development in relation to correction and improvement of self and others e.g.. use of video analysis, reflective journals, peer/mentor/coach feedback, questionnaires

Increasing Performance Levels and Reflective Learning

- Increasing the optimal performance level of an athlete requires the athlete or coach to;
  - Gather information about each performance
  - Identify strengths and weakness of that performance
  - Determine what factors limited the performance
- Once this analysis has been done, the athlete and coach determine what actions need to be taken to improve future performances. The intention is to guide the athlete from their current level of performance to their ideal level of performance
- This method of self-analysis and planning for improvement is called **reflective learning**
- A reflective learner recognises the importance of looking back on past experiences to improve future performances
- Reflective learning is a 4 stage process:
  - 1. Reflection
  - 2. Recognition of things that need to be improved
  - 3. Planning for future improvement
  - 4. Action
- The reflective learner solves problems through self-evaluation and reflection. Reflective learning is only meaningful when the athlete can use it to make a change

Stage 1- Reflection

There are 4 methods used to reflect:

1. Reflective journals

- used to record feelings, emotions
- Keeps a record of successes, failures and suggestions, for improvement
- Records what has been achieved and possibilities for the future
- Are reviewed from time to time

2. Mentoring

- A significant other in the life of the athlete, the mentor assists by providing critical and constructive feedback to help the performer continue to improve. The mentor must be supportive of the athlete at all times throughout the process e.g. senior players mentor junior players

3. Video Analysis

- Allows the performer and coach to watch a re-play of the performance
- Can be paused/played frame by frame/slowed down to allow closer analysis of technique
- Allows athlete to compare current performance with past performance
- Video analysis also allows a performer to compare his performance against an elite athlete

4. Questionnaires

- Questionnaires are given to players to gather information about individual players, the leadership group, potential leaders and the coaching staff
- Feedback from the questionnaires can then be used to make changes if required and to guide the development of the team, the individual players and its leaders

Stage 2 - Recognition of Things to Improve

- As a result of self-reflection on a performance, an athlete can determine what aspects of the performance could have been done better, or could be improved to enhance future performances
- Gathering data about performances, and then recognising things to improve, has become more accurate with the latest technology
- Tennis players can use information gained from statistics and technology about the placement of their serves and statistics about the effectiveness of their serve

Stage 3 - Planning for Improvement

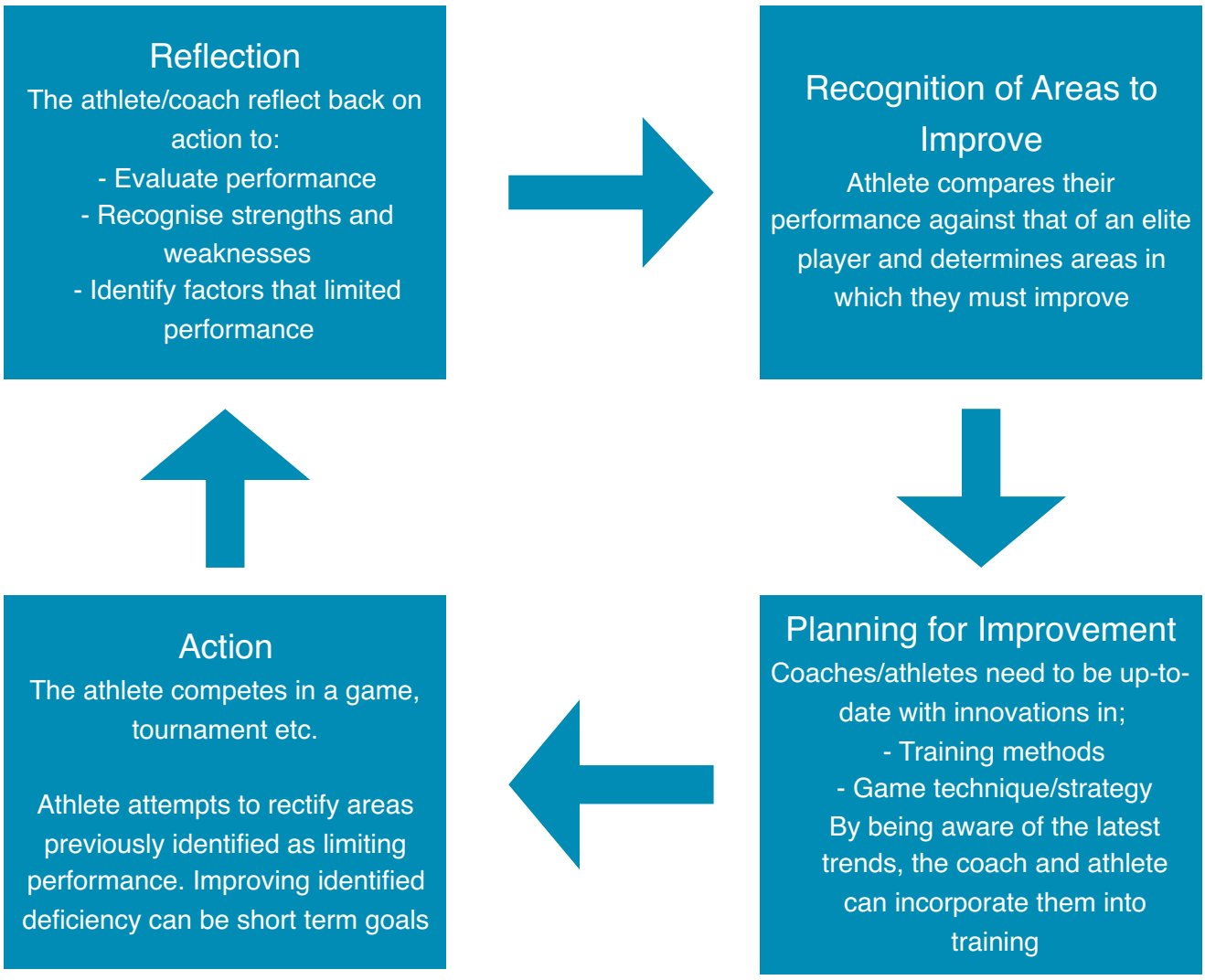
- Most sports are constantly evolving with changes in strategies, tactics, techniques and training methods

- It is important that players and coaches are aware of, and can implement, the latest advancements in their sport. If they do not, they will not perform at their optimal level as they will be using outdated methods
- Players and coaches can improve their knowledge of current trends and changes in two ways;
  - Formally- by attending coaching courses conducted by governing bodies e.g.. WACA run level 0-2 coaching courses as do most governing bodies
  - Informally- through meeting and speaking with other coaches, players at workshops, after games, observation of other coaches and players in action
- Newly acquired knowledge should be applied when planning for future improvement

Stage 4 - Action

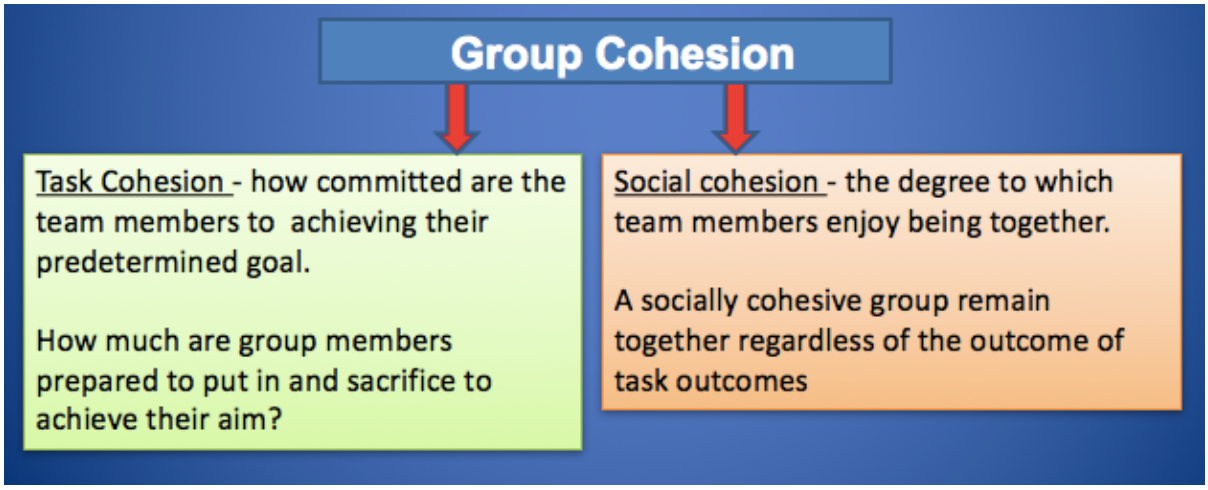
- Action is the product of the reflective process
- Having identified weaknesses, the athlete sets, short term goals to address the areas identified as needing attention. Achieving these short term goals will motivate the athlete and ultimately assist in achieving long term goals

Reflective Learning Flow Chart

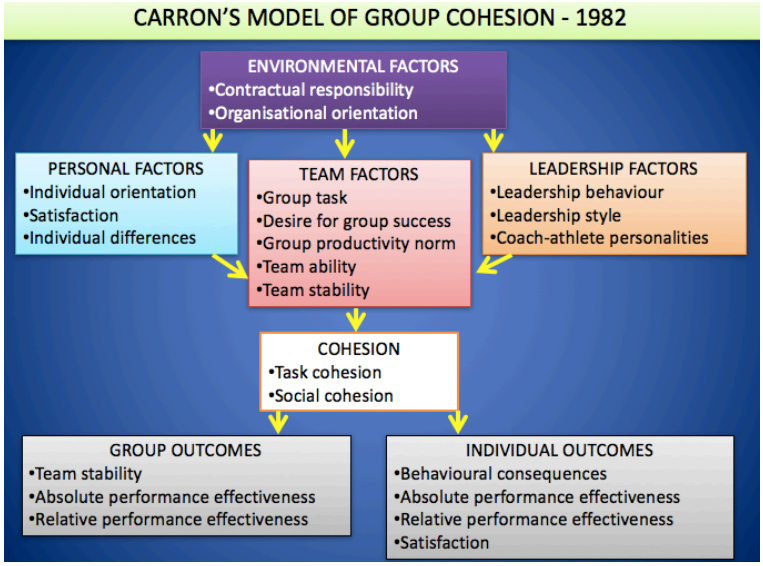


Group Cohesion

- The extent to which a group stays together and united in the pursuit of the common goals and objectives
- Has two components- Task and Social cohesion;



Factors Affecting Cohesion



- Albert Carron (1982) developed a model which describes the 4 key factors that affect team cohesion (P.E.L.T)
  1. Personal Factors
  2. Environmental Factors
  3. Leadership Factors
  4. Team Factors

1. **Environmental Factors**

- These are the normative forces which hold a group together;
  - Contracts
  - Age
  - Geographical limitations
  - Group size

2. **Personal Factors**

- Refer to the individual characteristics of group members, such as participation motives
- Players participate for three main reasons;
  - Task Motivation: associated with task cohesion and being involved in a successful team
  - Affiliation Motivation: associated with social cohesion and a desire to be a part of a group
  - Self-motivation: attempt to obtain personal satisfaction through improving personal performance

3. **Leadership Factors**

- Good leadership is a key factor in developing a cohesive team
- The most appropriate style of leadership is used - autocratic, democratic, casual/laissez faire.
- Good leaders will set;
  - Team goals
  - Individual roles
  - Team rules
  - Standard of
- Compatibility between the players and the leaders is essential in developing team cohesion

4. **Team Factors**

These factors include;

- Team stability
- Prior successes and failures
- Team goals
- Type of sport - team/individual

Demands of the task also impact on interaction and cohesiveness- 3 levels of communication/interaction;

- Co-acting activities
  - Little or no communication between players and result is determined by tallying individual scores e.g. team surfing, Darts
- Interacting activities
  - High level of interaction and communication between team members if the team is to achieve it's goal e.g. Netball, AFL
- Mixed Activities
  - Combination of co-acting and interacting activities e.g. Cricket

Cohesion and Performance

- More cohesion within a team contributes towards higher level of enjoyment and satisfaction and an increased likelihood of the team staying together

Other factors Impacting on Cohesion

- Group size
  - there is an optimal group size for each specific sport and if the group becomes too big, cohesiveness can decrease and social loafing can occur
- Leadership
  - Strong leadership improves cohesion whereas weak leadership decreases it
- Goals
  - Clearly defined goals improve cohesion as all member of the group work towards common goals

Developing Task Cohesion

- Task Cohesion can be developed by;
  - Communicating clearly and regularly so all members understand their roles and responsibilities
  - Clear and understood expectations
  - Making clear what each individual must do in order for the team to achieve its goals
  - Challenging but realistic goals are set for the team as a whole
  - Fairness and consistency in dealing with the player group
  - Prioritising team goals over individual goals

Developing Social Cohesion

- Social cohesion can be developed by;
  - Encouraging social interaction away from the sport
  - Maintain open and honest communication
  - Resolve conflicts quickly
  - Establish team standards of presentation

Barriers to Group Cohesion

- Personality clashes
- Frequent changes to the group
- Lack of communication
- Power struggle between players

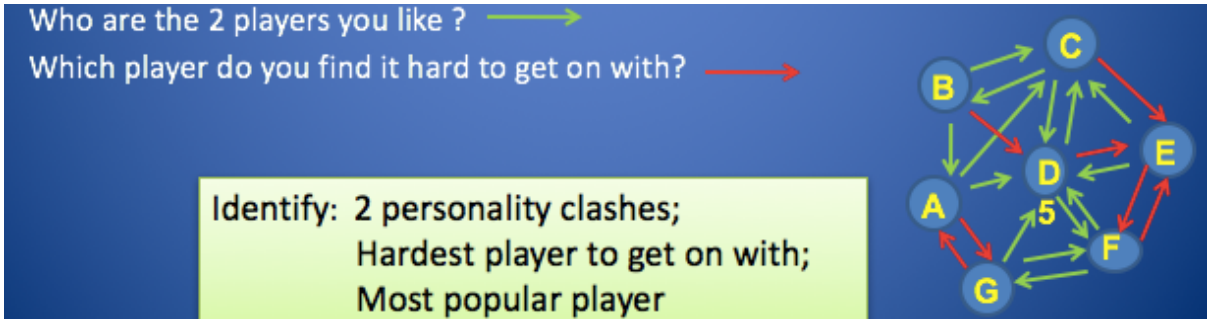
Benefits of Cohesion

- Communication and motivation within the group is extensive
- Players work together to achieve team goals ahead go personal goals
- Players enjoy each others success
- A group that has a high level of group cohesiveness is much more successful in achieving their goal

Measuring Cohesiveness in Sporting Teams

Measured in three ways;

- Sociograms
  - Players describe their interpersonal relationships within the group - who they like, who they don't like and a sociogram is developed from the responses. Coach then uses this information to try and improve the cohesiveness within the team



- Questionnaires
  - 'Group Environment Questionnaire" (GEQ) recognises that group cohesion is multi-dimensional. It requires 18 responses covering 4 dimensions of cohesion. The dimensions are;
    - Group integration- Task: Perception of the group regarding degree of task orientation
    - Group integration- Social: Perceptions of the group on what needs to be done socially
    - Individual attractions in the group- Task: Individual perception of group task orientation
    - Individual attraction in the group- Social: Individual perception of the group as a social unit

- Observation
  - Coach can use a checklist to observe how players relate to each other, who they mix with, who they avoid, who they interact with.

Social Loafing (Ringelman Effect)

- Tendency of individuals to lessen their effort when they are part of a group - larger the group = greater the chance of social loafing
- Why does it occur?
  - Individual perceives other athletes to be working at a lower intensity which gives them an excuse to put in less effort
  - Belief that their efforts won't make a difference to the team and little if any effect on the outcome and the desired outcome will still be reached
  - Avoiding hard work and assuming no one will notice in a large group - easier to hide in the pack

Impact of Social Loafing on Individual and Team Performance

- Individual athletes are prone to social loafing if they feel that the team can still perform well without a maximum contribution from them
- Social loafing by some athletes in teams high in self-confidence. The individual athlete perceives the team will win even without every player performing at their best and consequently puts in less effort
- In both cases, individual and team performance is below optimum
- Effort towards the team performance increases where each player's input is identifiable and consequently individual and team performance improves
- Social loafing = negative impact on individual and team performance

How can Social Loafing be Minimised

1. Write a team contract which states group expectations, individual responsibilities, forms of communication and methods of discipline
2. Develop rules of conduct on expected behaviour. This will help the team achieve goals and objectives
3. Create appropriate group sizes as assigning too many members to an easy task encourages loafing
4. Evaluate all members of a group individually as members will be more productive if they know that their individual contribution will be evaluated

Using Mental Skills to Improve Performance

What mental skills are we trying to maximise?

- Motivation
- Self-confidence

- Concentration
- Arousal Regulation
- Stress and Tension Management

What methods do we use to control/manage/improve mental skills?

- Imagery
- Relaxation
- Self-talk
- Performance Routines
- Goal Setting

Methods of Improving Mental Skills (GRIPS)

1. Goal Setting
2. Relaxation
3. Imagery
4. Performance Routines
5. Self-Talk

- An athlete can use one or more of these methods to improve their mental skills which will result in improved performance.
- These methods can be used at different times; Before, During and After performance

1. Imagery

- Recreating of the performance, in the mind, of a skill or group of skills, a previous positive experience or the picture of new events to prepare an individual mentally for performance

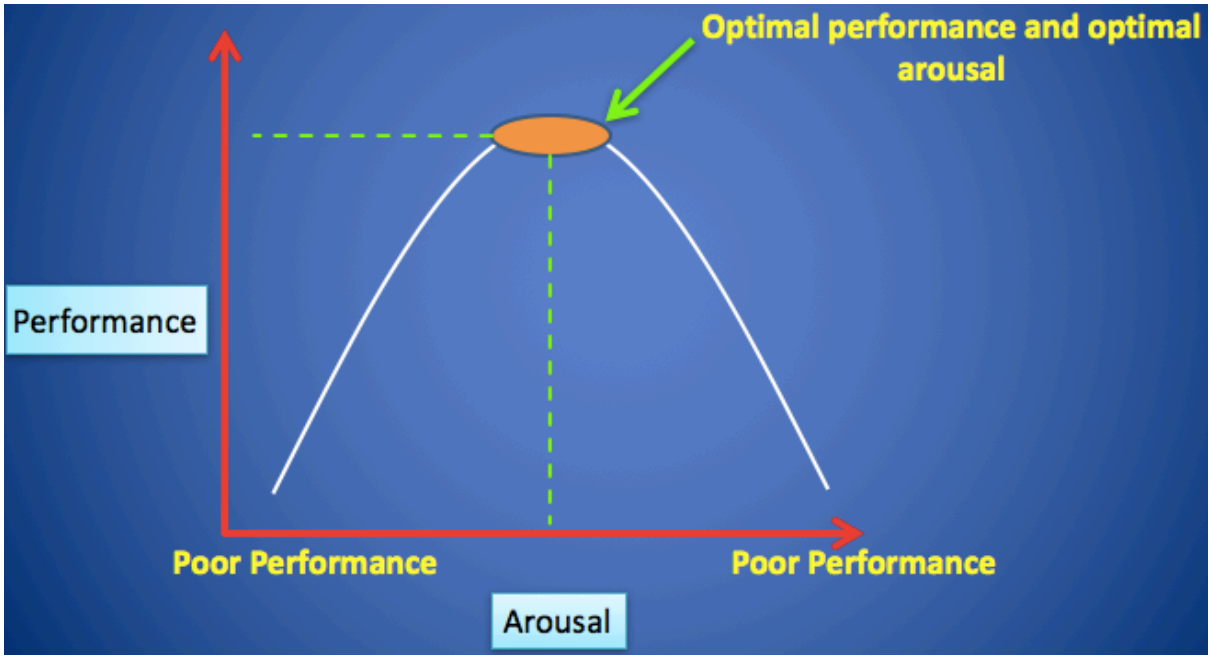
<u>Use of Imagery</u>

- Most commonly used before and during performance

<u>Imagery and Arousal</u>

- Under or over arousal results in performance not being at optimum level as these mental states can result in missing or imagining important cues in the environment and not focusing on the task at hand
- Over arousal=negatively impact on the production of physical skills
- Arousal can be increased by creating an image of an aggressive performance and decreased by creating a more relaxed image in the mind of an athlete

"Inverted U Hypothesis" shows the linear relationship between arousal and performance.



Imagery and Stress

- Stress can have a positive or negative impact on performance
- Stress on highly skilled athletes can result in an improvement in performance particularly if the athlete perceives the required performance to be a challenge they are capable of meeting
- Stress on a less skilled athlete, particularly an athlete who feels threatened by the demands of the task (perceives that they are not capable of doing what is required) will result in a decline in performance
- An athlete can use imagery to reduce stress by creating a mental picture of themselves performing the skill perfectly, in its entirety, with the desired outcome

Imagery and Motivation

- Imagery can be used to motivate an athlete to strive for ongoing improvement

Imagery and Concentration

- Athletes use imagery to focus on a particular skill, aspect of a skill or a specific game scenario
- A player involved in a set play may mentally rehearse the play concentrating on their role in the successful execution of the move

Imagery and Self-Confidence

- Athlete can increase their self-confidence by creating a mental picture of themselves preforming the skill perfectly and achieving the desired outcome

2. Relaxation

- High levels of stress and tension have a negative impact on a performer.
- An athlete uses personal relaxation techniques to minimise the stress and tension which will result in improved performance

Use of Relaxation

- Relaxation techniques are commonly used before, during and after a performance
- Some methods include meditation, progressive muscle relaxation, flotation tanks, music, breathing techniques and autogenic training

Relaxation and Arousal

- Over aroused=performance not at optimal level as athlete can experience difficulty shifting their attentional focus and miss important cues in the environment

Relaxation and Stress

- Stress can improve an athletes performance if the athlete perceives she has the ability to meet the demand of the situation and is challenged by the task
- If the athlete feels the demands of the situation are beyond her capabilities, her performance will drop as she feels threatened by the task
- Relaxation techniques can be used prior to the event so they commence the contest in an optimal mental state
- During performance, imagery and controlled breathing to control stress levels
- Post-performance, relaxation techniques can help the athlete recover from the demands of the contest

Relaxation and Motivation

- Highly motivated athletes can experience a decline in performance often associated with trying too hard to achieve their optimal performance
- Over motivated athletes can use relaxation techniques to try and control their thoughts and focus on their performance, rather than thinking about what the possible outcome of their performance might bring

Relaxation and Concentration

- Sport related concentration revolves around three main aspects;
  1. Selective attention
  2. Maintaining attention
  3. Situational awareness
- An athlete who loses attention or focuses their attention on the wrong cues will underperform

- High level performers have the ability to shift concentration quickly from a broad to narrow focus. Over aroused performers have a narrow focus and this limits their ability to concentrate on all the relevant cues in the environment
- Using relaxation techniques help the performer maintain concentration on all relevant cues thereby improving performance

Relaxation and Self-Confidence

- Optimal performance relies on an athlete being physically and mentally at their peak- in "the zone"
- Athletes who are mentally fresh have an increased self-confidence in their ability to perform at their optimal level

3. Self-Talk

- Involves talking to or thinking to yourself prior to or during performance.
  - Positive self-talk: Motivational to enhance self-esteem, motivation, attentional focus and performance
  - Negative self-talk: Self-critical or demeaning that creates anxiety and self-doubt and has a negative impact on performance
- Can be used before, during and after performance

Self-talk and Arousal

- Can be used to increase or decrease arousal levels
- By using motivational phrases or terms, a performer can increase arousal levels
- By using terms such as "relax" can help reduce arousal levels

Self-talk and Stress

- Can be used to reduce stress during performance
- When in stressful situation, terms such as "i've done this before and I can do it again"
- Athletes can use terms such as "relax" to reduce the effect that stress can have on performance

Self-talk and Motivation

- Players are experiencing low motivation will have a decline in their performance levels as the intensity and effort they put into training and games decreases
- Self-talk can be used to increase their motivation and performance

Self-talk and Concentration

- Key terms can be used to help maintain concentration or to change level of concentration

Self-talk and Self-confidence

- Positive self-talk increases self-confidence and the likelihood of success
- Negative self-talk decreases self-confidence and the likelihood of success

4. Goal Setting

- Process of deciding on something you want to achieve, planning the steps to follow that will help reach the goal, and then working towards achieving the goal.
- Can be used before, during and after a performance
- Goal setting process: SCAMP
  - Specific
  - Measurable
  - Action-orientated
  - Realistic
  - Time phased
  - Effective
  - Reviewed

<u>Goal Setting and Arousal</u>

- Performance goals can be set to assist athletes perform at optimum level
- Can increase and then help maintain an optimal level of arousal resulting in improved performance
- Having a realistic goal to strive for increases the arousal and performance levels of the athlete

<u>Goal Setting and Motivation</u>

- Goal setting has a significant impact on the motivation of the performer
- If goals are too easily achieved or unrealistic, motivation will decrease resulting in a less than optimal performance .
- Properly set goals will increase the motivation of the performer resulting in improved performance. As the athlete achieves short term goals, self-confidence and motivation increase and the athlete will continue to strive to achieve the long term goal

<u>Goal Setting and Concentration</u>

- Setting goals enables performer to concentrate on a particular aspect of their performance

<u>Goal Setting and Stress</u>

- Realistic but challenging goals can promote stress in a positive manner
- If performer has realistic goals that are achievable within a specific time frame, a degree of street is placed on them to achieve these goals. If she starts falling behind herself - determined time frame, her stress levels will increase but because she views achieving her goal as a challenge, this will result in an increased effort on her part to reach her set goals

Goal Setting and Self-Confidence

- Can have a positive or negative influence on self-confidence
- Realistic but challenging goals will increase the athletes self-confidence as the goals are achieved
- Unrealistic goals which cannot be achieved result in decreased levels of self-confidence as the athlete experiences failure when trying to reach them. Repeated failure has a negative impact on self-confidence

5. Performance Routines

- Ritual a performer follows in the preparation for or during the execution of a task or skill
- Assist with focus, concentration and arousal level of the performer.
- Can be used before, during and after performance

Performance Routines and Arousal

- Athletes perform at their best when arousal levels are optimal whereas over aroused and under aroused athletes perform below optimal levels
- Can be used to increase or decrease arousal levels
- Some players increase arousal levels before a game by following a set routine
- Performance routines can be used to decrease arousal levels.

Performance Routines and Stress

- Stress levels are at their highest at critical points during a game and can affect the performer both physically and mentally
- Performance routines can be used to focus on the task at hand instead of worrying about the possible outcomes of their actions

Performance Routines and Motivation

- Intrinsic motivation and desire to perform well can be heightened by their game day routine
- As part of the game day routine is completed, intrinsic motivation and excitement increases as game time gets closer

Performance Routines and Concentration

- Can help the athlete to focus on relevant cues in the environment and ignore irrelevant cues which would detract from performance
- Routine allows the player to control their emotions, gather their thoughts and focus all their attention on performing the task required of them

Performance Routines and Self-Confidence

- self-confident athlete=more likely to perform at an optimal level than an athlete who has self doubt
- Leading into a game, an athlete can have a routine which can include using imagery to increase self-confidence. An athlete who creates a mental image of themselves performing the skills with a successful outcome will have an increase in their self-confidence
- Can be used prior to and during the game to increase self-confidence and to focus attention.

Using Mental Skills to Improve Performance

Application of Imagery

- Performer would use imagery prior to performing to;
  - Picture the perfect take off. He would use as many sense as he can - "hear" the snow under the skis, "feel" the wind in his face, "see the take-off ramp.

Application of Relaxation Techniques

- Prior to performing, the performer could;
  - Mediate
  - Progressive muscle relaxation
- Between jumps, he could use the same techniques to relax his mind and body. By being in a relaxed state, the performer is more likely to produce his optimal performance than if tense or over aroused

Application of Self-Talk

- Prior to the jump, the athlete would use positive self-talk to boost her confidence
- Approaching the jump in a positive frame of mind will improve performance

Application of Goal Setting

- 6 months before the competition, her goal may have been to qualify for the competition
- Immediately prior to the competition, her goal may have been to make the final round and achieve her personal best score
- Going into the final 3 jumps, her goal may have been to score a certain number of points from these jumps
- After the competition, she could set goals based on the outcome of her performance

Application of Performance Routines

- Prior to performing, performer could have a pre-determined routine to help focus on the upcoming task. Could include;
  - Putting on gloves in a certain order
  - Adjusting face goggles and helmet