

## Skill Acquisition

**Analyse the processes of learning/ developing a new or existing skill (AO3)**

To answer the big question you will need to be able to complete the following tasks:

1. Explain the information processing model (AO2)

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2. Describe how skill is classified (AO2)

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3. Analyse the processes of learning when developing a new or existing skill (AO3)

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## 1. Skill, ability and application to practical activity

### Question

Describe how skill is classified. (AO2)

Analyse the processes of learning when developing a new or existing skill. (AO3)

### A. Content

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- The definitions including: Skill, Ability; gross motor and psychomotor.
- The characteristics of skilled performance including; techniques, attitudes, aesthetics, accuracy.
- Skill continuums including: pacing, difficulty, organisation, continuity, muscular involvement and environmental influence.
- Stages of learning (Fitts and Posner): cognitive, associative and autonomous.
- Learning/performance curves: positive, negative, linear and plateau.
- Different learning curves and the possible causes of plateaus and how a coach may overcome such an occurrence.
- Transfer of learning: positive/negative, proactive/retroactive, bilateral.
- Theories of learning including: Bandura's observational learning – demonstration, attention, retention, motor reproduction, motivation, matching performance (DARMMM).
- Methods of practice; whole/part/progressive part, variable/fixed, massed/distributed – linked to skill continuum and stage of learning; mental rehearsal and practice.
- Methods of guidance: visual, verbal, manual and mechanical.
- Reinforcement: positive, negative and punishment; drive reduction theory and feedback.

## B. Knowledge and Understanding

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### Introduction

The learning of a new skill and the development of an existing skill requires the coach and the athlete to understand what we can develop and how best this is achieved. To improve performance skills need to be identified and specific approaches taken.

### Understanding the links between skill, ability, learning and performance

The link between skill and ability is that the more ability an individual has the easier it will be to learn skills that utilise that ability i.e. skill is the application of ability, and skills are learned using existing abilities.

MOTOR ABILITY	SKILLS DEPENDENT ON ABILITY
Co-ordination	Kicking a ball, a cartwheel.
Reaction Time	Tennis serve return, interception in netball.
Balance	Handstand, landing a jump.

**SKILL** - 'The learned ability to bring about pre-determined results with maximum certainty, often with the minimum outlay of time or energy or both.' Barbara Knapp (1977)

**ABILITY** - This describes the physical attributes that affect our potential for a given sport. Abilities are largely determined genetically i.e. they are natural or innate. 'Motor abilities are relatively enduring traits which are generally stable qualities that help a person carry out a particular act.' (Fleishman)

**GROSS MOTOR** - Large muscle movements, whole body or limbs.

**PSYCHOMOTOR SKILL** - The individual's ability to consciously make movements

successful e.g. curling the ball into the top corner of a goal.

**LEARNING** – ‘The more or less permanent change in behaviour that is reflected in a change in performance’ (Knapp). Learning is a lifelong process – even elite sports performers claim that they are still learning about their sport in order to improve their performance. Every learner will progress through the stages of learning, given appropriate opportunities to practice and receive feedback.

**PERFORMANCE** – is a demonstration of the solving of a problem or task at a given moment in time i.e. it is a temporary phenomenon. We can all think of skilful performers that have an abundance of ability who at times can turn in a poor performance.

**LINK BETWEEN LEARNING AND PERFORMANCE** – as learning takes place we usually see gradual improvement in performance.

## Skilful Performance









## Classification of Skill

Skills are classified to understand the learning process and offer appropriate methods of guidance and practice. Classifying the skills also allows the correct information and degrees of variables to be assessed when teaching/learning new skills.

Skills can be classified into the following continua:

- Pacing
- Difficulty
- Organisation
- Continuity
- Muscular involvement
- Environmental influence

INTERNAL Performers control – golf swing	<b>Pacing</b> - who is in control of the movement 	EXTERNAL Control by opposition – batting in cricket
SIMPLE Few decisions - walking	<b>Difficulty</b> - the degree of decision making for the skill being demonstrated 	COMPLEX Decision making– tennis serve
LOW Simple skills, requiring little attention - swimming	<b>Organisation</b> - the number of subroutines needed to perform the skill 	HIGH Complex skills, lots of subroutines – diving

<p><b>DISCRETE</b> Start and finish - Netball pass</p>	<p><b>Continuity</b> - how many stages of the skill exist</p>  <p><b>SERIAL</b> Several discrete skills – triple jump</p>	<p><b>CONTINUOUS</b> No obvious start or finish - cycling</p>
<p><b>FINE</b> Small muscle groups, controlled and accurate – hand placements in gymnastics</p>	<p><b>Muscular involvement</b> - how many muscle fibres are involved and the precision of movements</p> 	<p><b>GROSS</b> Large muscle groups – rugby tackle</p>
<p><b>OPEN</b> Variables – football – crowd, opposition, weather</p>	<p><b>Environmental influence</b> - the amount of variables when performing</p> 	<p><b>CLOSED</b> Reduced variables – long jump</p>



**Stages of Learning** - Fitts and Posner (1967) describe 3 phases of learning:

**COGNITIVE** – This is the beginner phase. In this phase demonstrations are important, together with clear verbal explanations. The visual demonstrations give the learner a mental picture of the movement. Verbal cues can be used to ensure the correct sequencing of the movement.

In this phase the learner has limited attention capacity so instructions should be brief and to the point. Manual guidance might also be used in this stage to guide the learner through the movement. This phase is characterised by lots of mistakes. Extrinsic feedback, especially positive reinforcement of correct responses, is needed to help the learner progress to the associative phase.



**ASSOCIATIVE** – In this stage the learner has a mental picture of what is required but still makes mistakes. Movement patterns are more fluent, and the learner now begins to refine skills that are well learned. The learner begins to know the 'feel' of the movement



and so can begin to use kinaesthetic feedback. However, they still need extrinsic feedback from the teacher/coach especially highlighting correct technique and timing. Faults need to be corrected at this stage to stop the learner developing bad habits.

## **AUTONOMOUS –**

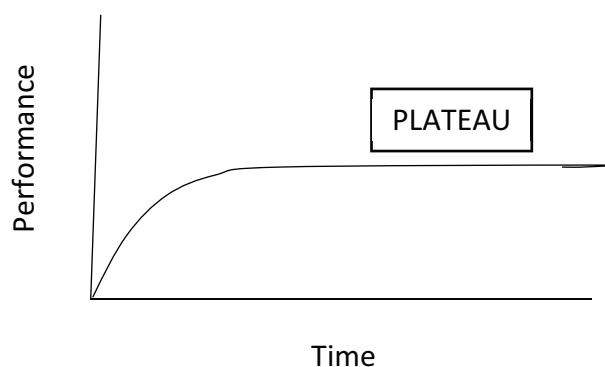
Movement patterns are now well learned and are performed competently and they have become automatic. This means that the learner does not have to concentrate on performance so will have spare attention capacity, enabling them to concentrate on other things. The learner will make greater use of kinaesthetic information but will also still benefit from further complicated technical feedback from their teacher/coach.



## Learning plateaus and performance curves

Learning tends not to be linear and in link performances there are peaks and troughs. As we begin to develop and refine skills learning will sometimes not progress as well as we would like. This may be due to a number of factors and it is important for both the coach and athlete to put strategies in place to stop or off-set these plateaus.

Performance can be plotted over time to measure training, learning and interventions. There are a variety of shapes to learning curves, each giving us information relating to the rate of learning.



Plateauing can be caused by a number of factors including:

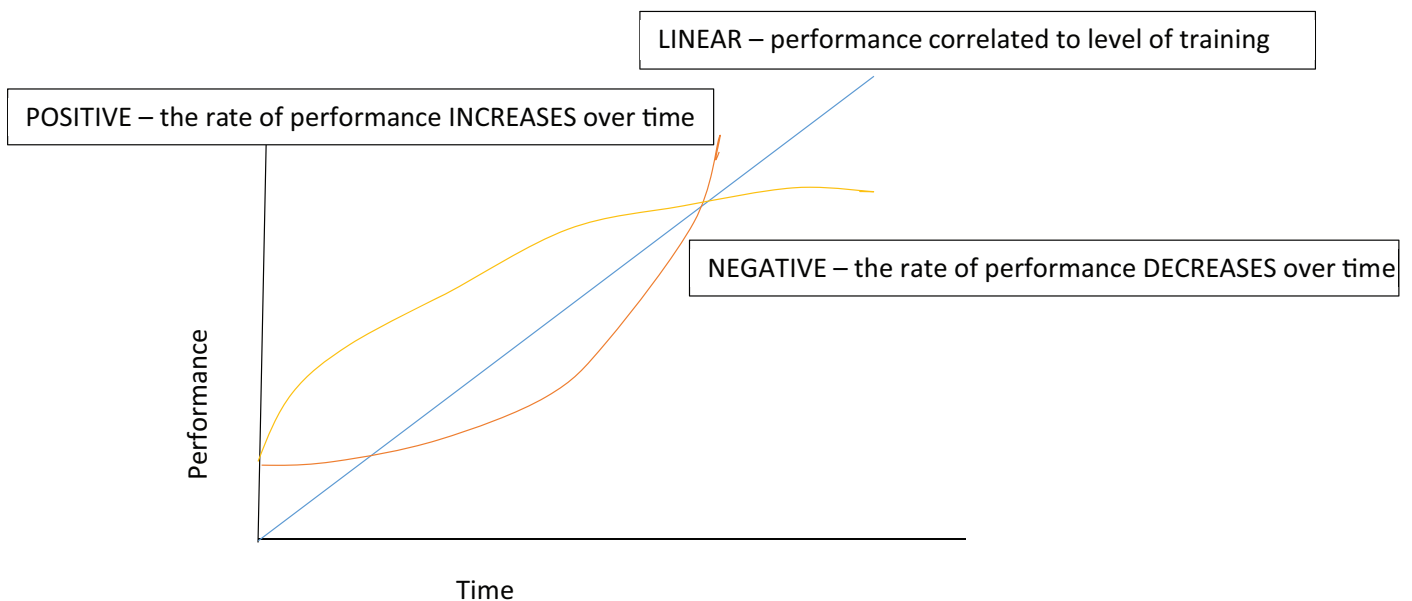
- Not skilful enough to progress
- Too much information
- Feedback/coaching not detailed enough for progress
- Motivation – mundane activities
- Fatigue of the performer

For both the coach and performer they need to work together to reduce, off set or remove plateauing. The strategies are sometimes trial and error and tend to be specific to the individual.

Strategies could include:

- Rewards both extrinsic and intrinsic
- Smaller chunks of information and subroutines
- Appropriate practice – interesting and meets the needs of the individuals
- Effective Feedback – quality, timely, accurate
- Effective and planned recovery

There are three other performance curves identified in the graph below, all demonstrating the relationship between training and performance.



## Observational Learning

Social learning theorists believe that we learn by observing other people (observational learning). Teachers and coaches who use this theory use demonstration as the main learning tool and the learners **model** the behaviour. One problem of observational learning is that coaches and teachers cannot always control what is being observed – pick up bad habits through modelling behaviour on professional sportsmen e.g. questioning referees' decisions because they see it on TV.

Bandura (1977) suggests that there are four processes in observational learning:

DEMONSTRATION	Modelling behaviour giving the correct clues for learning
ATTENTION PROCESSES	The learner must pay attention to the demonstration using selective attention to pick out the relevant cues. A teacher/coach should highlight the relevant cues.
RETENTION PROCESSES	The learner must remember the model's performance, creating a mental picture. Retention can therefore be improved through repeated demonstrations and mental rehearsal.
MOTOR REPRODUCTION	The learner modelling the skill i.e. copying the performance. There is a need for the learner to replicate the skill. Practice should meet the capabilities of the learner. Performance can be improved by practice and through the use of both intrinsic and extrinsic feedback.
MOTIVATIONAL PROCESSES	The learner needs to be motivated to learn the skill they need to reproduce. The status of the model can affect motivation. If they are highly skilled and respected the learner is more likely to be motivated. External reinforcement of the model will increase the motivation.
MATCHING PERFORMANCE	Replication of skill modelling the behaviour of the coach or demonstrator.



## TRANSFER OF LEARNING

This refers to the effect that learning one task has on the learning of another. It is important to note that not all transfer enhances learning. Transfer is a complex concept and can take many forms:

**POSITIVE TRANSFER** – This occurs when prior learning promotes present learning e.g. there might be positive transfer from gymnastics to diving.



**NEGATIVE TRANSFER** – This occurs when prior learning has an inhibiting effect on the learning of a new task e.g. there could be negative transfer for an experienced basketball player beginning to play netball as the different weight of the ball could cause the player to overshoot/overthrow.



**ZERO TRANSFER** – In this case prior learning has no effect on present learning e.g. skills learned in football would have no impact when learning to play golf.



**BI-LATERAL TRANSFER** – This is transfer between limbs.

**PROACTIVE TRANSFER** – The effect that learning a skill has on a skill that has not yet been learned – this could be positive, negative or zero.

**RETROACTIVE TRANSFER** – The effect that learning a skill has on a previously learned skill, again the effect could be positive, negative or zero.

## C. Methods of Guidance, Practice and Reinforcement

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### Introduction

Within any coaching session, the teacher/coach will facilitate learning through providing appropriate guidance, the correct practices and worthwhile feedback to the participant. The actual methods of guidance, practice and feedback will vary depending on the learners' stage of learning and the activities being taught. E.g. somebody in the cognitive stage of learning will receive different guidance, practice and feedback from someone in the autonomous stage.

### Methods of Guidance

Guidance refers to any information we give to learners to help them develop their skills. The type of guidance used is affected by several factors:

- The stage of learning of the individual – cognitive, associative or autonomous.
- The nature of the activity – complexity of the skill, safety etc.
- Individual preferences – most people have preferred styles of learning e.g. most people like to see what the skill they are learning looks like.

There are 4 basic forms of guidance:

1. VISUAL – This is used in all stages of learning, but particularly valuable in the cognitive stage. (DEMONSTRATION) – this includes physical demonstration by coach or other competent performers, the demonstration must be accurate so that the learner builds up the correct picture.
2. VERBAL – This is often used by coaches to explain the task and describe the actions. It is also used effectively to highlight important performance cues,



used in conjunction with visual guidance. This is used in the associative stage of learning to give more information for progress. Within the autonomous stage verbal guidance is vital for marginal gains.

3. MANUAL– This form of guidance involves physical contact / support. Often used when there is an element of danger or taking the performer through the movement. This might be more appropriate at the cognitive or associative stage.
4. MECHANICAL – Uses equipment to aid the learning process. This might be a float in swimming at the cognitive stage to allow the performer to swim or at the autonomous stage to take them through difficult move as the use of a harness in gymnastics.

## Overview of methods of guidance

Type of Guidance	Advantages	Disadvantages	Stages of learning
<b>VISUAL</b>	Replicate performance video can help with accuracy and technique and is useful in all stages of learning. Gives the students a mental image of performance.	If no accurate image is available it can cause problems.	Very effective in cognitive stage of learning but useful in all stages. When using video in associative and autonomous stages, demonstrations can be slowed down to highlight points of detail e.g. looking at the different phases of a gymnastics vault.
<b>VERBAL</b>	Enhances learning and understanding. When effectively combined with visual guidance it gives an accurate picture for learner. It is immediate.	Language could be too complicated for beginners, they may lose concentration. Some movements cannot be accurately explained.	Explanations should be brief and to the point especially during cognitive stages of learning due to limited capacity to process information. It is more useful in later stages of learning when attention capacity is greater.
<b>MANUAL</b>	Helps the individual to develop kinaesthetic awareness (the feel) of the motion. Early stages of learning position limbs/body parts of learner	Should not be overused as performers can become dependent on support.	Very useful in cognitive stage of learning, in helping the learner to experience the 'feel' of the movement. Gymnastics uses a lot of manual guidance when learning more difficult moves.
<b>MECHANICAL</b>	With hazardous activities it can be used to prevent the learner from making inaccurate movements. Provides a safe environment.	The 'feel' of the movement with guidance can be unrealistic. There can be experience failure on removal of manual/mechanical guidance.	In some activities mechanical guidance is used by more experienced performers because of safety issues e.g. rock climbing.

## Types of Practice

The types of practice used in a coaching session will be linked to the stage of learning, and the type of skill being developed. This requires the knowledge of classifications of skill to develop the most effective type of practice e.g. netball requires variable practices to simulate the open nature of the game, by only practicing closed repetitive drills with no opposition the players will not be prepared for the game.

The following factors must be considered when creating the best possible practice conditions.

### Technical Knowledge

- Stage of learning: Information to process: Previous experience.
- Personality and motivation.
- Classification of skill e.g. open/closed, fine/gross etc.
- Facilities, equipment and time available.
- Size and structure of group.

**Mental Practice/Rehearsal** (Imagery/Visualisation): The athletes visualise themselves performing a skill with no actual physical movement involved. Mental practice has been shown to have an impact on improved performance; unfortunately it cannot replace physical practice. Athletes use a combination of mental and physical practice however physical practice is the most important.

Mental practice uses the following factors:

- Cognitive – thinking about strategies and tactics can help the learner to make the correct decision.
- Neuromuscular –mental practice causes the muscular neurones to fire as if the muscle is actually active.
- Confidence –can improve as the performer concentrates on successful and correct performance.

## Types of Practice

Type of practice	Description	Application	Advantages	Disadvantages
FIXED	Conditions closed and practice is repetitive	When learning closed skills. Promotes over learning.	Repetitive practice allows moments to be grooved and one action or skill practiced and mastered.	It does not always prepare performers for when things go wrong.
VARIABLE	Range of different experiences that relate directly to performance in the full activity.	When learning open skills Interaction and decision making involved in the competitive performance. Practice in realistic situations.	Learners to practice in situations more realistic to their sporting activity. Whole activity.	Difficult to simulate appropriate competitive situations.
MASSED	Practicing the skill to be mastered is repeated over an extended period of time.	Learning simple skills.  Performers are experienced, fit and highly motivated.	'Grooving' skills.  Learning discrete skills of short duration. Practice time is short.	Can lead to fatigue and boredom.
DISTRIBUTED	Practice has intervals of rest that could be other training or rest. Mental rehearsal can be the rest periods.	Learning a new or complex skill. Danger of injury if performer is fatigued. Early stages of learning. Low motivation.	Good for learning most skills. Time to recover physically and mentally. Good for potentially dangerous situations.	Unsuitable for complex skills.
WHOLE	Whole method a skill is taught without breaking it down into parts or sub-routines.	The skill is continuous and not broken down into sub-routines, learner experiences the true 'feel' of the movement Learning serial and complex skills.	Understand the timing of the whole movement. Learning can be quicker.	Not suitable for learners that require small chunks of information.
PART  Progressive Part	Split up into sub-routines, each part is practiced separately.  Parts are put together to equal whole e.g. dance routine.	The skill is low in organisation.  When learning serial and complex skills.  Linked to the early stages of learning.  The parts tend to be put back into the whole (part/whole).	Provides early success. Focus on particular parts of the skill.	Difficulty in putting parts back together. Reduces kinaesthetic awareness. Sometimes some of the parts doesn't equal whole.

## Reinforcement

During performance the coach and athlete expect a certain level of behaviour, skill and effort. When the athlete exhibits the desired performance the coach should reinforce this behaviour so that the athlete learns from the experience and will replicate the performance in the future. There are a number of reinforcement theories:

1. Behaviourism theory– operant conditioning
2. Drive reduction theory

**Behaviourism** – Operant conditioning is achieved via reward or punishment, which effects further actions. Operant conditioning suggests that there are three responses to the athletes behaviour and will effect further actions and learning.

- a. Positive reinforcement; a coach will praise/reward successful performance, thus encouraging the athlete to repeat the behaviour when faced with a similar experience.
- b. Negative reinforcement; a coach will remove the stimulus that is causing the performance to be unsuccessful e.g. remove the opposition in training to allow the performer to focus on technique.
- c. Punishment; reinforcing the unsuccessful performance with punishment.

These three techniques will have an impact on the stimulus response bond (SR bond). Both positive and negative reinforcement strengthen the SR bond, whereas punishment has a weakening effect on the SR bond.

**Drive reduction theory** – An athlete's drive (motivation) will impact on the successful completion of a task. This theory was developed by behaviourist Clark Hull, as a way of accounting for learning, motivation and behaviour. Behaviour occurs in response to the

drive (motivation), when the goal is achieved the drive is reduced and the learning is reinforced.

The Theory suggests that the more an athlete is aroused the better the performance. However, this only happens when skills are autonomous. At the cognitive stage, performance will deteriorate as arousal increases. Therefore, Drive Reduction Theory suggests that beginners tend not to perform well under pressure. Elite athletes tend to perform better under pressure due to their level of skill and the use of stress management.

## Feedback

Feedback is the information that is available to the performer either during or after performing, its purpose is to alter/correct or persuade future performances. Feedback is essential for learning to take place.

Functions of feedback include:

- Motivate - information concerning success or failure can be motivational
- Reinforce - positive reinforcement increases the chance of repeating the performance
- Informs - provide information about errors and correction.

Feedback is most effective when:

- Accurate
- Concise
- Immediate
- Easily understood
- Truthful

Feedback can be categorised as INTRINSIC or EXTRINSIC.

Intrinsic feedback comes from your senses during the movement e.g. sight, hearing and is perceived by the performer e.g. you hear when you hit a tennis ball with the frame of your racket. It can also be from kinaesthetic feedback i.e. the feel of the movement. The success of this type of feedback is relevant to the level of experience and stage of learning.

Extrinsic feedback comes from external sources, and is an important part of coaching. It can be tangible; facts and figures and non-tangible; offering advice and motivation which will have a positive impact upon intrinsic feedback. These types of extrinsic feedback are known as:

1. Knowledge of results - tangible facts and figures that is simply outcome driven.
2. Knowledge of performance - non-tangible offering feedback on the movement and performance regardless of outcome.

## Other Forms of Feedback

During matches or training there are various types of feedback provided by coaches or teachers regarding individual, team and unit performance. The main types are:

- Positive Feedback
- Negative Feedback
- Terminal Feedback
- Concurrent Feedback

## D. Overview Skill, ability and learning

- Skill is a learned ability, while ability is inherent.
- Learning is affected and determined by several factors, it requires careful monitoring to offset plateauing.
- Skilled performance achieves the desired outcomes; consistently, with efficiency, effectively and accurately.
- Skills are classified to understand the learning process and offer appropriate methods of guidance and practice.
- Skills can be classified into the following continua: Pacing; Difficulty; Organisation; Continuity; Muscular involvement; Environmental influence.
- Fitts and Posner (1967) describe 3 phases of learning; cognitive (beginner), associative (developing), autonomous (skilled/advanced).
- Learning tends not to be linear, link performances where there are peaks and troughs. Plateauing can be caused by a number of factors including: level of skill; information; feedback; motivation; fatigue.
- Strategies to overcome plateauing include: rewards; chunking information; appropriate practice; effective feedback; recovery.
- Social learning theorists believe that we learn by observing other people. This is known as observational learning. Bandura (1977) suggests that there are four processes in observational learning: DARMMM.
- Transfer of learning refers to the effect that learning one task has on the learning of another. It is important to note that not all transfers enhance learning.
- The methods of guidance, practice and feedback will vary depending on: the participants stage of learning; the activity; individual preferences.
- There are four types of Guidance: visual, verbal, manual and mechanical.
- The type of practice will vary depending on: stage of learning; personality and motivation; the classification of the skill; facilities; size and structure of group.



- Types of practice include: -Fixed (closed) and Variable (open); Massed (continuous) and Distributed (discrete); Whole (high organisation and simple) and Part (low organisation, serial and complex skills).
- Behaviour should be reinforced when the athlete exhibits the desired performance allowing the athlete to learn from the experience and replicate the performance in the future.
- Three types of reinforcement are: Positive; negative and punishment.
- Drive reduction theory – believes that an athletes drive (motivation) will impact on the successful completion of a task.
- Feedback is used to (MRI): Motivate; Reinforce good habits; Inform athlete of any errors.
- Feedback is effective when it is: accurate, concise, immediate, easily understood, truthful.
- Feedback can take on a number of forms the main types are: -
  - Extrinsic feedback
  - Intrinsic Feedback
  - Knowledge of performance
  - Knowledge of results
  - Positive Feedback
  - Negative Feedback
  - Terminal Feedback
  - Concurrent Feedback.

## 2. Information processing

Question:

Explain the information processing model (AO2)

### A. Content

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- Understand the information processing models including: Welford's and Whiting's models. Sensory input, perception, decision making, memory, output and feedback.
- How these models can aid a coach in improving performance.
- Understand the memory processes including: short-term memory store, short-term memory, long-term memory, selective attention.
- Strategies for improving memory such as chunking, imagery, association, organisation and rehearsal.
- Understand the factors that affect response time including: reaction time, movement time, response time, psychological refractory period.
- Hick's Law: previous experience, anticipation and how response time may be improved.
- Understand motor programmes and sub routines including: how motor programmes are stored in the long-term memory.
- Understand the types of feedback including: intrinsic, extrinsic, knowledge of results, knowledge of performance.
- The benefits of feedback to the performer; motivate, reinforce and inform.
- Characteristics of effective feedback.

## B. Knowledge and Understanding

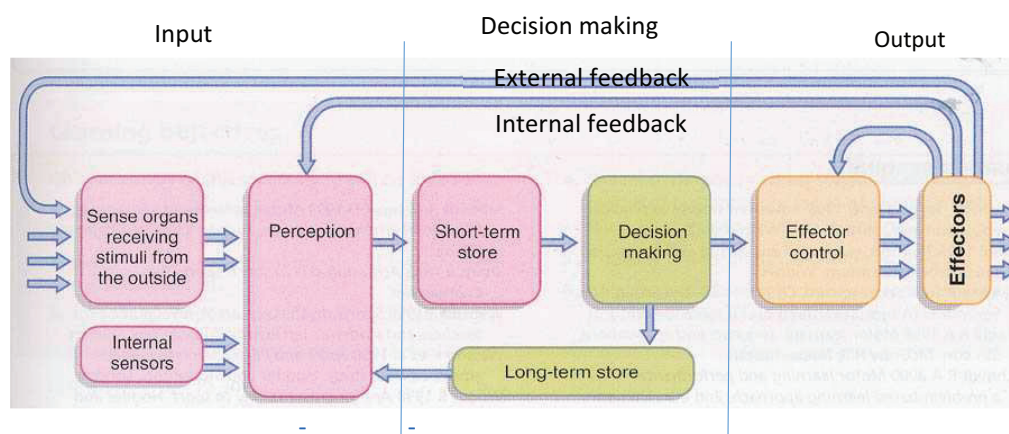
### Introduction

Information processing theory offers an explanation of how the brain processes information relating to skill acquisition.

Welford (1968) was the first psychologist to apply the information processing approach to skill acquisition. He saw it as having three stages: input of information (perception); throughput (decision making); and output (response).

It allows sport psychologists to break down skills and skill acquisition to their component parts.

### Welford's Model

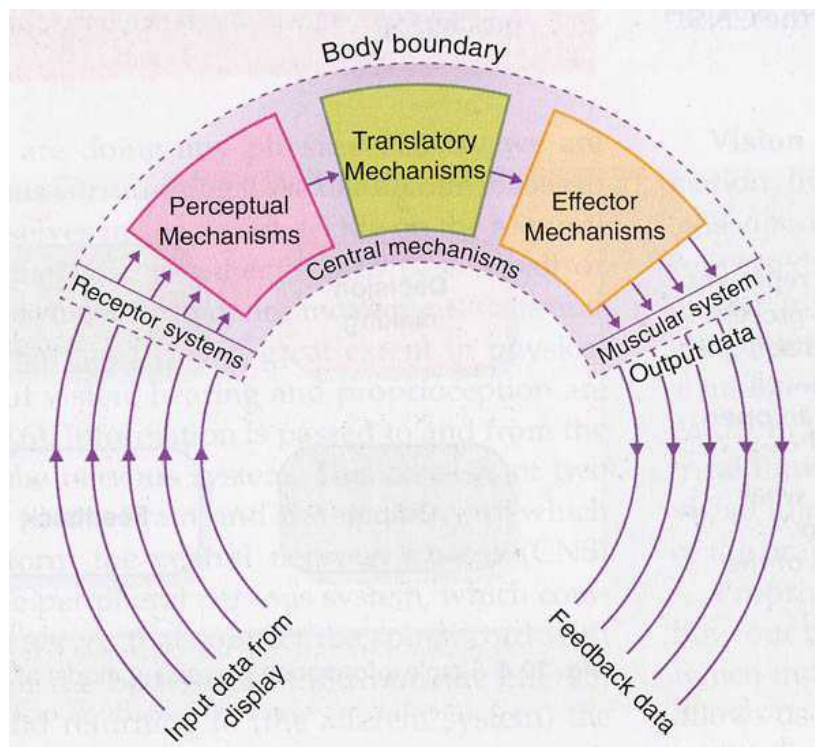


Although there are a variety of different models they all follow Welford's Model regardless of the terminology.

## Whiting's model

Splits information processing into:

1. Receptor system – these are the sensory organs, which receive the information.
2. Perceptual mechanism – this involves selective attention and filtering information.
3. Translatory mechanism – where decision making takes place, sorting the relevant information and using both short and long term memory.
4. Effector mechanism – output messages are sent to the limbs via the nervous system.



The three stage information model explained:

**SENSORY INPUT** is simply information entering the body from the sense organs, in a sporting situation (sight, touch, hearing), but internal processes including internal sensors called **PROPRIOCEPTORS**, these sensors that provide information about muscle tension, length and angle of joints offering information about the position of the limbs in space.

**PERCEPTION** is the process by which the sensory input is given meaning i.e. interprets

the information and identifies the elements that are important. Perception consists of THREE elements:

- **DETECTION** – identifying the correct stimulus; beginners often attend to the wrong stimulus, and that is why their decision-making is often poor.
- **COMPARISON** – the brain processes this information by comparing it with previous experiences stored in our memory.
- **RECOGNITION** – a match in our memory of a similar stimulus. The information is then perceived.

**SELECTIVE ATTENTION** – the brain has a limited short term capacity and can only cope with a certain amount of information. It is important that it selects the correct information to attend to. As the performer moves through the stages of learning, they are able to attend to more elements.

**DECISION MAKING** – our ability to use the information to make decisions about what to do next in a task.

**MEMORY** is used to make the correct decision. There are THREE aspects to memory:

- **SHORT TERM SENSORY STORE** – information from the senses passes through the short-term sensory store (STSS). Information is only kept for ONE second and if it is not considered important, it is forgotten.
- **SHORT TERM MEMORY** (working memory) lasts for between 20-30 seconds before we lose the information and we can only retain 5-9 items as a rule. This capacity can be increased by grouping the information (chunking). This information can be passed into the long term memory if practised.
- **LONG TERM MEMORY** – these are past experiences and the memory has a limitless capacity. Once information is stored in the LTM it is not forgotten although at times it is difficult to retrieve.

## **Motor programmes and subroutines**

Motor programmes are a series of sub-routines organised into the correct sequence in order to perform a movement (linked with stages of learning) e.g. tennis stroke – grip, stance, swing and follow-through. These are stored in long term memory and retrieved when performing a skill.

Motor programmes means that not every part of an action needs to pass through short-term memory (overcoming issues with memory overload), this allows a movement to be performed quickly/effective and efficient.

There are two theories:

Closed Loop focuses intrinsic feedback/errors detected and possible correction during performance.

Open Loop focuses on all the information being sent as a single message for the movement not reliant on feedback.

Schema theory challenges both theories and states that motor programmes are clustered together and are interchangeable in response to the situation, making them adaptable.

**Output** occurs from making the decision to performing the movement. There are several steps within this process.

## **REACTION TIME, RESPONSE TIME, MOVEMENT TIME AND PSYCHOLOGICAL**

**REFRACTORY PERIOD** – For quicker decision making, a coach will try to improve reaction time and develop a performer's ability to anticipate an opponent's actions.

**Reaction time** is the amount of time between a stimulus and the first movement

initiated in response to the stimulus.

The more choices a person has, the more information that needs processing, the longer it takes to process the information, so the slower the reaction time. This is known as **Hick's Law**.

Another concept linked to reaction time is the **Psychological Refractory Period (PRP)**. This refers to the time taken to react, once an individual has realised that he/she has responded in an incorrect way and wants to change their response. It refers to the time taken to respond to the second stimulus, after the first stimulus has occurred. The PRP is the time taken to change your mind. It explains why a performer is unable to quickly respond to a dummy or fake.

**Movement time** is the time between starting and finishing a movement.

**Response time** is the time between the first presentation of the stimulus to the completion of the movement.

**RESPONSE TIME = REACTION TIME + MOVEMENT TIME**

**FEEDBACK** can be intrinsic (how it felt) and extrinsic from a coach, it happens during or after performing a skill. Feedback is essential for learning to take place.

**Intrinsic feedback** comes during the movement from your senses; it is sometimes referred to as kinaesthetic feedback i.e. how it felt.

**Extrinsic feedback** comes from external sources, i.e. the coach. It comes in TWO forms – KNOWLEDGE OF PERFORMANCE and KNOWLEDGE OF RESULTS.

**Knowledge of performance** is how well they performed. **Knowledge of results** is terminal feedback offering simple information on the success of the performance/result.



## Effective Feedback

Successful feedback should motivate, challenge, reinforce and inform performers, supporting them in the development of skill and performance.

To allow performers to achieve their full potential coaches should consider the most effective forms of feedback. It is important that the coach understands the stage of learning the performer is at and must consider what, how and when feedback is given.



[http://resource.download.wjec.co.uk.s3.amazonaws.com/vtc/2015-16/15-16\\_30/eduqas/04-preparation/Component4-guidance-practice-feedback.html](http://resource.download.wjec.co.uk.s3.amazonaws.com/vtc/2015-16/15-16_30/eduqas/04-preparation/Component4-guidance-practice-feedback.html) (AS Resource Eduqas guidance)

The quantity and quality of feedback is important as performers respond differently to coaching, and feedback. The coach must consider how to offer effective feedback. Here are five key principles:

1. Positive –constructive and informative. This feedback should motivate and offer instructions on how to improve performance. The feedback will be qualitative and helps with the development of performance. There is also a need to acknowledge effort as well as performance.
2. Specific and consistent offering clear and transparent information that has integrity.

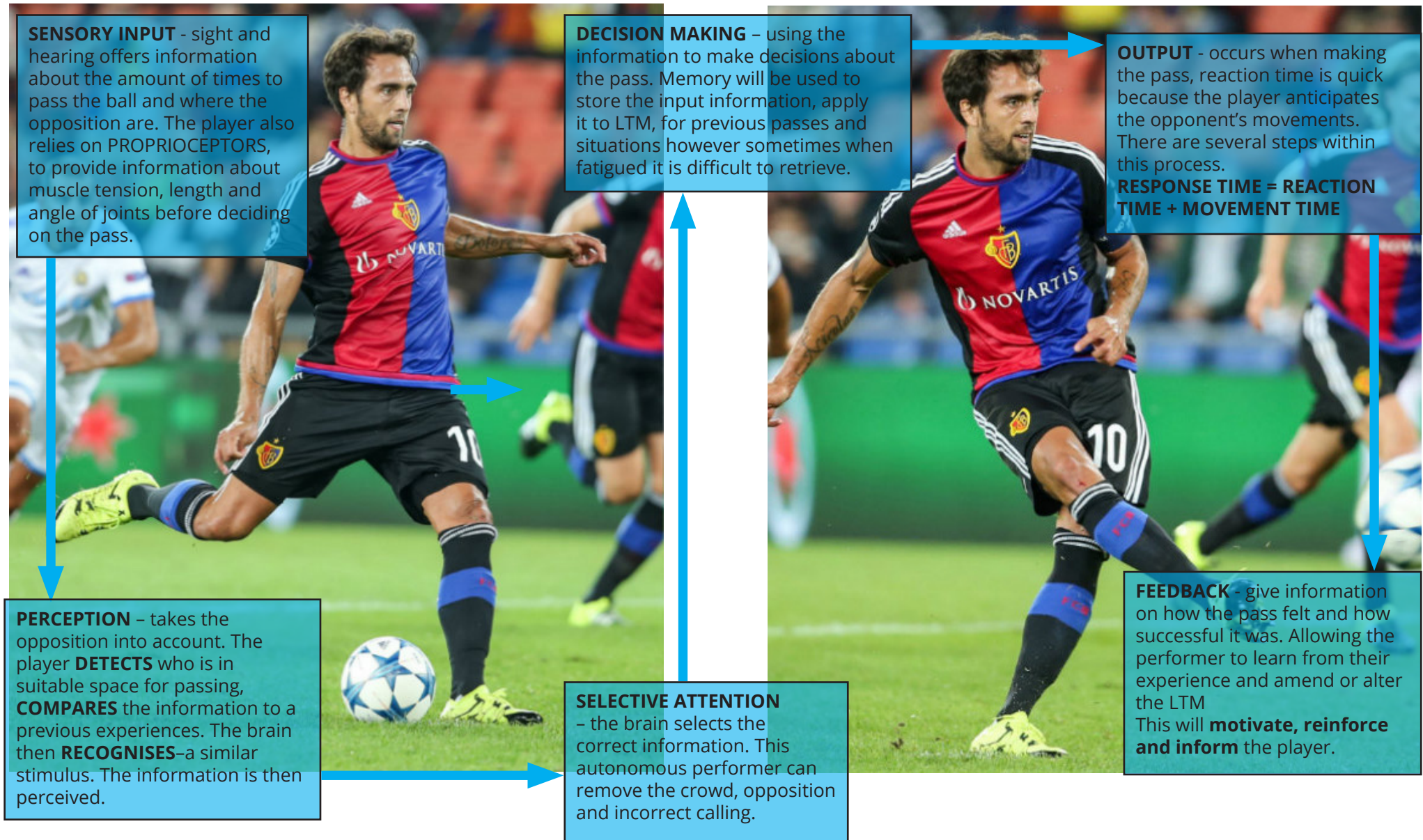


3. Immediate – the timing of feedback is vital to progress, if the feedback is going to have an impact on skill or behaviour.
4. Frequently offering the performer small pieces of information that they can act upon. The quantity of information does not overload the performer; however it is important that the language used is relevant to the performer and their stage of learning.
5. Accurate offering feedback that is correct and sincere. This will require the building of a relationship where the coach can be honest with the performer. This is sometimes helped with quantitative data.

How the coach can improve the information processing model

<b>SENSORY INPUT/ SELECTIVE ATTENTION</b>	<p>When learning a skill a coach could:</p> <ul style="list-style-type: none"> <li>• Change visual display such as using a bigger ball.</li> <li>• Reduce the cues so that the learner is not overloaded.</li> <li>• Ensure basic skills are well learned to free up spare attention capacity.</li> <li>• Reduce anxiety.</li> </ul>
<b>MEMORY</b>	<p>The coach can develop memory retention and skill development by:</p> <ul style="list-style-type: none"> <li>• Providing lots of practice.</li> <li>• Use phrases and sayings that will help learners to remember key points e.g. clean palm, dirty neck in shot put.</li> <li>• Making sessions exciting and more memorable.</li> <li>• Not moving on too quickly.</li> </ul>
<b>DECISION MAKING</b>	<p>Coaches can develop experiences by:</p> <ul style="list-style-type: none"> <li>• Varying practice so that learners experience a range of different situations, building up their long-term memory to enhance decision-making.</li> </ul>
<b>REACTION TIME</b>	<p>Coaches can help with improving the performers anticipation by:</p> <ul style="list-style-type: none"> <li>• Giving learners information about important cues to watch for.</li> <li>• Practice!</li> </ul>
<b>FEEDBACK</b>	<p>Coaches are extremely important within all stages of learning for further development:</p> <ul style="list-style-type: none"> <li>• Use informational/technical feedback wisely, so that performer does not become too dependent on it.</li> </ul>

## Application of Information Processing



## C. Overview Information Processing

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- Information processing theory explains the brains processes for decision making and learning.
- The universal theory is sensory input, perception and selective attention, decision making including memory (Short term sensory store, short and long term memory and effector/output).
- There are two main theories Welford and Whiting whose models on information processing only differ slightly.
- Welford's model (1968) subdivides input, decision making and output, and has two feedback mechanisms, internal and external.
- Whiting's model (1969) however tends to use different terminology and sees the process more as a cycle. He refers to the process having four stages: Receptor systems – these are the sensory organs; Perceptual mechanism –filtering information; Translatory mechanisms – decision making; Effector mechanism – output messages are sent to the limbs via the nervous system.

The information process can be subdivided into three stages:

Input which includes:

- SENSORY INPUT is simply information entering the body from the sense organs, internal and external.
- PERCEPTION is the process by which the sensory input is given meaning; three stages; DETECTION –identifying the correct stimulus; COMPARISON – the brain processes this information; RECOGNITION –a match in our memory.
- SELECTIVE ATTENTION –It is important that it selects the correct information to attend to. As the performer moves through the stages of learning, they are able to attend to more elements.

DECISION MAKING is our ability to use the information given to make decisions.

MEMORY is used to make the correct decision. There are THREE aspects to memory:

- SHORT TERM SENSORY STORE –information is only kept for ONE second and if it is not considered important, it is forgotten.
- SHORT TERM MEMORY (working memory) lasts for between 20-30 seconds before we lose the information and we can only retain 5-9 items as a rule.
- LONG TERM MEMORY – these are past experiences and the memory has a limitless capacity. Once information is stored in the LTM it is not forgotten. This is believed to be stored as motor programmes or schema.
- Motor programmes are a series of sub-routines organised into the correct sequence in order to perform a movement (linked with stages of learning) e.g. tennis stroke – grip, stance, swing and follow-through.
- Motor programmes means that not every part of an action needs to pass through short-term memory (overcoming issues with memory overload) this allows a movement to be performed quickly/effective and efficient.
- There are two theories: closed loop- intrinsic feedback and correction during performance; open loop-information as a single message not reliant on feedback.
- Schema theory challenges the both theories and states that motor programmes are clustered together and are interchangeable in response to the situation.

Output which includes:

- Reaction time is the amount of time between a stimulus and the first movement initiated in response to the stimulus.
- The more choices a person has, the more information that needs processing, the longer it takes to process the information, the slower the reaction time. This is known as Hick's Law.
- Psychological Refractory Period (PRP). This refers to the time taken to react, once

an individual has realised that he/she has responded in an incorrect way and wants to change their response.

- Movement time is the time between starting and finishing a movement.
- Response time is the time between the first presentation of the stimulus to the completion of the movement.
- $\text{RESPONSE TIME} = \text{REACTION TIME} + \text{MOVEMENT TIME}$
- Intrinsic feedback comes during the movement from your senses; it is sometimes referred to as kinaesthetic.
- Extrinsic feedback comes from external sources; two forms – KNOWLEDGE OF PERFORMANCE and KNOWLEDGE OF RESULTS.
- Knowledge of performance is how well they performed. Knowledge of results is terminal feedback offering simple information on the success of the performance/result.
- Successful feedback should motivate, challenge, reinforce and inform performers, supporting them in the development of skill and performance.
- Effective feedback. Here are five key principles; **positive –constructive and informative; specific and consistent; immediate; frequent and Chunked; accurate and honest.**

## Acknowledgements

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