

Skill Acquisition

**Analyse what
the player must
consider to make
an accurate pass.
(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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1. Information processing

Question

Explain the information processing model (AO2)

A. Content

- 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

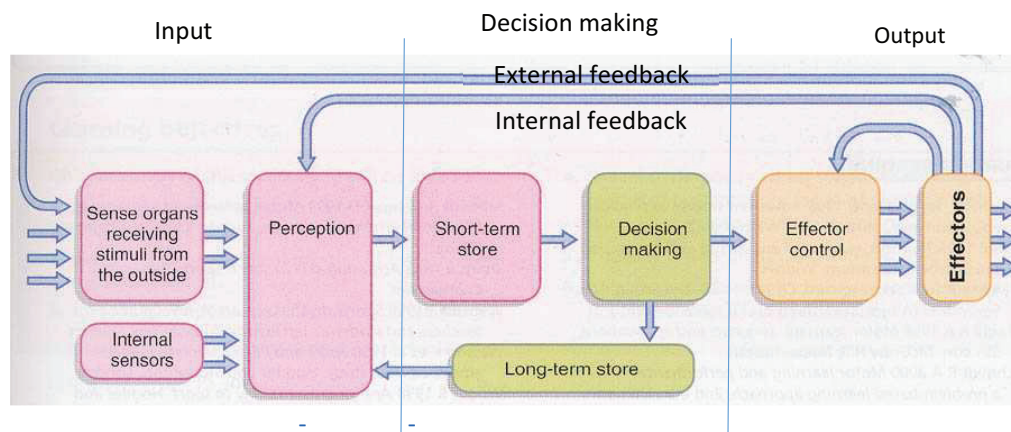
Introduction

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

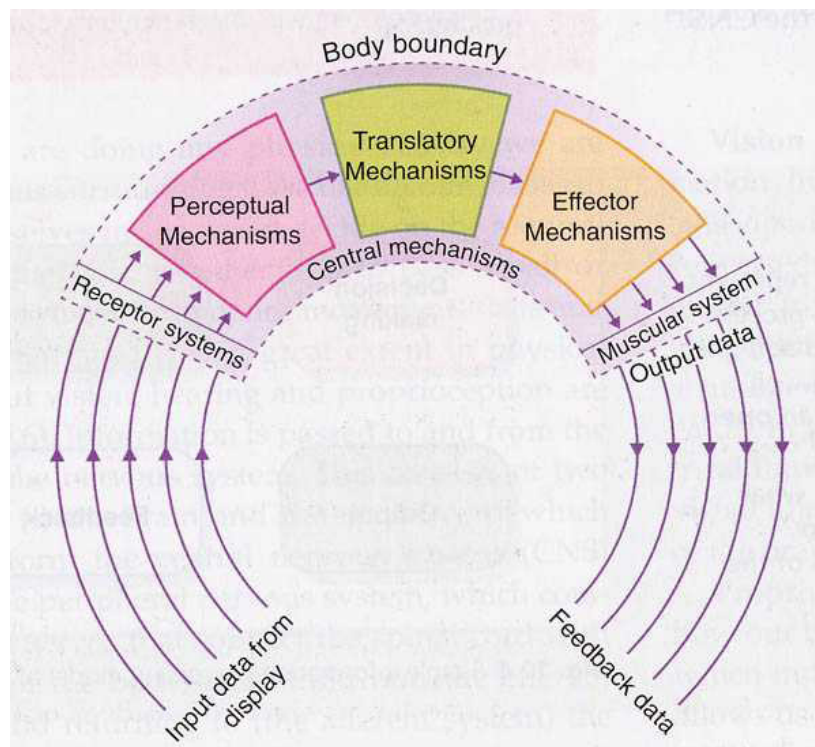


There are a variety of different models. Regardless of terminology however they all follow Welford's Model.

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/eng/04-preparation/Unit4-guidance-practice-feedback.html

(AS Resource WJEC guidance)

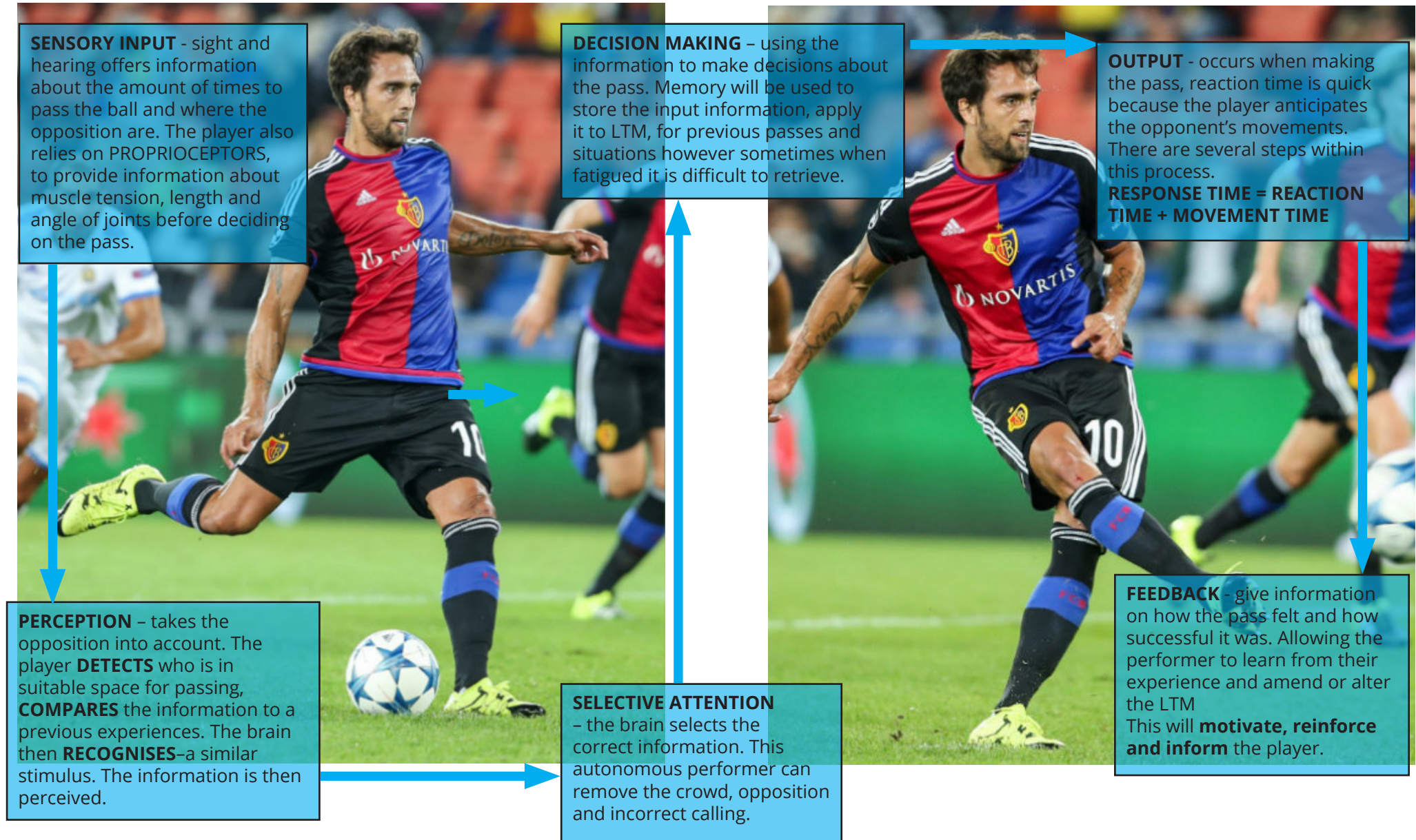
The quantity and quality of feedback is important as performers respond differently to coaching, and feedback. The coach must consider how to offer effective feedback. Here are five key principles:

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

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

Application of Information Processing



C. Overview Information Processing

- 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

Page	Image description	Acknowledgement
Cover	Football	Simon Hofmann/Stringer/Getty Images
11	Football - preparation phase	Simon Hofmann/Stringer/Getty Images
11	Football - contact phase	Simon Hofmann/Stringer/Getty Images