Information Processing – Acquiring Movement Skills.

Whiting's Model

Input data from display

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Perceptual mechanisms

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Effector mechanisms

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Output data

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1. Give an example of serial processing.

2. Give an example of parallel processing.

Strategies to improve retention and retrieval.

1. ___

2. ___

3. ___

Factors affecting reaction time.

- **Body temperature** – if we are cold our reactions are ____.
- **Personality** - ____ tend to have quicker reactions than ____.
- **Age** – Reaction time gets ____ until you are about 20 and then gets ____ as you get older.
- **Limb used** – the ____ the information has to travel the ____ the reaction will be.

Three stages to information processing:

1. **Stimulus identification** – detecting there is a stimulus and then interpreting the information.

   E.g. there is a ball coming and then determining its speed and direction.

2. **Response selection** – having interpreted the information, deciding what to do.

   E.g. Move in the appropriate direction and put the appropriate limb in position.

3. **Response programming** – this is when the information is sent via the nervous system to the appropriate muscles to carry out the appropriate movement.

Serial Processing:

When information is processed in stages.

Parallel Processing:

Where process occur at the same time.

Hick's Law

Disguising intentions and increase number of possible alternatives opponents have to select from.

Single channel hypothesis:

When we receive many stimuli from the environment the brain can only deal with one stimulus at a time. The way we process information is called **single channel hypothesis** which can only deal with one piece of information at a time. This one piece of information has to be dealt with before the next piece can be dealt with. Sometimes referred to as **bottleneck.**

Choice reaction time:

Occurs when there is more than one stimulus and/or more than one response. It occurs in many sporting situations.
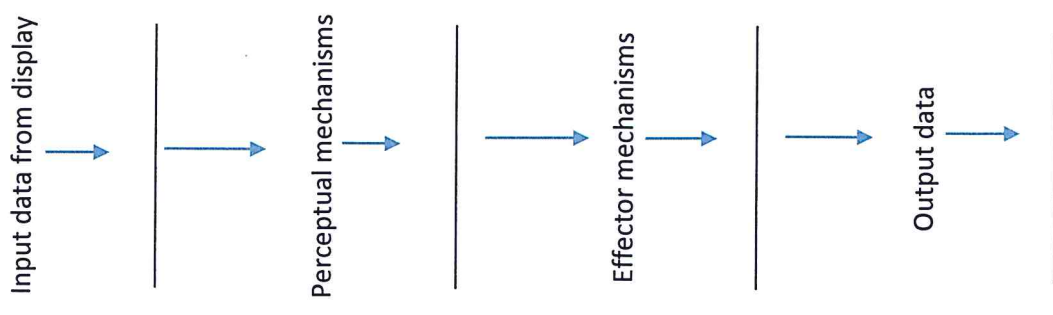
Information Processing ⚽

Stages of information processing—remember Whiting and Welford

Stimulus identification: detecting the stimulus and then interpreting this information through perception. Eg a ball coming towards you and determining its speed, flight and direction.

Response selection: having interpreted the information and deciding what to do using motor programmes. Eg move in appropriate direction and move limb to position.

Response programing: when the information is sent via the nervous system to the appropriate muscles to carry out the movement, via proprioception. Eg moving arm out to catch the ball.

The processes involved

1. Display: the surroundings/environment the performer is in.
2. Sensory input: detect information which stimulates their receptors, including hearing, vision and proprioreceptors.
3. Perception: process that interprets and makes sense of the information received—three elements: detection stimulus is present), comparison (comparing stimulus to long term memory) and recognition (matching it to one found in long term memory).
4. Memory: plays important role in the perceptual and decision making processes.
5. Decision-making: choosing the correct response to put into action in a form of motor programme.
6. Effector mechanism: motor program put into action via impulses in nervous system to the appropriate muscles to carry out actions.
7. Feedback: one motor programme is put into action the display changes and new information is created, known as feedback—either intrinsic or extrinsic.

Memory

Selective attention: process of picking out and focusing on relevant parts of the display –filtering out irrelevance.

A few strategies to improve retention and retrieval:

Rehearsal: keep repeating the skill until it becomes over learned and it becomes automatic and fluent.

Association: link new information with older information that the performer already knows so they learn better.

Simplicity: give few instructions and allow time for the information to be taken in and make more complex later.

Imagery: give demos to allow the learner to have a mental image of the skill and what to aim for.

Enjoyment: make sure it is fun and so the performer is more likely to remember the skill.

Reaction time

Reaction time: time from stimulus occurring to the performer starting to move in response.

Factors affecting reaction time:

Body temperature: colder temp = slower reactions.

Age: reaction time gets quicker until 20 where is starts to slow,

Personality: extroverts have quicker reactions

Gender: males have quicker reactions than females.

Limb used: further the info has to travel the slower reaction time is.

Alertness/arousal/motivation: optimum levels needed for quicker reactions.

Sensory system used: reactions vary depending on which sense is used.

Improving response time:

Warm up: makes sure all systems are prepared.

Practice: more practice will make it automatic response.

Mental rehearsal: make sure they attend to the correct cues and expect and respond to correct stimulus.

Cue detection: anticipate when the stimulus will occur.

Stimulus response compatibility: if response to stimulus is a usual response this will make the reaction quicker.

Experience: increases awareness of stimulus occurring.

Selective attention: focus on relevant stimulus only.

Arousal/motivation: need to be a an appropriate level.
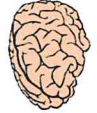
Extra to remember:

Single channel hypothesis: the brain can only deal with one stimulus at a time, through a single channel.

Choice reaction time: when there is more than one stimulus/ more than one response.

Hick's Law: choice reaction time increases linearly as the number of stimulus/ choice alternatives increases.

Anticipation:

Need to look for relevant cues in opponents actions so they can predict what to do. Two types:

Spatial: predicting what will happen and

Temporal: predicting when it will happen

Psychological refractory period: if we anticipate something wrong it will slow reaction as we cannot attend to more than on stimulus at a time which causes a delay.

Activities

Fill in the blanks

1.

Body boundary

Central mechanisms
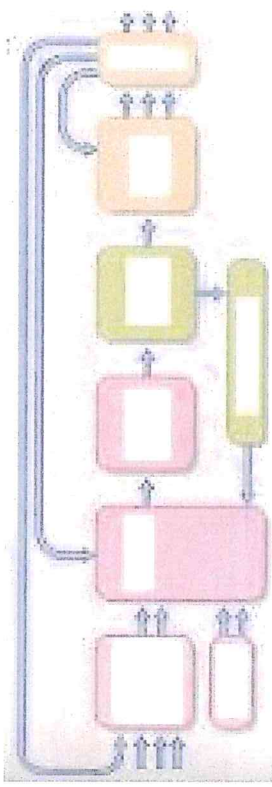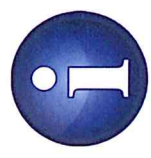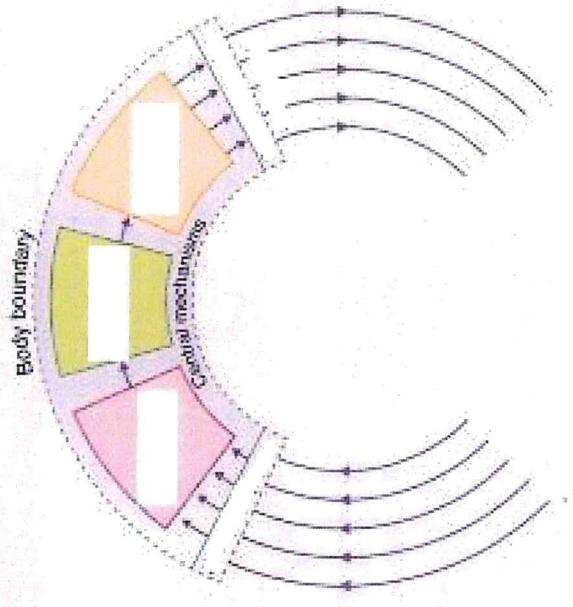
2.

Practice questions:

1. Identify two forms of anticipation. Explain the effects of anticipation on response time. (4 mark)

2. Why is it important to have quick reaction time when performing and movement skill? What factors could affect response time in physical activity? (4 mark)

How do teachers / coaches attempt to improve Response time of performers.

Practice – The more often a stimulus is responded to the shorter the reaction time becomes. If enough practice is done little attention is needed and response becomes automatic.
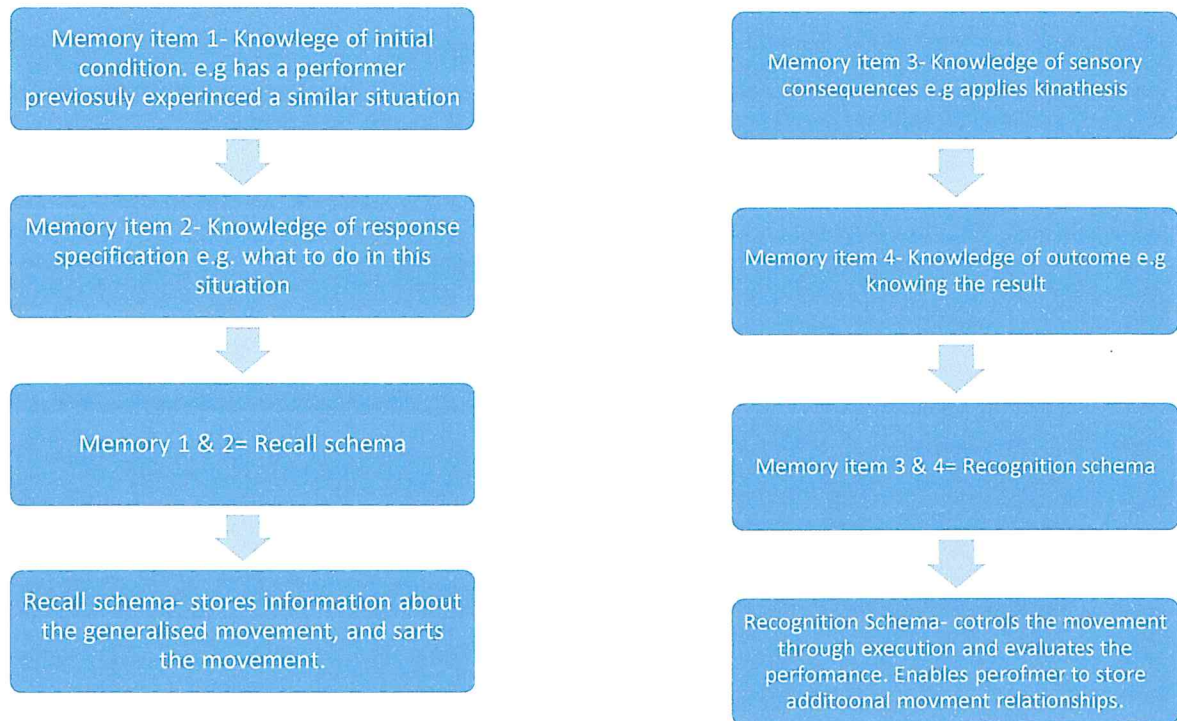
Mental rehearsal – This enables the performer to ensure that they attend to the correct cues and expect to respond to the correct stimuli. Mental rehearsal works better with complex tasks that need a lot of information processed.

Experience – Playing the activity enhances the performer's awareness of the probability of particular stimuli happening.

Stimulus-response capability – If the response you are expected to make to the stimulus is the one you would normally make you will react quicker than with a different response.

...ve detection – Analysing the opponent's play to anticipate what they are going to do for instance finding out what foot a winger is in football to know when they are going to cross and when you should put in a block.

Improve the performers physical fitness – The fitter you are the fitter you will be.

Selective attention – In a simple reaction time situations you focus on the relevant stimulus and ignore everything else. During a sprint start only focusing on the gun.

Level of arousal / motivation – The teacher / coach has to ensure the performer has the correct level of arousal for the activity.

(Word search grid of letters — not transcribed)

Mental rehearsal.   Experience

Stimulus.   Performer.

Response Capability.

Selective attention.

Arousal

Motivation.

Cue.

Schema Theory

Motor programmes are not stored as separate items as presented in open loop. Instead they're retained in the long term memory as relationships with motor programmes. This is known as generalised movement, allowing the performer to adapt quickly.

Schemas are a store of information based upon experience and can be adapted to meet demands from a new situation.

Schema theory states that information is gathered from 4 areas, known as memory items.

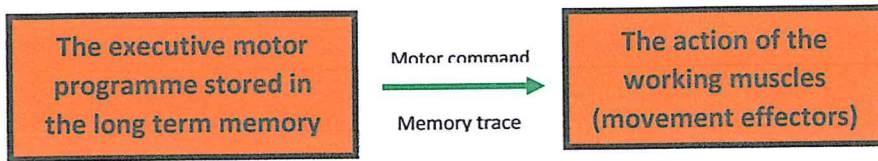|	
Memory item 1- Knowlege of initial condition. e.g has a performer previosuly experinced a similar situation	Memory item 3- Knowledge of sensory consequences e.g applies kinathesis
↓	↓
Memory item 2- Knowledge of response specification e.g. what to do in this situation	Memory item 4- Knowledge of outcome e.g knowing the result
↓	↓
Memory 1 & 2= Recall schema	Memory item 3 & 4= Recognition schema
↓	↓
Recall schema- stores information about the generalised movement, and sarts the movement.	Recognition Schema- cotrols the movement through execution and evaluates the perfomance. Enables perofmer to store additoonal movment relationships.

Activities:

Develop a schema theory example for your own sport using the model above

Fill in the blanks:

Motor programmes are stored in the ____ _____ _____. Generalised movements are the adaptations of movement that _____ to influence the performance and learning of other skills. A schema is the store of information and _____ which allows performers to adapt to demands of a new situation.
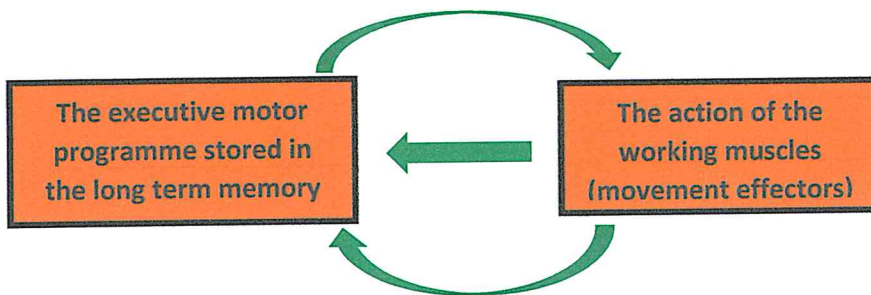

Discuss the link between the development of schema, types of practice and the effect of transfer of learning.

OPEN LOOP CONTROL
(LEVEL ONE CONTROL)

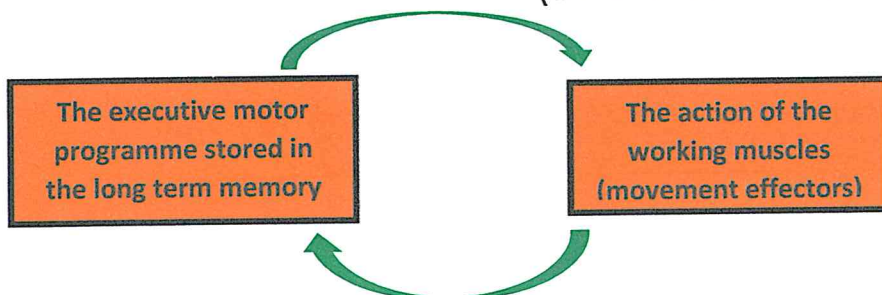| The executive motor programme stored in the long term memory	Motor command → Memory trace	The action of the working muscles (movement effectors)

- How rapid movements are performed in sport
- For example: a close catch in cricket is a rapid action plan stored and triggered from long-term memory
- The transfer of information from the long term memory is through a memory trace which forms when the skill is well learned
- There is no concurrent feedback given in an open loop control skill
- Open loop control occurs with ballistic/fast movements
- The skill cannot be adjusted during open loop control
- Applies to simple and closed skills

CLOSED LOOP CONTROL
(LEVEL TWO CONTROL)

The executive motor programme stored in the long term memory	←	The action of the working muscles (movement effectors)

- Closed loop control involves feedback called the perceptual trace
- Feedback is gathered through kinesthesis and proprioception during the skill allowing quick and subconscious corrections to take place
- For example: a slalom skier makes quick adjustments to maintain balance
- The adjustments are stored in long term memory for future reference

CLOSED LOOP CONTROL
(LEVEL THREE CONTROL)

The executive motor programme stored in the long term memory		The action of the working muscles (movement effectors)

- This feedback loop is longer as performance is relayed to the brain
- The brain modifies movement by passing corrective messages to the working muscles
- The loop involves conscious thought and attention to external feedback
- For example: changing direction to avoid an opponent whilst controlling the ball requiring conscious thought
- Level three control is necessary in the associative phase of learning – reliance on external feedback
- The perceptual trace:
  -Comparing performance taking place with the motor programme stored in the long term memory
  -If the skill matches the motor programme it is reinforced and continues
  -If the skill does not match the plan it is adjusted and stored as a new motor programme

OPEN AND CLOSED LOOP THEORY

It explains how psycho motor skills are:

- Controlled
- Learnt – the perceptual trace is developed and becomes stronger as the movement is practised

Problems with open and closed loop theory:

- If separate memory traces were required for each separate skill it would not be possible to store so many motor programmes
- It would be difficult for the memory trace to recall the motor programme plan in time to execute the skill
- 'Novel responses' would not be possible as the motor programme would not be stored in the memory

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OPEN AND CLOSED LOOP THEORY QUIZ

1. What is an example of open loop control?

2. What are the characteristics of open loop control?

3. What is an example of level two control?

4. What are the characteristics of level two control?

5. What is an example of level three control?

6. What are the characteristics of level three control?

7. What does open and closed loop theory explain?