



# Motor Development

# Motor Development

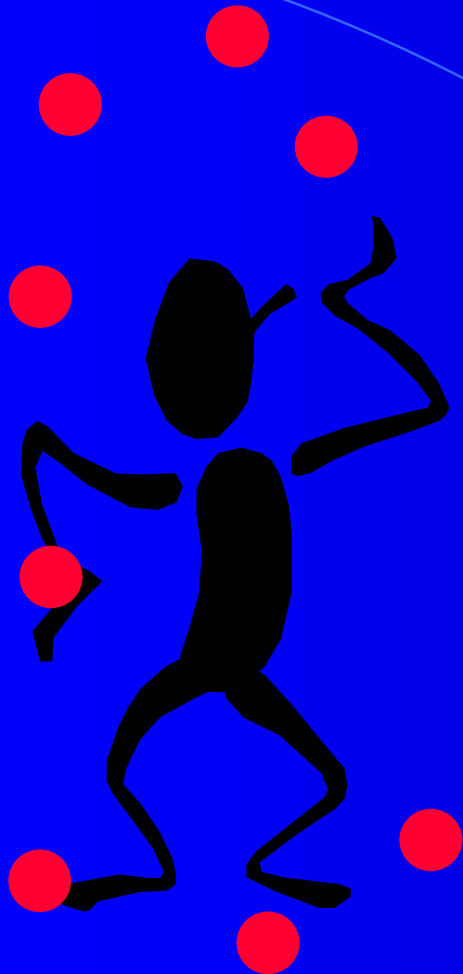
**Motor Behavior:** The study of executed human performances and postures that are a result of integrated internal processes that lead to a relatively permanent change in performance.

**Motor Control:** the study of the internal processes that command them.

**Motor Learning-** defined as a multifaceted set of internal processes whereby relatively permanent changes occur in human performance through practice

**The process is dynamic**

# Motor Program

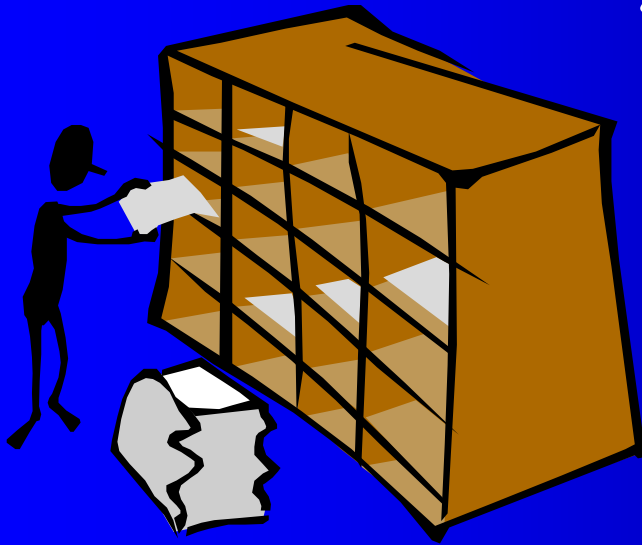


It is based on the understanding that movement is planned in advance, stored in the brain, and processed through the rest of the body. It is performed through an open loop system. (Henry & Rodgers, 1960)

# Schema Theory

(Schmidt, 1975)

A set of rules that guide decision-making about the goal of the skill. Once a performance is made, information is stored and grouped in four general areas



- The environmental conditions
- The specific requirements of the movement
- The outcome of the movement and its knowledge of results
- The sensory information relating to the movement. Learning is optimized if the grouped information is stored.

# Four Stage Model of Learning Motor Skills (Graham, 1998)

- **Precontrol (beginner)** lack of ability to either consciously control or intentionally replicate a movement
- **Control (advanced beginner)** less haphazard movements- the body appears to respond more accurately to the child's intentions
- **Utilization (intermediate)** increasingly more automatic movements. Child has ability to use a movement in different contexts and their use requires little thinking about how to execute the movement
- **Proficiency (advanced)** somewhat automatic, effortless execution of skill. Can employ a skill in changing environments- unpredictable play.

# Skill Development Process

**Discrete Skill:** one has a specific movement and a specific ending (kicking, throw-in)

**Continuous Skill:** a series of movements that are repetitive or linked with other parts of skills to achieve an outcome (running, swimming)

# Transfer Theory & its Implications for Soccer

- **Transfer Theory:** the amount of influence the learning of one skill has on the learning of another.
- **Applied Dynamic Transfer (Carr):** skills must be performed in an environment that most reflects how the skill is used in game performance (dribbling through cones does not prepare them for dribbling in the game)

# Sensory Transmission

**Vision, Auditory, Kinesthetic**

Adequate Stimulation

Coding (intensity & frequency)

Adaptation

# Vision

Children under the age of 10 may not have Dynamic Visual Acuity (DVA) that have developed sufficiently to perform certain motor skills. Adult-like vision develops between ages 10 & 12 (Schalen, 1980). Young children have difficulty tracking balls in the air (pace and direction)

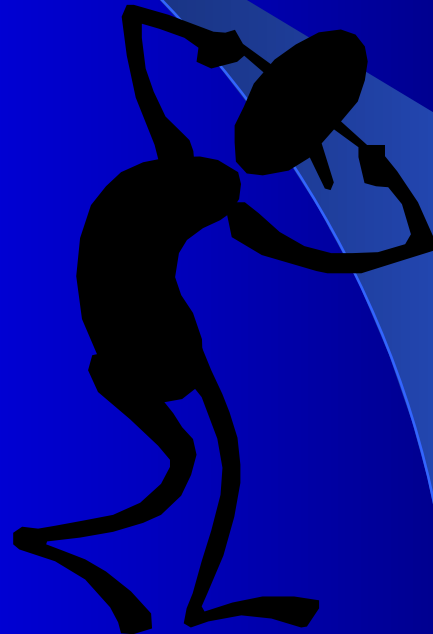
# Perception

**The application and interpretation of sensory- stored information**

In very young children, tactile and somatosensory information (pain, touch, warmth, vibration, etc.) predominates and is followed by visual learning

# Sensory

**Briefly holds sensory information before it is processed into short term memory**



# Short Term

**(Working memory)** passive rehearsal buffer for information. Ability to hold between 5 and 9 items (Miller, 1956). More information can be remembered if it is “chunked” into categories (routines). The function of working memory involves making decisions, problem-solving producing and evaluating movement, and creating long-term memory.

# Long Term



**(Knowledge base memory)**  
permanently stores information.  
Rehearsal is required to move  
information from working  
memory to long-term.

# Attention

Processing information  
by focusing on relevant  
stimuli; alertness;  
selectivity



- 1.) can be dynamic, changing initiation and duration throughout time
- 2.) attention has limited capacity
- 3.) attention requires effort and is a component of arousal
- 4.) attention limits the individual's capacity to combine actions (Schmidt, 1991)

# Information Processing

**Controlled Processing:** serial, slow, under voluntary control, and requires attention

**Automatic Processing:** requires little attention, is fast, parallel and involuntary

# Attentional Focus

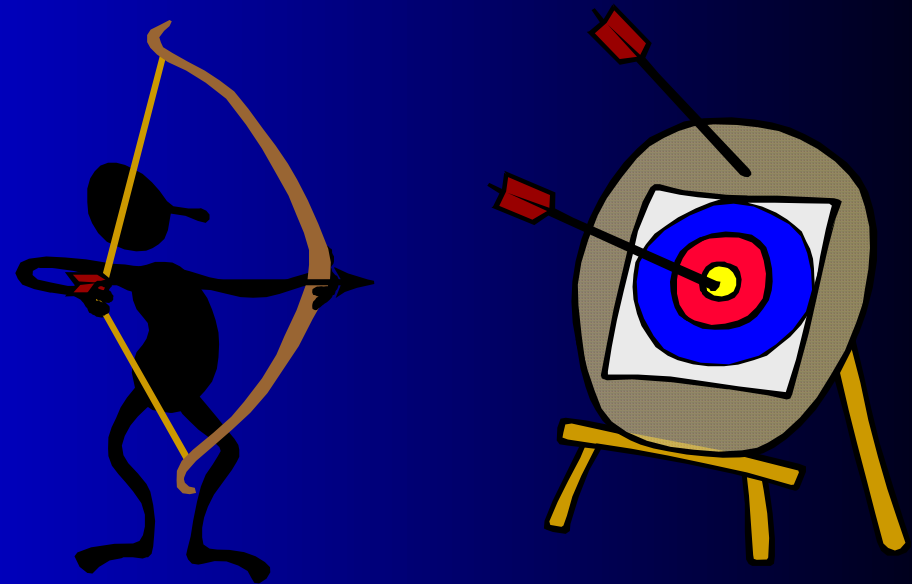
A state of focus in which irrelevant stimuli are removed and relevant ones are enhanced

**Focal:** small field with vivid details

**Diffuse:** wider span with less vivid details

**Style:** broad to narrow and vice-versa

# Feedback



**Augmented (external)**- knowledge of results, knowledge of performance, biofeedback

**Sensory (internal)**- vision, auditory, kinesthetic

**Feedback Statement-** information about skill just performed; can be general or specific

**Cue-** information just prior to next skill attempt

**Modeling-** demonstration of skill

**Manipulation-** physically maneuvering the body into proper position

**“Paralysis by Analysis”**: too much external feedback can lead an individual to rely on that feedback rather than developing an ability to process information and develop an internal mechanism for learning the skill (coaches- stop telling them what to do and how to do it)

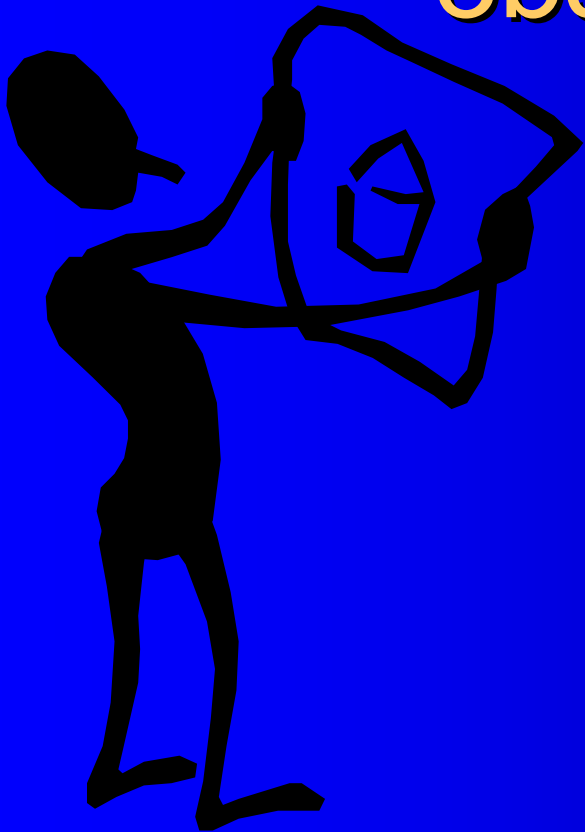


# Observational Learning

**Vicarious learning (Bandura, 1979)**

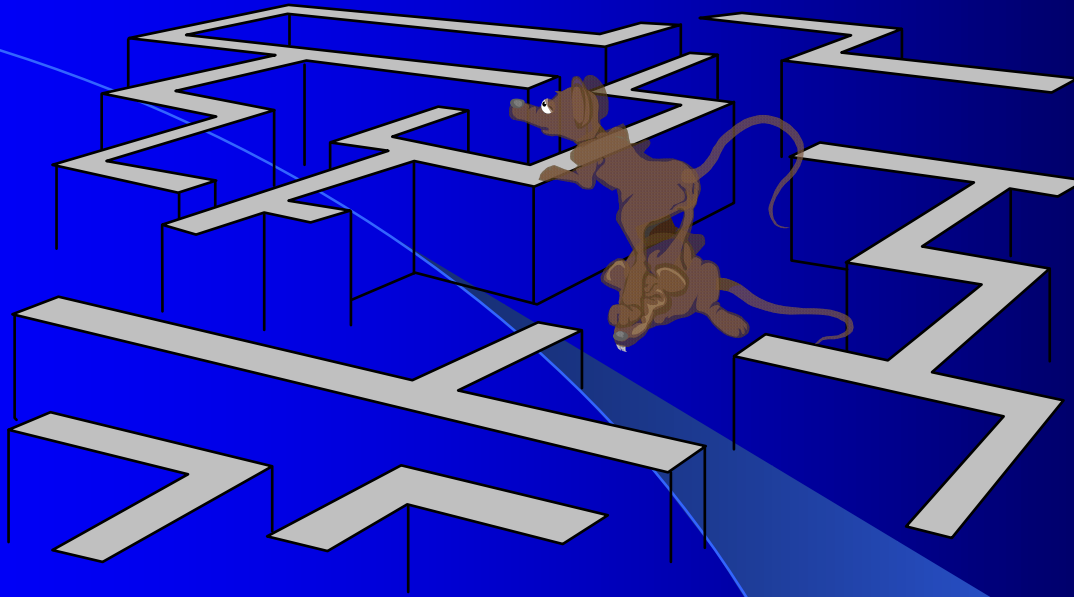
Children ages 4 to 7 reported difficulty organizing the information received through demonstration/observation (Weiss & Klint, 1987). Must provide verbal cues.

# Checklist for coach to develop efficient and effective observational skills



1. Classify each of the sport-specific skills
2. Understand the dynamics of game play and how skills are utilized within game contexts
3. “Chunk” each skill into phases
4. Focus on key body area
5. Interpret meaningful information
6. Provide effective and congruent feedback

# Practice Environment



Surroundings and conditions  
used to rehearse motor  
behavior performances

**Classical Conditioning-** shaping the relationship between stimulus and response, how a stimulus or a response is associated with another stimulus and the conditions under which stimulus and response are independently assessed. (Pavlov, 1927)

**Extinction-** length of time to eliminate a conditioned response by lack of reinforcement

# Reinforcement

**Schedule of Reinforcement-** a program to selectively reinforce through positive and negative rewards (fitness for punishment; good job, well done, nice try)

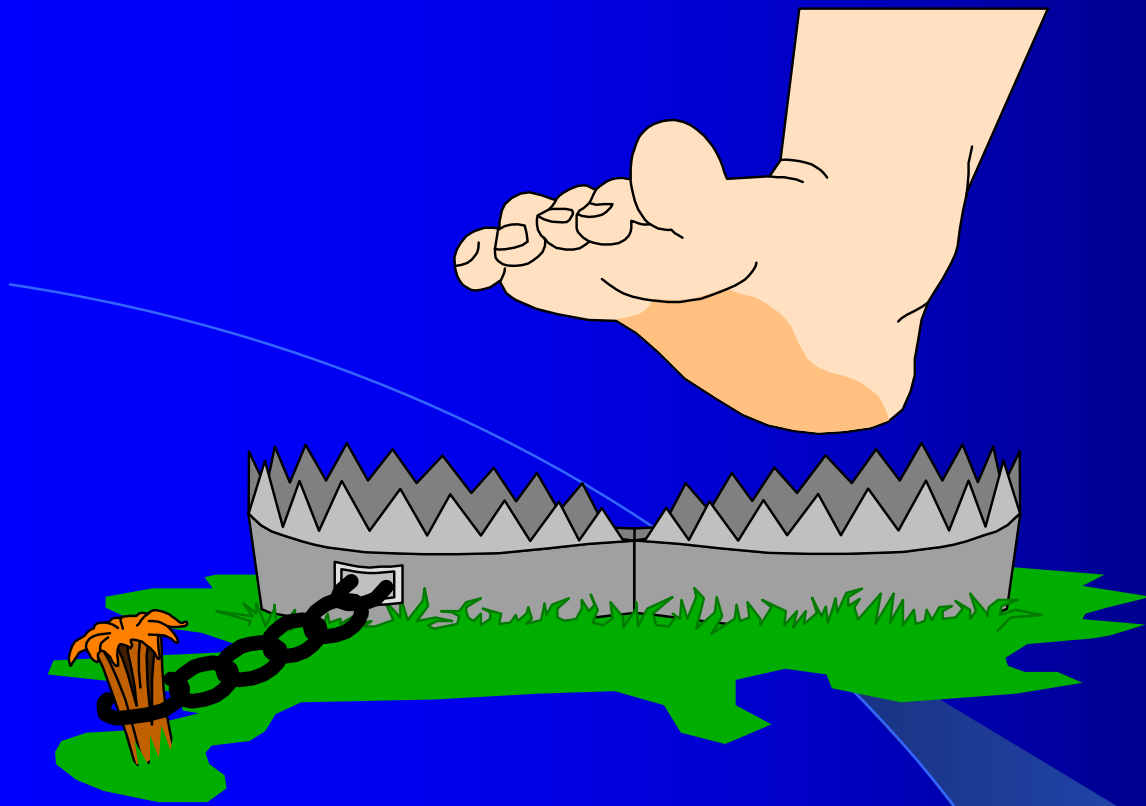
**Positive Reinforcement-** praise, pleasurable

**Negative Reinforcement-** scold, unpleasant

# Content

**Positive Content-** focus on what was done well  
(specific to task)

**Negative Content-** focus on what was not done  
well (specific to task)



Factors influencing learning  
and performance in a  
practice environment

1. Quality and quantity of motor skill practice (blocked vs. random)
2. Practice variability
3. Developmentally appropriate
4. Clear, concise, correct information
5. Simple to complex progression
6. Safe & appropriate training area
7. Opportunity for decision-making
8. Implications for the Game

# Contextual Interference

The use of different contexts to practice several skills

Learning through performance is better retained when the practice environment contains element of high contextual interference (Battig, 1966)

# Practice Structure

**Whole Task Practice-** motor skills presented and practice as an entire unit

**Part Task Practice-** motor skills presented and practice in parts

**Segmentation-** dividing parts into parts