

Motor learning: skill acquisition processed



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Motor control focuses on the processes that underlie the production of movement in health and disease. Motor learning focuses on how skilled movements are acquired, including the optimal conditions for learning new motor skills.

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Motor learning is a set of processes associated with practice or experience leading to relatively permanent changes in the capability for movement.

A change in the capability for movement rather than in movement itself. Retention test: estimating what was retained from a previous test.

The processes that underlie learning are associated with practice or experience.

Motor learning does not always require physical practice or experience. Conditions for Optimal Learning: The Law of Practice.

Maximizing the number of practice trials.

More practice leads to more learning. Following factors affect development of movement intelligence: Starting at young age.

Learning time

Instructor

Equipment

Progression: Starting the Learning Process at a Young Age. As early as the preschool years.

Basic skills = basis for other activities

Walking, throwing, catching

Skill should be taught correctly the first time to avoid development of bad habits. Providing Sufficient Learning Time: Without physical experience, skills

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cannot be effectively learned and maintained

Sufficient time must be allotted for participating in PA's that enhance movement skills
Being Taught By Qualified Instructors
Instructors, physical educators, and coaches must be properly trained and have experience with teaching PA

This means having trained physical educators fill such positions, rather than math or music teachers who do not have the necessary background
The Use of Quality Equipment
Safe, appropriate, and well maintained

Example: scaled down equipment for children

Lower basketball hoops

Smaller soccer nets

Lighter baseball bats

Effectiveness of teaching movement skills is directly related to the quality of equipment
Following the Right Progression
Teaching skills in an organized manner that makes skills easier to grasp and learn-simpler task --> complex task
Three general stages of motor learning have been identified
Cognitive, associative, autonomous
Each stage consists of: Changes that occur as motor learning takes place

Important features unique to each stage
Cognitive or Acquisition Stage
Begins when task first introduced

Learner cognitively determines:

What the particular skill involves

Performance goals required to perform the skill

Instructions:

Are verbally transmitted (verbal stage)

Serve to convey the general concept of the skill

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Self-talk and verbal reminders facilitate learning

Performance: slow, jerky, and awkward
Associative or Stabilization

Stage
Focused on performing and refining the skill

Concentration is directed toward smaller details (e. g., timing)

Performance: controlled and consistent

Rapid performance improvements (somewhat slower than fist stage)

Diminished self-talk
Autonomous or Application Stage
Performance: automatic and very proficient

Attention demands:

skill execution, creativity, strategy, environmental stimuli

Performance improvements:

Slow

Less obvious (e. g., reduced mental effort, improved style, reduced anxiety)
Information feedback" the information that occurs as a result of a movement"

Some information is received during the movement and some is provided as a result of the movement

Feedback is one of the strongest factors that controls the effectiveness of learning
Intrinsic Feedback
Information that is provided as a natural

consequence of performing an action
Extrinsic Feedback
Information that is provided to the learner by somebody else or some artificial means following a performance outcome

Provides information above and beyond what is naturally available to the learner (augmented feedback)

Can be controlled; when, how, how often...
Extrinsic Feedback
Knowledge of results

Information about the degree of success

Not effective when outcome is obvious

Important when outcome is less obvious

Knowledge of performance

Information about the execution of a completed movement

Example: " Took your eye off the ball," " Swing was a little late," etc.

Motivational Properties of Feedback
Extrinsic feedback serves to motivate the learner

Error correction

Therefore, a skilled instructor should be able to reinforce correct actions as well as point out errors
Feedback Can be a Crutch
Providing feedback continuously for a long period of time can lead to dependency

Occasional feedback tends to enhance learning

Various types of feedback that minimize dependency have been identified
Faded Feedback
Benefit: teacher can tailor feedback to respect individual differences
Bandwidth Feedback
Benefits:

Eventually faded feedback occurs

Lack of feedback = positive reinforcement

Movement consistency develops because learner is not encouraged to change movement on each trial
Summary Feedback
Benefits:

Generates movement consistency

Avoids overloading the learner
How Much Feedback is Necessary? Novel tasks: Processing capacity can be easily overloaded

Intense but selective instruction

One important piece of information feedback at a time
Descriptive (general) feedback
Indicates something you did, right or wrong

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Example: " There was no follow through" Prescriptive (precise)

feedback Provides Provides you with precise correction statements about how to improve your movements

Example: " Snap your wrist more on the follow through" What is the Best Timing for Information Feedback? Short-term memory is very susceptible to loss

Generally, the greater the delay of information provision the less effect the given information has

Therefore, immediate feedback is more beneficial Transfer of Motor

Learning Transfer of learning between two tasks generally increases as the similarity between them increases Types of transfer Positive versus negative Near versus far Positive transfer Example: practicing drills and lead-up games with strong (positive) transfer to the actual game

Learning can be positively transferred from practice to game situation when drills are similar in nature to the criterion task Negative transfer Not common Activities that may negatively transfer to the criterion task need to be avoided when performance is critical

Example: playing mini-golf before golf tournament Near transfer Desired when the learning goal is a task that is relatively similar to the training task

Transfer of learning is specific and closely approximates the ultimate situation

Example: practicing various plays before a volleyball tournament Far transfer Desired when interested in developing more general capabilities for a variety of skills

Occurs from one task to another very different task

Best applies when beginning to learn a skill

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Example:

overhand throw baseball throw, football throw, tennis serve, volleyball

spike... Transfer strategies Training machines and stimulators

Whole versus part practice

Lead-up activities and drills

Mental rehearsal Training Machines and Simulators Closely mimic features of real-world task

Goal = positive transfer of learning from simulator to the target skill

Effectiveness depends on the ability to simulate motor as well as perceptual,

conceptual, and biomotor elements Whole versus part practice Part practice

Practicing independent components of motor skill

Eventually, units of a task should transfer to the task as a whole

Example: gymnastics routine

Whole practice

Practicing skill as a whole

Example: golf swing

Part Practice Effective for tasks serial in nature and relatively long duration

Effective as long as the actions of one part do not interact strongly with the

actions of the next part (i. e., independent) Whole Practice Used with discrete

tasks of short duration where components interact intensely

Practicing individual components would change the essence of the skill Lead-

up Activities and Drills Transfer to another target sporting activity

Example: passing, shooting, dribbling, and faking drills for soccer

Improvement of basic abilities

Quickening, balancing, perceptual exercises, etc.

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Example: perceptual motor training
Mental Rehearsal
The process associated with mentally rehearsing the performance of a skill in the absence of any overt physical movement

Evidence has demonstrated that mental rehearsal generates positively transferable motor learning

Involves constructing model situations and going through the motions of what you will do later

Especially beneficial for injured athletes

It is a supplement to physical practice
Conditions for Optimal Learning
Massed vs. Distributed Practice

Variable vs. Constant Practice

Blocked vs. Random Practice
Massed vs. Distributed Practice
How much time should be spent in practice vs. rest during a practice session

How should practice sessions be distributed throughout the day

Retention
Variable vs. Constant Practice
Variable

Practicing the same skill under varying conditions

Constant

Practicing the same skill under constant conditions
Blocked vs. Random

Practice
Blocked

Practicing one skill until you become proficient

Random

Practicing many skills at one time