The Classification of Motor Skills
KIN 377 - Motor Learning

Ovande Furtado Jr

2023-08-31

Overview

Classifying skills into general categories helps us to understand the demands those skills place on the performer/learner Magill and Anderson (2020).

Learning Objectives

- Define and distinguish the terms *actions* , *movements* , and *neuromotor processes* and give examples of each.
- Describe the one common motor skill characteristic for each of three motor skill classification systems, the two categories of skills in each system, and examples of skills in each category of each system.
- Describe the two dimensions used to classify skills in the Gentile taxonomy of motor skills and the classification characteristic included within each dimension.
- Discuss ways to use the Gentile taxonomy of motor skills in physical rehabilitation or physical education and sport contexts.

The Study of Motor Behavior

A Multidisciplinary Field

MB is a multidisciplinary field that explores how people acquire, retain, and change motor skills

- Motor learning is the study of how people acquire, retain, and change motor skills through practice.
- Motor control is the study of how the nervous system controls movement.
- Motor development is the study of how motor skills change over time.

Why Study Motor Learning?

- We are born to move but learn to move **skillfully** .
- Skill is a biological imperative; without it, we would quickly perish.

  – Skill is vital to our sense of control of the world around us.
  – We depend on our capacity to learn and perform motor skills.

- One of the greatest strengths of humans is their unmatched ability to acquire skills.

The Process

This is the process of learning a new motor skill:

- Motor learning involves breaking the skill down into smaller components, practicing each component, and then gradually putting the components together to perform the entire skill.
- Motor learning can be improved through practice, feedback, and other techniques.

Motor learning is the study of how people acquire, retain, and change motor skills.

- The acquisition of motor skills is the process of learning a new motor skill. This process involves breaking the skill down into smaller components, practicing each component, and then gradually putting the components together to perform the entire skill.
- The performance enhancement of learned or highly experienced motor skills is the process of improving the performance of a motor skill that has already been learned. This can be done through practice, feedback, and other techniques.
- The reacquisition of skills following injury, disease, and the like is the process of regaining a motor skill that has been lost due to injury or disease. This can be a challenging process, but it is often possible with the help of rehabilitation.

Motor Control

The process of how the nervous system controls movement

- Motor control is a complex process that involves the brain, spinal cord, and muscles.
- The brain sends signals to the spinal cord, which then sends signals to the muscles.
- The muscles contract and move the limbs in the desired way.

Motor control is the study of how the nervous system controls movement.

- How the neuromuscular system functions to activate and coordinate the muscles and limbs involved in the performance of a motor skill is a complex process that involves the brain, spinal cord, and muscles. The brain sends signals to the spinal cord, which then sends signals to the muscles. The muscles contract and move the limbs in the desired way.
- How the nervous system uses feedback from the environment to control movement is also a complex process.
- The nervous system receives feedback from the environment through the senses, such as sight, touch, and hearing. This feedback is used to adjust the movement of the limbs in order to achieve the desired outcome.

Important Definitions

Skills and Actions

- Skills: Tasks or activities that have specific goals to achieve (action goals).
  - Require voluntary control over movements of the joints and body segments.
- Actions: Term often used synonymously with the term *motor skills* .

Characteristics of Skills and Actions

- There is a goal to achieve.
- Types of motor skills of interest are performed voluntarily.
- Motor skills require movement of joints and body segments to accomplish task goals.
- Skills need to be learned, or relearned.

Movements and Neuromotor Processes

- Movements: Specific patterns of motion among joints and body segments.
- Neuromotor processes: Mechanisms within the nervous and muscular systems that underlie the control of movements and actions.

Why Distinguishing?

- Actions, movements, and neuromotor processes represent the order in which motor control & learning are prioritized.
  - People initially learn to achieve action goals.

- People use a variety of movements to discover the best movement to accomplish the action goal.
- People modify neuromotor processes by refining the movement and making it more efficient.

> Not all people can accomplish the action goal using the same movement pattern. Different measures are used to evaluate actions, movements, and neuromotor processes.

Approaches of Classification

Why Classify Motor Skills?

- Provides basis for identifying similarities/differences among skills.
- Helps identify demands different skills place on performer/learner.
- Provides basis for developing principles related to performing and learning motor skills.

One-Dimension System

Size of Primary Musculature Required

- Two categories

  - Gross motor skills: Require the use of large musculature to achieve the goal of the skill.
    * Example: Walking, jumping, etc.
  - Fine motor skills: Require control of the small muscles to achieve the goal of the skill.
    * Example: Skills involving hand-eye coordination.

One-Dimension System

Specificity of Where Movement of a Skill Begins and Ends

- Two main categories

  - Discrete motor skills: Specified beginning and end points, usually require a simple movement.
    * Example: Flipping a light switch.
  - Continuous motor skills: Arbitrary movement beginning and end points; usually involve repetitive movements.

               ∗ Example: Steering a car

- Combination category: Serial motor skills

  – Involve a continuous series of discrete movements.
    ∗ Example: Shifting gears in a stick shift car.

One-Dimension System

Stability of the Environmental Context

- Environmental context: The physical location / setting in which a skill is performed.

  – Three specific features.
    ∗ Supporting surface.
    ∗ Objects involved.
    ∗ Other people or animals.

- Two main categories.

  – Closed motor skills: Involve a stationary supporting surface, object, and/or other people/animal; performer determines when to begin the action.
    ∗ Example: Picking up a cup while seated at a table.
  – Open motor skills: Performed in an environment in which supporting surfaces, objects, and/or other people or animals are in motion; environmental context in motion determines when to begin the action.
    ∗ Example: Catching a thrown ball.

Gentile's Two-Dimensional Taxonomy

Taxonomy : A classification system that is organized according to relationships among the component characteristics of whatever is being classified.

Gentile's Taxonomy of Tasks

- Environmental context.

  – Regulatory conditions : Features of environmental context* to which movements must conform to achieve the action goal.
    ∗ They regulate spatial and temporal aspects of the movement as well as the forces that underlie these characteristics.
    ∗ Objects, surfaces, or other people.

- Nonregulatory conditions : Features of environment that have no influence or only an indirect influence on movement characteristics.

- Environmental context.

  - Intertrial variability : Variations in the regulatory conditions associated with the performance of a skill change or stay the same from one trial to the next.
  - Example: When someone walks through a room several times in which various objects are located in different places each time because each walk through requires the person to walk with different movements to avoid colliding with the objects.

Table 1.2

Taxonomy of Motor Skills Based on the Environmental Context Dimension of Gentile's Two-Dimensions Taxonomy

Stationary Regulatory Conditions	No intertrial variability.	Free throws in basketball.Walking in an uncluttered hallway.
Stationary Regulatory Conditions	Inter-trial variability.	Golf shots during a round of golfTaking several drinks of water from the same glass.
In-Motion Regulatory Conditions	No inter-trial variability.	Hitting tennis balls projected at the same speed from a ball machine.Walking on a treadmill at a constant speed.
In-Motion Regulatory Conditions	Intertrial variability.	Hitting tennis balls during a rally in a game.Walking in a hallway crowded with moving people.

Gentile's Taxonomy of Tasks

- Function of the action.

  - Body stability: Skills that involve no change in body location during the performance of the skill.
  - Body transport: Includes active and passive changes of body locations.
  - Object manipulation: Maintaining/changing the position of moveable objects.

Table 1.1:

Gentile's Taxonomy of Motor Skills

Environmental Context	Intertrial Variability (ITV)	Body Stability: No Object Manipulation	Body Stability: Object Manipulation	Body Transport: No Object Manipulation	Body Transport: Object Manipulation
Stationary Regulatory Conditions	No ITV	1A	1B	1C	1D
Stationary Regulatory Conditions	ITV	2A	2B	2C	2D

Environmental Context	Intertrial Variability (ITV)	Body Stability: No Object Manipulation	Body Stability: Object Manipulation	Body Transport: No Object Manipulation	Body Transport: Object Manipulation
In-Motion Regulatory Conditions	No ITV	3A	3B	3C	3D
In-Motion Regulatory Conditions	ITV	4A	4B	4C	4D

Characteristics of Gentile's Taxonomy

- Each skill category poses different demands on the performer.
- Skills that demand the least of the performer are the simplest; those that demand the most are the most complex.

    - Skill categories begin at the top leftmost category with the simplest skills and progress to the most complex in the bottom rightmost category.

- Environmental context dimension and the action function dimension form the basis for creating sixteen categories of motor skills.

Practical Application of the Taxonomy

- Can be used for evaluating a learner's movement capabilities and limitations.
- Becomes a valuable tool for systematically selecting a progression of functionally appropriate activities to:

    - Increase person's performance capabilities.
    - Help the person overcome his or her performance deficiencies.

- Charts a person's progress.

    - Creates a profile of competencies

References

Magill, Richard A., and David Anderson. 2020. *Motor Learning and Control: Concepts and Applications.* McGraw-Hill Education. https://www.bkstr.com/csunorthridgestore/product/motor-learning-and-control--concepts-and-applications-147614-1.