CHAPTER 1

The Classification of Motor Skills
What is motor learning?

Emphasizes the acquisition of motor skills, the performance enhancement of learned or highly experienced motor skills or the re-acquisition of skills that are difficult to perform or cannot be performed because of injury or disease.
Why study motor learning?

- The focus is on motor skill acquisition.

- Understand how we acquire a motor or sport skill is important for several reasons:
  - Designing effective practices
  - Providing effective instruction
  - Providing effective feedback

- To be an effective instructor or clinician one needs to have an understanding of how we acquire motor skills.
What is motor control?

How our neuromuscular system functions to activate and coordinate the muscles and limbs involved in performing a motor skill.
Why study motor control?

In recent years there has been a great deal of interest among clinicians regarding the research in motor control and the implications research has on clinical practice.

Study of motor control exploring the research leads to the best clinical practices.

In studying motor control one becomes “an applied motor control physiologist (Brooks, 1986)”

Study of motor control is critical to clinical practice.
What is motor development?

“The study of the changes in human motor behavior over the lifespan, the processes that underlie these changes, and the factors that affect them”

* Age-related changes

* Movement product

* Underlying changes in processes
Why study motor development?

- Contributes to our general knowledge of understanding ourselves and the world we live in.
- Understanding human development across the lifespan helps us to diagnose problems in human who do not develop normally.
- Helps individuals perfect or improve their movement performance potential by providing developmentally appropriate activities.
  - One can compare “normal” to special populations to recognize coordination problems, trends, and gains.
Concept 1: Skills & Movements

- Define and identify the difference between skills and movements.
Motor Skill: Definition

- A goal to achieve or action goal.
- Performed voluntarily
- Requires body, head, and/or limb movement.
- Must be learned or relearned
The skills in:

The skills in golf are:

The skills in locomotion are:

Eye-hand are:

Eye-foot are:

In tennis are:
MOVEMENTS

- Behavioral characteristics of the body, the head, and/or a specific limb or combination of limbs.

- Grouped by category
  - Throwing (side arm, underhand, overhead)
  - Catching (one hand, two hand, underhand)
  - Jumping (one foot, two foot, high jump)
Why distinguish movements from skills?

1. People learn to perform a movement to achieve a certain goal but the skills can be performed in different ways from one person to the next.

2. People can adapt their movement characteristics (e.g., speed, force, displacement) to achieve a certain goal within their own physical limitations. The preferred way is not allowable for some people due to physical constraints.

3. Movement are evaluated by kinetic, kinematic, and EMG measures where as skills are evaluated by outcome measures.
Concept 2: One-dimension classifications

- Describe and discuss the three one-dimension classification systems.
ONE-DIMENSION CLASSIFICATION SYSTEMS

- Used to identify skill characteristics that are similar.

- Divided into two categories, which represent extreme ends of a continuum.

- One dimensional systems
  - Size of primary musculature required
  - Specificity of where actions begin or end
  - Stability of the environment
SIZE OF PRIMARY MUSCULATURE

- Gross ................... to .................... Fine
CLASSIFY THE FOLLOWING MOTOR SKILLS

Gross .................. TO .................. Fine

MOTOR SKILLS

- Writing
- Pitching a baseball
- Keyboarding
- Running
- Knitting

Why is it important to classify skills based upon degree of musculature?
DISTINCTIVENESS OF THE MOVEMENTS

Discrete...........Serial..................Continuous
CLASSIFY THE FOLLOWING SKILLS

DISCRETE ............... SERIAL .......... CONTINUOUS

MOTOR SKILLS

- Shooting a free-throw
- Walking
- Catching a ball
- Triple Jump
- Dance Routine

Why is it important to classify skills based upon degree of distinctiveness?
STABILITY OF THE ENVIRONMENT

- Closed skill..................................Open Skill

- Environment refers to the object the person is acting on or to the characteristics of the context in which the person performs the skill.
OPEN/CLOSED CLASSIFICATION SYSTEM

- Closed skill
  - Performer initiates the action
  - Environmental context is stable (does not change from trial to trial)

- Open Skill
  - Performer must act according to the actions of skill
  - Performer must act according to the actions of the changing environment
CLASSIFY THE FOLLOWING MOTOR SKILLS

CLOSED..........................TO..........................OPEN

MOTOR SKILLS IN THE GAME OF TENNIS

■ Tennis serve
■ Hitting a baseball off a batting tee
■ Jump shot in the game of basketball
■ Extra point (kicking) in football
■ Walking to class
Walking Rehab

- Develop a closed practice for re-training one to walk in rehab?
- Develop a open practice for re-training one to walk in rehab?
Concept 3: Two-dimensional classification

Describe the two dimensions used to classify skills in Gentile’s taxonomy of motor skills and the classification characteristics included in each dimension.
Gentile’s 2-Dimensions Taxonomy

The two dimensions are:

**Environmental context**
- Open or Close
- Inter trial variability

**Function of actions**
- Performer stationary or moving
- Performer manipulates an object or not
Function of Action

1. Does the movement involve moving the body or not?
   - i.e., does the performer standing still when shooting an arrow
   - i.e., does the performer moving while shooting

2. Does the movement involve manipulating an object or not?
   - i.e., Performer manipulates a ball, puck, stick, bat, racquet, paddle, tool, or another persons
   - i.e., Performer does not manipulate an object.
Environmental Context

- Inter-trial variability – the conditions during the performance are the same or different from one trial to another.

  - Examples
    - Ball’s path and speed is same each trial
    - Ball’s path and speed is different for each trial
## Gentile’s Model

<table>
<thead>
<tr>
<th>Environmental Context</th>
<th>Body Stability</th>
<th>Body Transport</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No object manipulation</td>
<td>No object manipulation</td>
</tr>
<tr>
<td>Stationary with no intertrial</td>
<td>Body stability/no object</td>
<td>Body stability/object</td>
</tr>
<tr>
<td>Stationary with intertrial</td>
<td>Body stability/no object</td>
<td>Body stability/object</td>
</tr>
<tr>
<td>In-motion with no intertrial</td>
<td>Body stability/no object</td>
<td>Body stability/object</td>
</tr>
<tr>
<td>In-motion with intertrial</td>
<td>Body stability/no object</td>
<td>Body stability/object</td>
</tr>
</tbody>
</table>
## Example: Applying Gentile’s Model

<table>
<thead>
<tr>
<th>Action Function</th>
<th>Body Transport:</th>
<th>Body Transport:</th>
<th>Body Transport:</th>
<th>Body Transport:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Context</td>
<td>None</td>
<td>Object Manipulation:</td>
<td>None</td>
<td>Object Manipulation:</td>
</tr>
<tr>
<td>Regulatory Conditions:</td>
<td>Stationary</td>
<td>Intertrial Variability:</td>
<td>Hitting off a batting tee from the same height for every trial. The hitter is stationary and does not strike the ball.</td>
<td>Hitting off a batting tee from the same height for every trial. The hitter moves in all different directions then swings at the ball.</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Regulatory Conditions:</td>
<td>Stationary</td>
<td>Intertrial Variability:</td>
<td>Hitting off a batting tee. But for every attempt the height of ball on the tee is raised or lowered. The hitter is stationary and does not strike the ball.</td>
<td>Hitting off a batting tee. But for every attempt the height of ball on the tee is raised or lowered. The hitter moves in all different directions then swings at the ball.</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Regulatory Conditions:</td>
<td>Has Motion</td>
<td>Intertrial Variability:</td>
<td>Hitting off a pitching machine where the ball comes at the same location and speed. The hitter stands their holding bat over the hitting area but does not swing.</td>
<td>Hitting off a pitching machine where the ball comes at the same speed and location. The hitter moves around without a bat.</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td></td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>Regulatory Conditions:</td>
<td>Has Motion</td>
<td>Intertrial Variability:</td>
<td>Standing and watching the thrower throw different types of pitches.</td>
<td>Pretending to hitting with no bodily movement or stationary while the pitcher moves throwing different pitches.</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td></td>
<td>13</td>
<td>15</td>
</tr>
</tbody>
</table>

Chapter 1
Developmentally Appropriate Activity

- 2. Hitting off a batting tee from the same height where hitter strikes the ball with a bat.

- 6. Hitting off a batting tee but from a different height with each strike.

- 8. Hitting off a pitching machine where the ball comes at the same height and speed. The hitter stands in the same area and strikes the ball with a bat.

- 14. Hitting a ball from a pitcher who is pitching different types of speeds every throw.
PRACTICAL APPLICATION OF GENTILE’S MODEL

One starts with 1 and progress to 4.

Using the for 4 steps in previous slide, design how one would retrain a person how walk after a stroke?
PRACTICAL APPLICATION OF GENTILE’S TAXONOMY

1. Evaluation of movement capabilities and limitations.
2. Select functionally appropriate activities.
3. Chart an individual’s progress through rehab or skill development.
In Summary

- Classification of motor skills is the first step in developing the skill.

- There are different types of classification taxonomies. Each has its own purpose.