

# Introduction to Motor Development, Control, & Motor Learning

## Chapter 1

# 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.

# What is motor control?

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

# 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: Developmental appropriate practices or programs

Development has become associated with the changes type and quality of experience we pass through in life. If these experiences are *developmentally appropriate in* early childhood, exercise program, rehab, or learning of motor or sport skills it will assure that the child will develop normally.

# Developmentally Appropriate Perspective

## – Age appropriate

- Predictable sequences of growth and development through which most children pass.
- Knowledge of these sequences provides a basis from which we provide the best instructional experiences for student and/or client

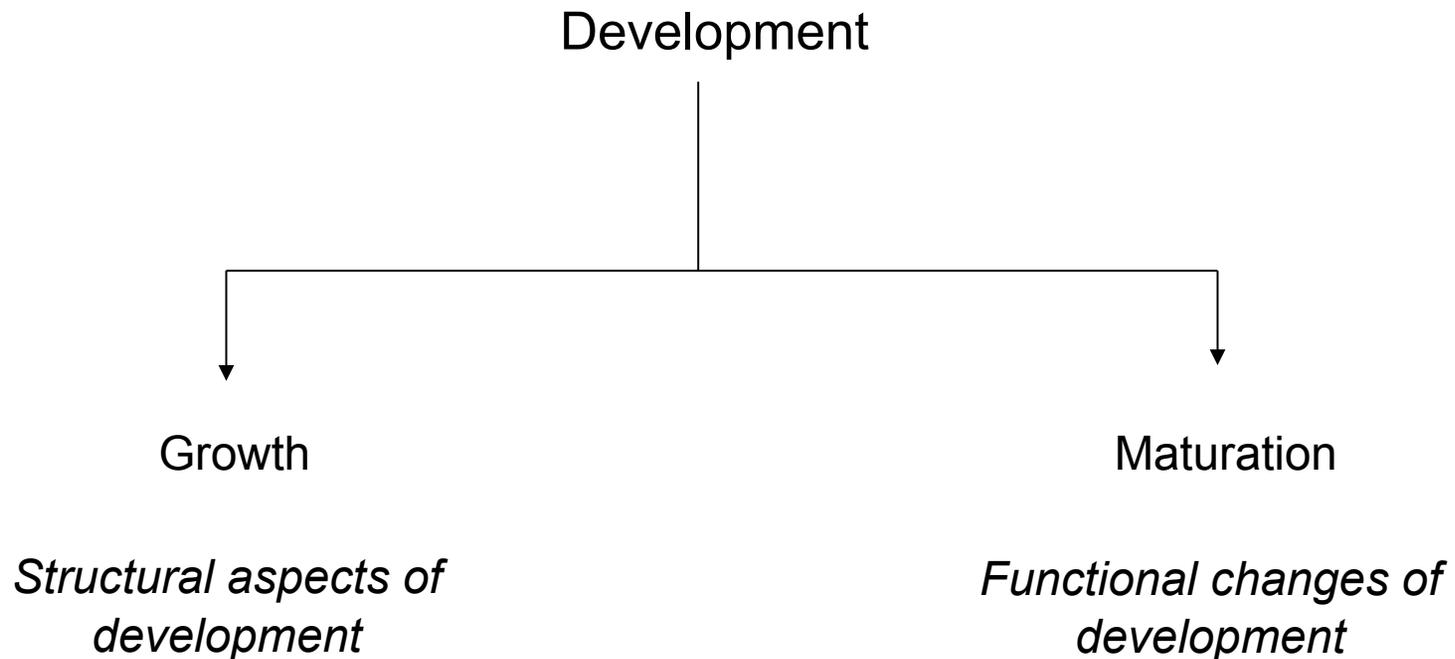
## – Individual appropriate

- Children nor clients pass through these sequences in the same manner or within the same time period.
- Based on their stage of development
  - Experience player versus inexperienced

# Elements of Developmental Appropriate Change

1. Qualitative- Components of a skill change as does the product outcome. (i.e. one can jump farther)
2. Sequential-Identifiable sequences of development (e.g. crawling to upright walk)
3. Cumulative-motor behavior is additive (e.g. assisted to unassisted standing)
4. Directional- skill progress but can regress as we age, due to training, or due to disease
5. Multifactorial- no one factor directs change, it may be a combination of physical characteristics, movement opportunities, the learning environment, the task and individual that affects the speed of development.
6. Individual-rate of change varies for all humans but the general sequence of development remains stable.

# Concept 2: Maturation & Growth



# Maturation & Growth

Qualitative functional changes that occur with age is known as maturation.

- \* i.e., as the brain matures, children's higher order cognitive abilities change (e.g. some say that children below the age of 10 have difficult with playing sports that have complex plays and rules, such as baseball, soccer, & football)

Quantitative structural changes that occur with age is growth.

- \* Increase in physical size (i.e., height, weight)
- \* Most noticeable growth changes occur during adolescence -height, weight, muscle adaptation, hormonal changes, and body fat differ by gender

# Issue

- Using the qualitative and quantitative concepts, children should not play organized sport before the age of 10?  
Agree or not agree!

# Concept 3: Developmental Direction

1. Cephalocaudal – we develop from the top of the body (head) to the tail (feet).
2. Proximodistal- we develop from points close to the center of the body to points close to the periphery.
3. Differentiation- we progress from gross, immature movement to precise, well-controlled, intended movement.
4. Integration- we become more capable of integrating the various systems, especially the muscular system, to produce a well-controlled, intended movement.

# Concept 4: Process-Product Controversy

## Product Approach



Task, oriented approach that measures the development of a skill based on the end results or outcome.

## Process Approach



Process, oriented approach which emphasizes the movement itself with little attention to the outcome

***Which is better way to develop a movement: Emphasis on the outcome or the form of the movement?***

# Process Versus Product

Having deliberate practices that are extrinsically motivated, that is, focused on outcomes rather than processes, and having somewhat rigid rules involving children have detrimental effects on learning and motivation (Piaget, 1962; Wiersma, 2000).

# Developing tennis players

- Coach works with a player by emphasis on stroke development (proper grip, stance, arm action, etc).
- Coach works with a player by emphasis on where they should hit the ball and what to do with the ball

# Major League Baseball Scouts

- Drafting players based on process
  - how fast they can run
  - velocity in throwing
  - Hitting
- Drafting player based on product:
  - On base percentage
  - Slugging %
  - Number of run scored
  - Hitting deep in the count versus first ball hitters
  - Out of College

## Concept 5: Age Period Approach

- For example some parent's are concerned about the child's ability to walking independently by 18 months of age. If not there must be something wrong with the child.
- Walking by 18 months is based on growth factors;
  - Size of child's head in relation to body
  - Weight.

# Lifespan Periods

- Prenatal Period
  - Embryonic Period (conception to 8 weeks)
  - Fetal period (Organogenesis-birth)
- Infancy
  - Neonatal period (birth to 22 days)
  - Infant (first day of life to independent walking)
- ***Toddler (independent walking to 4 years)***
- ***Early Childhood (Somewhere between 4-7 years)***
- ***Middle Childhood (Somewhere between 7-9)***
- ***Late Childhood (Somewhere between 9-12)***
- ***Adolescence***
  - ***11 to 19 for girls***
  - ***12 to 21 for boys***
- ***Early Adulthood (After 19 for young women; after 21 for young men to 40)***
- ***Middle Adulthood (Ages 40 to 60)***
- ***Late Adulthood (Ages 60 to death)***

# Summary

1. Human development is the progression and regression that occur within human beings as they age and over the lifespan.
2. Development is age-related but not totally age dependent.
3. Developmentally appropriate planning involves six elements: qualitative, sequential, cumulative, directional, multifactor, and individual.
4. Directions of development describe motor development trends.
5. Product versus process approach is used to evaluate and measure movement performances.
6. Age-period approach is useful for facilitating our study of motor develop through a lifespan perspective.

# Quiz

- On the answer sheet mark the appropriate response that best completes the question.

# Question #1

- Which one of the following disciplines is concerned with the acquisition and retraining one to develop or relearn motor or sport skills?
  - A. Motor development
  - B. Motor control
  - C. Motor Learning
  - D. Exercise physiology

## Question #2

- The developmental appropriate perspective comprises two concepts, they are:
  - A. Gross to fine; open & closed.
  - B. Age appropriate; Individual appropriate
  - C. Easy to difficult; Critical periods
  - D. Developmental phases; age appropriate

# Question 3

- A stroke patient is being retrained to move their shoulder muscles first, then the upper arm, then the lower arm, and lastly the finger is what concept of development:
  - A. Proximodistal
  - B. Cephalocaudal
  - C. Differentiation
  - D. Integration

# Question 4

- When one's ability to run is related to a loss of weight and increase in length of the his or her limbs is consider to be caused by:
  - A. Maturation
  - B. Growth
  - C. Practice
  - D. Differentiation

# Question 5

- Instructors who emphasizes repetitive practice of the same skills, video analysis about the form of the player, provide feedback about the athlete's movements, and provide instructor about how the performer moves has taken what approach in developing this athlete:
  - A. Product
  - B. Process
  - C. Integrated
  - D. DEPA approach