KINESIOLOGY

The study of human movement
Kinesiology

- Anatomy
- Physiology
- Physics
- Geometry
Kinesiology

- Kinetics
- Kinematics
What motions does the joint allow?
Kinesiology

- A muscle must “span” a joint to cause motion in that joint.
Kinesiology

- Line of Pull
Kinesiology: Motions and Locations

- Anatomical Position
  - Standing upright, eyes facing forward, feet parallel and close together, arms at the sides with palms facing forward
Kinesiology: Positions and Locations

- Fundamental Position
  - Anatomical position, but the palms are turned facing the body
Kinesiology: Positions and Locations

- **Medial**
  - toward midline
- **Lateral**
  - away from midline
- **Anterior**
  - front or ventral
- **Posterior**
  - back or dorsal
Kinesiology: Positions and Locations

- **Distal**
  - Away from the torso

- **Proximal**
  - Closer to the torso

- **Superior**
  - Above or cephalad (toward the head)

- **Inferior**
  - Below or caudal (toward the feet/tail)
Location, location, location

- Superficial
  - Toward the body’s surface (skin)
- Deep
  - Toward the body’s core (inside)
Location of parts of muscles

- **Origin**
  - The proximal attachment of a muscle or ligament

- **Insertion**
  - The distal attachment of the muscle or ligament
Patient position

- **Prone**
  - The patient’s position if they are face down

- **Supine**
  - The patient’s position if they are face up
Kinesiology: Motions

- **Translation or Linear motion**
  - All parts of a “body” move in the same directions as every other part
    - Rectilinear – if they move in a straight line (bowling ball)
    - Curvilinear – occurs in a curved line (baseball)
Kinesiology

- Rotation or Angular Motion
  - The arc of movement of a “body” about an axis of rotation.
  - The axis is the pivot point. (the elbow is the pivot point and the forearm is rotating around it.)
Kinesiology

- Osteokinematics
  - Motion that occurs at joints due to the joint’s bony structure.

- Joints or articulations – the articulation of two bones – where 2 bones meet.

- Open vs. Closed-chain motion
Segments and Motions…

- In any joint you have a proximal and a distal segment.
- Movement of the distal segment when the proximal segment is fixed is referred to as an open-chain motion.
- Movement of a proximal segment against a fixed distal segment is referred to as a closed-chain motion.
Open Chain Exercises

- Typically use a single joint with the weight being lifted by a freely movable arm or leg.
  - The hands and feet are free to move
  - Usually, these are non weight bearing exercises.
  - The movement occurs at the elbow or knee and the weight is on the distal end of the limb.
  - There is an increased stress placed on the joints and therefore may not be suitable for individuals with joint inflammation or injuries.
  - Generally targets an individual muscles
Open Chain Exercises

- Bicep curl
- Leg extension
- Lat pulldown
- Chest press
- Leg curls
Closed Chain Exercises

- Involve multiple joints as the resistance is not static and moves on the anchored part of the body.
- The distal segment (hands/feet) are fixed and in constant contact with a surface.
- Typically consist of weight bearing exercises
- Strengthen multiple muscle groups simultaneously
- Better mimic functional daily movements
- Less stress on joints and ligaments
  - Injury may result due to lack of predictability in real world scenarios, think ACL injury!
Closed Chain Exercises

- help to stabilize the joints and may lead to better coordination and stability
- more common than open chain exercises in rehabilitation, sports conditioning
  - Push ups
  - Squats
  - Lunges
  - Pull ups
  - Leg Press
  - Dips
  - Running
Osteokinematics

- Describes the motion of bones relative to the three cardinal planes of the body
  - Sagittal
  - Frontal (coronal)
  - Horizontal (transverse)
What occurs at this plane of motion?

1. Frontal plane
   a. Abduction/adduction
   b. Lateral flexion
   c. Ulnar and radial deviation
   d. Eversion and inversion
What occurs at this plane of motion?

2. Sagittal plane
   a. Flexion and extension
   b. Dorsiflexion and plantar flexion
   c. Forward and backward bending
What occurs at this plane of motion?

3. Horizontal plane
   a. Internal (medial) and external (lateral) rotation
   b. Axial rotation
PART II

MOTION

GET READY TO MOVE!!!!
Kinesiology: Motions

- Flexion
  - Bending movement
  - Causing a decrease in joint angle
Kinesiology: Motions

- **Extension**
  - Straightening movement
  - Causing an increase in the joint angle
Kinesiology: Motions

- ABDuction
  - Movement away from midline
Kinesiology: Motions

- ADDuction
  - Movement toward midline
Kinesiology: Motions

- Circumduction
  - Combination of flexion, extension, ADDuction and ABDuction in a sequence in the air
Kinesiology: Motions

- **Rotation**
  - **Internal rotation**
  - (Medial rotation)
    - The anterior surface moves toward midline rotating around its longitudinal axis
Kinesiology: Motions

- **Rotation**
  - **External**
  - **(Lateral)**
    - The anterior surface of the structure moves away from midline rotating around its longitudinal axis.
Kinesiology: Motions

- **Inversion**
  - Moving the sole of the foot inward at the ankle
Kinesiology: Motions

- Eversion
  - Moving the sole of the foot outward at the ankle
Kinesiology: Motions

- **Protraction**
  - Movement along the plane parallel to the ground and away from midline

- **Retraction**
  - Movement the opposite of protraction
Kinesiology: Motions

- **Supination**
  - Anatomical position of the forearm
  - Palm facing forward or anteriorly
  - Palm is facing UP
Kinesiology: Motions

- **Pronation**
  - The palm is facing posteriorly or down
Kinesiology: Motions

- **Palmar flexion**
  - Flexion at the wrist
- **Plantar flexion**
  - Flexion at the ankle
  - Pushing the foot downward
Kinesiology: Motions

- Dorsiflexion
  - Extension at the ankle
  - Bringing the foot upward
Kinesiology: Motions

- **Horizontal ABD/ADD**
  - When the shoulder joint is flexed to 90° and then ABD (away from midline) or ADD (toward midline)
Kinesiology: Motions

- **Ulnar deviation**
  - When the wrist moves the hand medially toward the ulna

- **Radial deviation**
  - When the wrist moves the hand laterally toward the radius
Kinesiology: Motions

- Lateral bending
  - When the neck or trunk moves sideways in the frontal plane
  - Also known as lateral flexion or sidebending