(1) Intro to Kinesiology

- Major Divisions of the Human Body
- Joints Between Major Body Parts
- Describing Movement in the Body
- True Movement vs. “Going Along for the Ride”
- Anatomic Position
- Directional Terms
- Planes of Movement
- Axes of Movement
- Joint Action Terminology Pairs
- Concept of “Reverse Actions”

(2) Major Divisions of the Human Body

- The human body can be divided into the Axial body and the Appendicular body
- The **Axial Body** is the central core axis of the body and contains the head, neck and trunk
- The **Appendicular Body** is made up of appendages that are “added(appended) onto” the axial body, and consists of the upper and lower extremities
  - The **Upper Extremity** consists of the shoulder girdle, arm, forearm and hand
  - The **Lower Extremity** consists of the *pelvis, thigh, leg and foot

*Note: the pelvis is considered a transitional body part that is part of both the axial body and appendicular body, as the sacrum and tailbone are part of the spine (axial body) and each hip bone is part of the lower extremities (appendicular body)*

(3) Joints Between Body Parts

- What separates one body part from another is the presence of a joint, which is located between the bones of adjacent body parts
- When a body part moves, it moves relative to another body part that is next to it
This movement occurs at the joint that is between the two body parts

(4) How to Describe a Movement

Confusion can arise if we describe a movement by only stating the body part or joint where the movement is occurring

- i.e., “flex the elbow” does not indicate which body part is moving (the forearm or the arm); “flex the forearm” does not indicate which joint is involved (the elbow or the wrist)

To avoid any possible confusion, when describing movement three things should be stated:

1. the action that is occurring
2. the name of the body part that is moving
3. the joint where the movement is occurring

Examples:

- “flexion of the forearm at the elbow joint”
- “extension of the arm at the elbow joint”
- “lateral rotation of the thigh at the hip joint”

(5) True Movement versus “Going Along for the Ride”

For true movement of a body part to occur, it must move relative to an adjacent body part

For example, when the forearm is flexing at the elbow, the hand is merely going along for the ride (as it is not moving at the wrist); or, when anteriorly tilting the pelvis as we “swan dive” over the legs, the spine is just going along for the ride

(6) Anatomic Position

Anatomic position is the position assumed when a person stands upright, facing forward, with the arms at the sides, the palms facing forward, and the fingers and thumbs extended (similar to Tadasana)
Anatomic position is important because it is used as a reference position for naming locations, structures and points on the human body.

(7) Directional Terms

- Describing a location on the human body involves the use of specific *directional terms* that describe the location of one structure or point on the body relative to another structure or point on the body -- always in reference to anatomic position.
- Using specific terminology helps avoid the ambiguity of lay language.
- Directional terms always come in pairs of opposites, and can be combined to more specifically indicate location (e.g., “anteromedial,” or “posterolateral”).

(8) Anterior/Posterior

- **Anterior**: farther to the front
- **Posterior**: farther to the back
  - Example: the sternum is *anterior* to the spine; the spine is *posterior* to the sternum.

(9) Medial/Lateral

- **Medial**: closer to the midsagittal plane (which is an imaginary line that divides the body into left and right halves)
- **Lateral**: farther from the midsagittal plane
  - i.e., the sternum is medial to the humerus; the humerus is lateral to the sternum
  - i.e., the little finger is medial to the thumb; the thumb is lateral to the little finger

  *Note: in the forearm, the terms ulnar/radial can replace the terms medial/lateral, respectively; in the leg, the terms tibial/fibular can replace the terms medial/lateral, respectively.*

(10) Superior/Inferior

The terms superior and inferior refer to the axial body parts only.
Superior: above
Inferior: below
  - i.e., the head is superior to the trunk; the trunk is inferior to the head
  - i.e., the sternum is superior to the umbilicus; the umbilicus is inferior to the sternum

(11) Proximal/Distal

The terms proximal and distal refer to the appendicular body parts only

- Proximal: closer to the axial body
- Distal: farther from the axial body
  - i.e., the arm is proximal to the forearm; the forearm is distal to the arm
  - i.e., the thigh is proximal to the leg; the leg is distal to the thigh

(12) Superficial/Deep

The terms superficial and deep can be used for the entire body

- Superficial: closer to the surface of the body
- Deep: farther from the surface of the body (more internal)
  - i.e., the anterior abdominal wall muscles are superficial to the intestines; the intestines are deep to the anterior abdominal wall muscles
  - i.e., the biceps brachii muscle is superficial to the humerus; the humerus is deep to the biceps brachii

(13) Planes of Movement

- When we want to describe motion of the human body, we need to describe or map the space through which motion occurs
- As space is 3-dimensional, three types of planes exist to describe movement through those dimensions
(14) The Sagittal Plane

♦ The *sagittal plane* divides the body into left and right portions
♦ Movements in the sagittal plane occur in an anterior to posterior, or posterior to anterior direction (i.e., nodding the head yes, reaching for the refrigerator door handle, moving into a forward bending pose)

(15) The Frontal Plane

♦ The *frontal (coronal) plane* divides the body into anterior and posterior portions
♦ Movements in the frontal plane occur in a medial to lateral, or lateral to medial direction (i.e., sweeping the arms out to the side, spreading the feet apart, moving into Warrior 2 from Tadasana)

(16) The Transverse Plane

♦ The *transverse (horizontal) plane* divides the body into superior/proximal and inferior/distal portions
♦ Movement in the transverse plane is rotational -- the body part spins in place (i.e., turning the head no, twisting the spine, externally/internally rotating the arm in the shoulder joint)

(17) Oblique Planes of Movement

♦ An *oblique plane* is a plane that is not exactly sagittal, frontal, or transverse, but has components of two or three cardinal planes
♦ For example, when swan diving into *Uttanasana*, the arms move in an oblique plane that is a combination of the frontal and sagittal planes

(18) Axes of Movement

♦ When motion of a body part occurs, it can be described as occurring within a plane
♦ Motion within a plane can be further described as moving around an imaginary line called an *axis*, which is perpendicular to the plane in which the movement is occurring
Thus, three cardinal axes exist that correlate to the three cardinal planes (each axis is named according to its orientation)

(19) The Mediolateral Axis

- Movements in the sagittal plane occur around a mediolateral axis, which is an axis that runs from medial to lateral (or lateral to medial)
- Flexion and extension are movements that occur within the sagittal plane around a mediolateral axis

(20) The Anteroposterior Axis

- Movements in the frontal plane occur around an anteroposterior axis, which is an axis that runs anterior to posterior (or posterior to anterior)
- Abduction and adduction are movements that occur within the frontal plane around an anteroposterior axis

(21) The Vertical Axis

- Movements in the transverse plane occur around a vertical axis
- Lateral and medial rotation are movements that occur within the transverse plane around a vertical axis

(22) The Pinwheel Analogy

- When visualizing the various axes of movement, it can be helpful to imagine a pinwheel, wherein the fan represents the plane of movement and the pin through the center of the fan represents the axis (see slide #20 for illustrations/examples)

(23) Joint Actions in the Sagittal Plane

- **Flexion**: when the ventral (soft) surfaces of two body parts move closer together at a joint
- **Extension**: when the dorsal (hard) surfaces of two body move closer together at a joint
Anterior Tilt: when the anterior aspect of the pelvis moves inferiorly, and the posterior aspect of the pelvis moves superiorly

Posterior Tilt: when the posterior aspect of the pelvis moves inferiorly, and the anterior aspect of the pelvis moves superiorly

Plantarflexion: when the plantar (soft) surface of the foot moves toward the ventral (soft) side of the leg

Dorsiflexion: when the dorsal (hard) side of the foot moves toward the dorsal (hard) side of the leg

(24) Joint Actions in the Frontal Plane

Abduction: a movement of an appendicular body part within the frontal plane, wherein the body part moves away from the midline of the body

Adduction: the opposite of abduction, wherein the body part moves toward from the midline of the body

Right Lateral Flexion: a movement of the trunk and/or neck within the frontal plane, wherein the trunk and/or neck flexes to the right

Left Lateral Flexion: the opposite of right lateral flexion, where the trunk and/or neck flexes to the left

Right Lateral Tilt: a movement of the pelvis within the frontal plane, wherein the left side of the pelvis moves superiorly and the right side moves inferiorly

Left Lateral Tilt: the opposite of right lateral tilt, wherein the right side of the pelvis moves superiorly and the left side moves inferiorly

Inversion: a movement of the foot within the frontal plane, wherein the medial edge of the foot moves toward the medial aspect of the leg, orienting the plantar side of the foot toward the midline of the body

Eversion: the opposite of inversion wherein the lateral edge of the foot moves toward the lateral aspect of the leg, orienting the plantar side of the foot away from the midline of the body

Radial Deviation: when the radial side of the hand (the thumb side) moves toward the radius within the frontal plane
**Ulnar Deviation:** when the ulnar side of the hand (the pinky finger side) moves toward the ulna within the frontal plane

### (25) Joint Actions in the Transverse Plane

- **Horizontal Abduction** (aka, Horizontal Extension): a movement of an appendicular body part within the transverse plane, wherein the body part is first flexed or abducted and then moves horizontally away from the midline in a posterior direction
- **Horizontal Adduction** (aka, Horizontal Flexion): the opposite of horizontal abduction, wherein the body part is first flexed or abducted and then moves horizontally toward the midline in an anterior direction
- **Medial Rotation:** the opposite of lateral rotation, wherein the anterior aspect of the body part rotates toward the midline of the body (relative to anatomical position)
- **Lateral Rotation:** a movement of an appendicular body part, wherein the anterior aspect of the body part rotates away from the midline of the body (relative to anatomical position)
- **Right Rotation:** a movement of an axial body part, wherein the anterior surface of the body part rotates to the right
- **Left Rotation:** the opposite of right rotation, wherein the anterior surface of the body part rotates to the left
- **Pronation:** can relate to the forearm or the foot; as related to the forearm, pronation is when the radius crosses over the ulna; as related to foot, pronation is a combination of abduction, eversion and dorsiflexion
- **Supination:** can relate to the forearm or the foot; as related to the forearm, supination is when the radius uncrosses the ulna such that the two bones are parallel to each other; as related to the foot, supination is a combination of adduction, inversion and plantarflexion

### (26) Joint Actions of the Scapulae

We’ve placed the joints actions of the shoulder blades in their own category because they are somewhat unique and often occur in more than one plane. Also, please note that the mandible and clavicle can also perform some of these actions
Retraction: when the scapulae wrap around the ribcage in a posterior and then medial direction toward the spine

Protraction: when the scapulae wrap around the ribcage in a lateral and then anterior direction away from the spine

Elevation: when the scapulae move superiorly, away from the pelvis

Depression: when the scapulae move inferiorly, toward the pelvis

Upward Rotation: a rotational movement of the scapula wherein the glenoid fossa orients superiorly; during upward rotation of the scapulae, the left scapula rotates clockwise and the right scapula rotates counter-clockwise

Downward Rotation: a rotational movement of the scapula wherein the glenoid fossa orients inferiorly; during downward rotation of the scapulae, the left scapula rotates counter-clockwise and the right scapula rotates clockwise

Circumduction refers to a combination of sequential actions within two or more planes that results in a circular pattern

Reverse Actions

Normally, when a muscle contracts the usually more fixed attachment stays fixed, while the more mobile attachment moves
  
  i.e., in anatomic position when we contract the brachialis muscle the humerus remains fixed and the forearm flexes at the elbow joint

A reverse action is when a muscle contracts and the usually more fixed attachment moves, while the usually more mobile attachment stays fixed
  
  i.e., when doing a “chin-up,” the brachialis contracts and causes the arm to flex at the elbow joint, while the forearm remains fixed