Anatomy - Muscular System

Implications for Athlete Performance and Injury

KIN 856

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United States Olympic Committee

Before we begin...

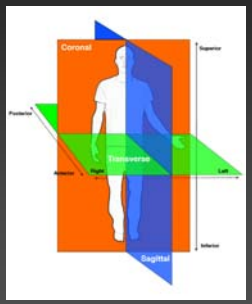
- Print out copies of:
  - Anatomy - Muscular System I Handout
  - Anatomy – Muscular System II Handout
  - Presentation Notes/ Handout

Anatomical Planes

HORIZONTAL or TRANSVERSE PLANE: divides the body into upper and lower portions.

FRONTAL or CORONAL PLANE: divides the body into front and back.

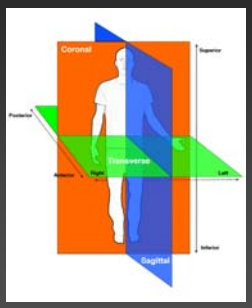
SAGITTAL or ANTERO-POSTERO PLANE: divides the body into right and left.



Anatomical Terminology

CRANIAL/ SUPERIOR: towards the head.

CAUDAL/ INFERIOR: towards the feet.



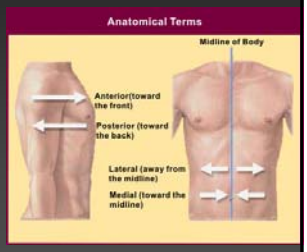
Anatomical Terminology

ANTERIOR/ VENTRAL: towards the front.

POSTERIOR/ DORSAL: towards the back.

MEDIAL: towards the midline.

LATERAL: away from the midline.

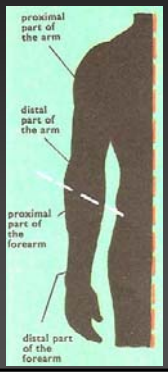


Anatomical Terminology

PROXIMAL: closer to the body.

DISTAL: further away from the body.

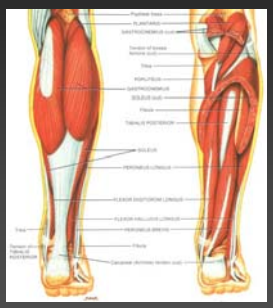
* Both used when describing location on a limb



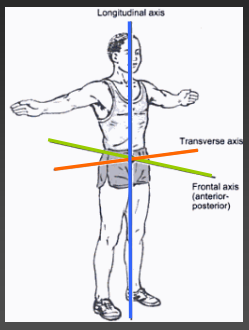
Anatomical Terminology

SUPERFICIAL: closer to the skin/ surface of the body.

DEEP: more internal/ deeper in the body.



Axes of Rotation

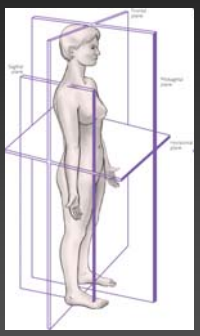


FRONTAL AXIS

TRANSVERSE AXIS

LONGITUDINAL AXIS

Anatomical Position



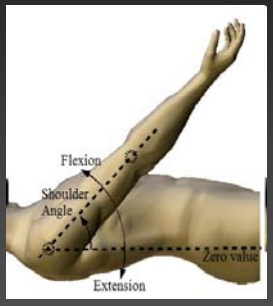
- Body standing erect
- Facing Forward
- Limbs extended
- Palms facing forward (forearms supinated)

Movement Definitions

FLEXION: movement that shortens the angle between two bones. Most flexion movements are forward movements.

EXTENSION: movement that increases the angle between two bones. Most extension movements are backward movements.

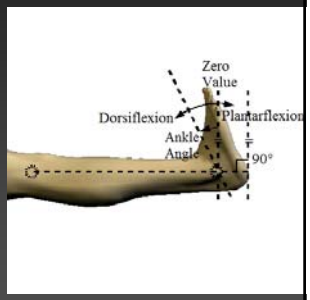
HYPEREXTENSION: extension that continues past the joint angle seen in the anatomical position.



Movement Definitions

DORSIFLEXION: movement that brings the top of the foot toward the shin.

PLANTARFLEXION: movement that brings the sole of the foot downwards (as in pointing the toes).



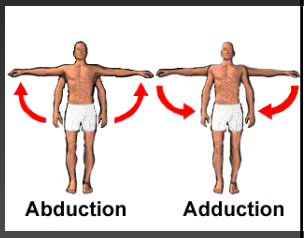
Movement Definitions

LATERAL FLEXION: bending the spine or neck to the side.

Movement Definitions

ABDUCTION: moving away from the midline of the body.

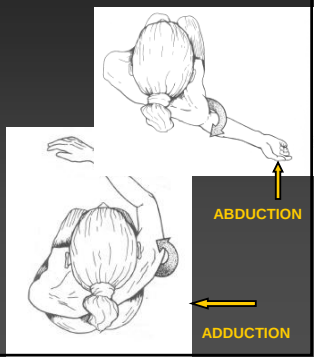
ADDUCTION: moving toward the midline of the body.



Movement Definitions

HORIZONTAL ABDUCTION: a transverse-plane motion that the arm moves horizontally backward and outward from a starting position of 90° of shoulder flexion.

HORIZONTAL ADDUCTION: a transverse-plane motion that the arm moves horizontally forward and inward from a starting position of 90° of shoulder abduction



Movement Definitions

CIRCUMDUCTION: movement in which an extremity goes through a 360 degree circle.

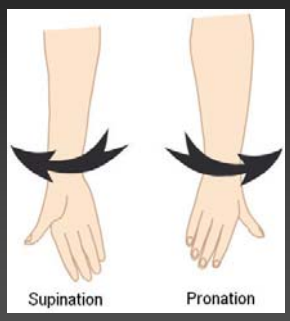
Combination of:

- Flexion/ Extension
- Abduction/ Adduction

Movement Definitions

SUPINATION: the lateral rotation of the forearm, bringing the palm of the hand upward. In this position, the radius and ulna are parallel.

PRONATION: medial rotation of the forearm, with the palm in a downward position so the radius lies diagonally across the ulna.



Movement Definitions

INVERSION: rotation of the foot so the plantar surface faces medially.

EVERSION: rotation of the foot so the plantar surface faces laterally.

Movement Definitions

INTERNAL ROTATION/ MEDIAL ROTATION: rotation towards the midline of the body.

EXTERNAL ROTATION/ LATERAL ROTATION: rotation away from the midline of the body.

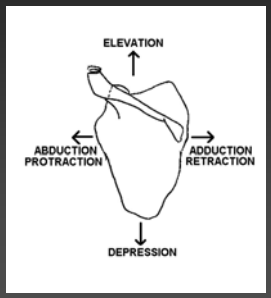
Movement Definitions - Scapula

ELEVATION: lifting of the shoulder blade.

DEPRESSION: lowering of the shoulder blade.

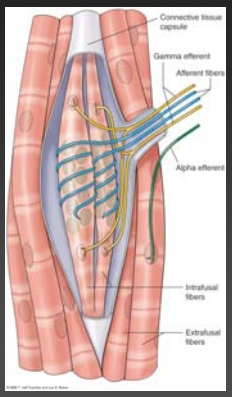
PROTRACTION/ ABDUCTION: forward movement of the shoulder girdle with the scapulae pulled away from the midline.

RETRACTION/ ADDUCTION: backward movement of the shoulder girdle with scapulae pulled toward the midline .



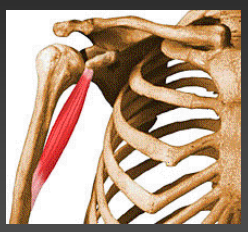
Muscle Facts:

- 639 named muscles
- 40% of a person's weight
  - Largest (size) – gluteus max.
  - Largest (surface) – latissimus dorsi
  - Longest – sartorius
  - Smallest – stapedius



Muscle actions

- Origin – attachment point closer to torso or center of the body.
- Insertion – muscle attachment point located further from the center of body.
- Action – joint movement that is produced



Muscle Naming Conventions:

- **Size Related Names:**
  - vastus (huge): vastus medialis
  - maximus (large): gluteus maximus
  - longus (long): flexor pollicis longus
  - minimus (small): gluteus minimus
  - brevis (short). extensor pollici brevis
- **Shape Related Names:**
  - deltoid (triangular): deltoid
  - rhomboid (like a rhombus): rhomboid
  - latissimus (wide): latissimus dorsi
  - teres (round): teres major
  - trapezius (trapezoidal): trapezius

Muscle Naming Conventions:

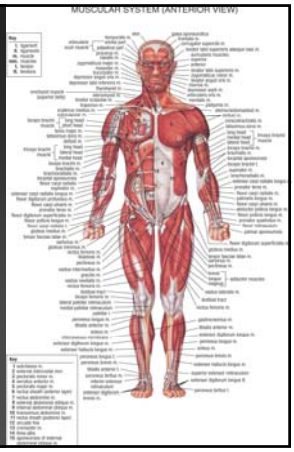
- **Names based on Direction of fibers:**
  - rectus (straight): rectus femoris
  - transverse (across): transverse abdominus
  - oblique (diagonally): internal oblique
  - orbicularis (circular): orbicularis oculi
- **Names based on Location:**
  - pectoralis (chest): pectoralis major
  - gluteus (buttock or rump): gluteus medius
  - brachii (arm): tripceps brachii
  - supra- (above): supraspinatus
  - infra- (below): infraspinatus
  - sub- (under or beneath): subscapularis
  - lateralis (lateral): vastus lateralis

Muscle Naming Conventions:

- **Names based on Number of origins:**
  - biceps (two heads): biceps brachii
  - triceps (three heads): triceps brachii
  - quadriceps (four heads): quadriceps femoris
- **Names based on Action:**
  - abductor (to abduct a structure): abductor pollicis
  - adductor (to adduct a structure): adductor magnus
  - flexor (to flex a structure): flexor digitorum
  - extensor (to extend a structure): extensor carpi
  - levator (to lift or elevate a structure): levator scpulae

Muscular Anatomy: Upper Body

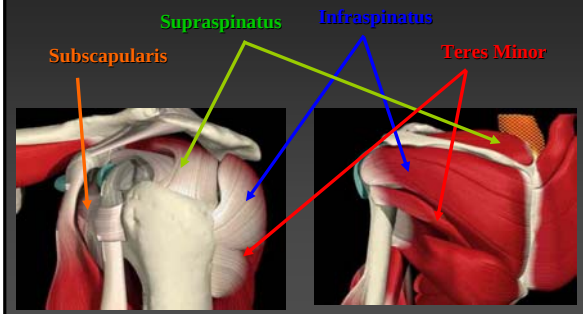
- Sternocleidomastoid
- Pectoralis major
- Pectoralis minor
- Serratus anterior
- Deltoid
- Biceps brachii
- Brachioradialis
- Flexor carpi ulnaris
- Flexor carpi radialis



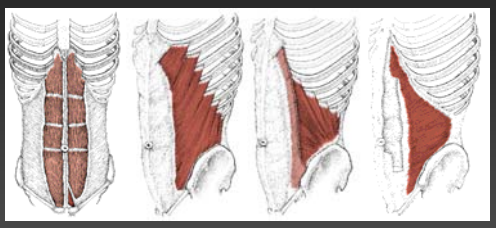
Muscular Anatomy: Upper Body

- Trapezius
- Deltoid
- Latissimus dorsi
- Rhomboid major
- Triceps brachii
- Extensor digitorum
- Externsor carpi ulnaris

Rotator Cuff Anatomy



Muscular Anatomy: Torso/ Hip Area

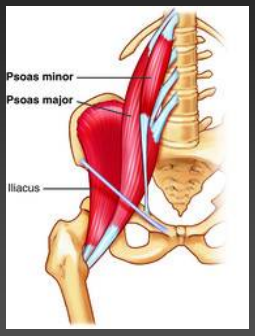


1. Rectus abdomius
2. External obliques
3. Internal obliques
4. Transverse abdominus

Muscular Anatomy: Torso/ Hip Area

- Erector spinae
- Gluteus maximus
- Gluteus medius

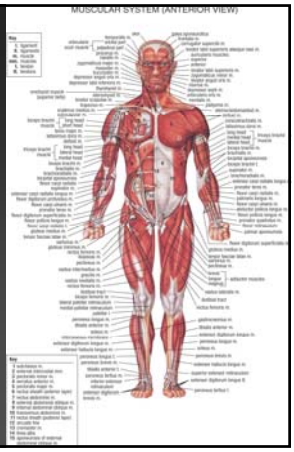
Anterior Hip Region



- Psoas major
- Iliacus

Muscular Anatomy: Lower Body

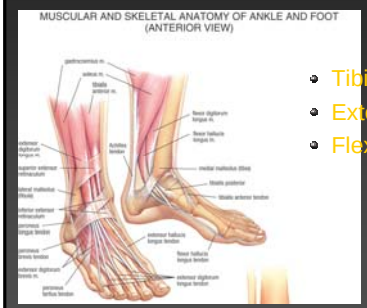
- Sartorius
- Rectus femoris
- Vastus medialis
- Vastus lateralis
- Vastus intermedius
- Tibilalis anterior



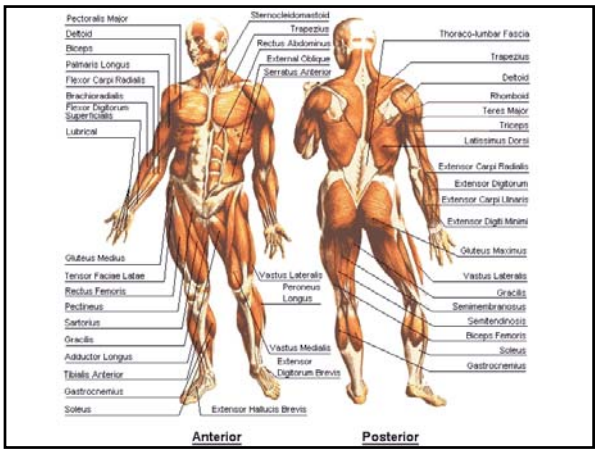
Muscular Anatomy: Lower Body

- Semitendinosus
- Semimembranosus
- Biceps femoris
- Adductor magnus
- Tensor fascia lata (IT band)
- Gastrocnemius (medial and lateral)
- Soleus

Foot and leg musculature



- Tibialis posterior
- Extensor digitorum
- Flexor digitorum



Muscle Actions:

- What muscles are involved in producing specific movements?

http://www.massagenerd.com/Muscle_Actions_Explained.html

http://www.ptcentral.com/muscles/

Other Websites:

- Anatomical Images – Univ. of Washington
- Visual Human Project – Univ. of Colorado
- Visual Human Project – Univ. of Michigan
- NIH Anatomy pages

Exercise: Movement Description

Identify a movement commonly performed in a sport you work with. Examples could be a sprinting stride, the freestyle swimming stroke, a tennis serve, execution of a high jump, a soccer kick, etc. You should be able to break the movement down into a 'sequence of events,' each comprised of coordinated movements at different joints. Describe the movement as best you can, breaking it down into a sequence of smaller events, or phases. Within each phase, describe the movement, discussing the actions that are occurring at the various joints. While not a requirement, inclusion of pictures of each phase will help in the presentation an understanding of the description that is provided.