

Chapter 2

Kinematic Concepts for Analyzing Human Motion

Basic Biomechanics, 6th edition
By Susan J. Hall, Ph.D.

general motion

involving translation and rotation simultaneously

linear

along a line that may be straight or curved, with all parts of the body moving in the same direction at the same speed

angular

involving rotation around a central line or point

translation

linear motion

rectilinear

along a straight line

curvilinear

along a curved line

axis of rotation

imaginary line perpendicular to the plane of rotation and passing through the center of rotation

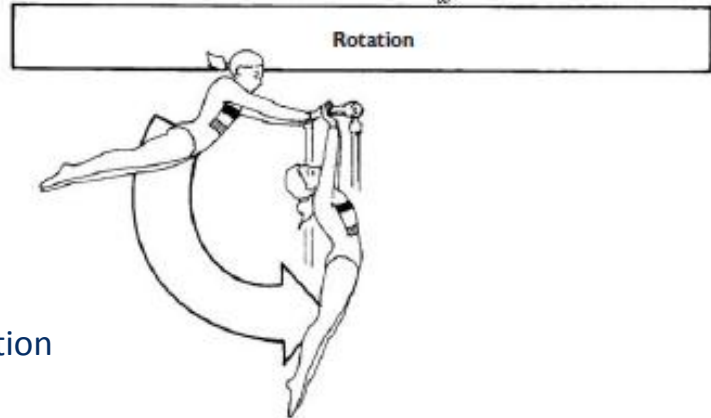
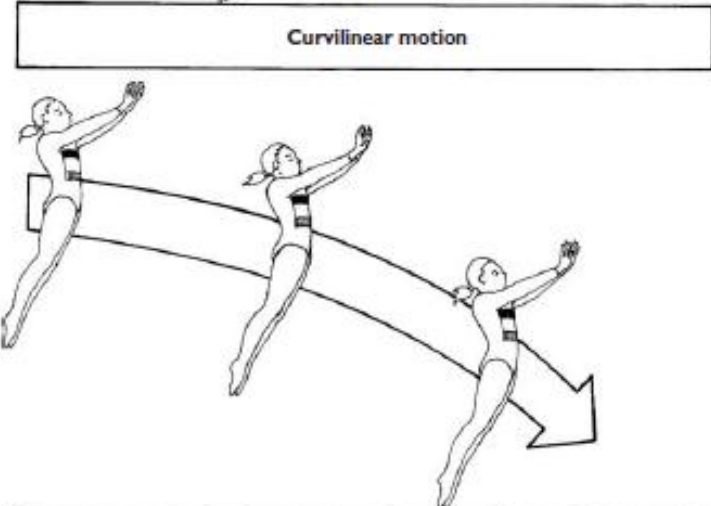
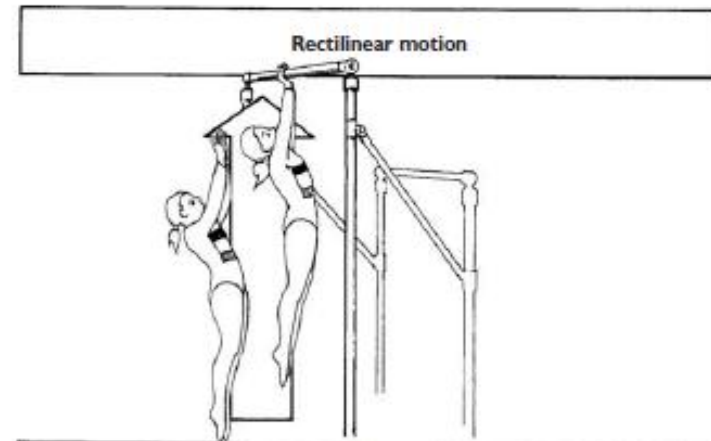
Genel Hareket

-Doğrusal Hareket

-Açısal Hareket

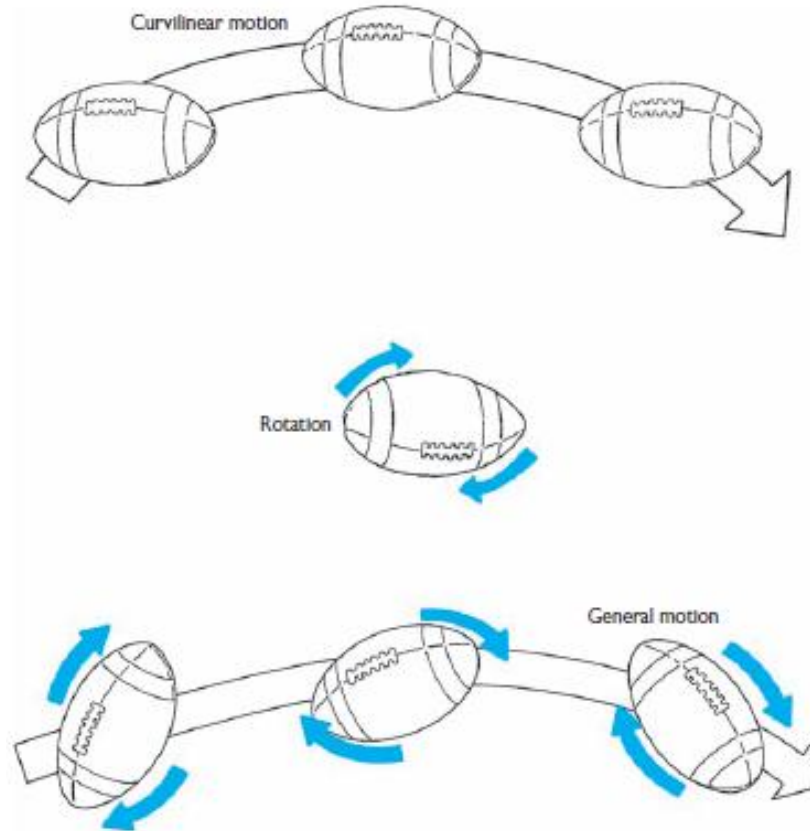
anatomical reference position

erect standing position with all body parts, including the palms of the hands, facing forward; considered the starting position for body segment movements.



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Superior: closer to the head (In zoology, the synonymous term is *cranial*.)

Inferior: farther away from the head (In zoology, the synonymous term is *caudal*.)

Anterior: toward the front of the body (In zoology, the synonymous term is *ventral*.)

Posterior: toward the back of the body (In zoology, the synonymous term is *dorsal*.)

Medial: toward the midline of the body

Lateral: away from the midline of the body

Proximal: closer in proximity to the trunk (For example, the knee is proximal to the ankle.)

Distal: at a distance from the trunk (For example, the wrist is distal to the elbow.)

Superficial: toward the surface of the body

Deep: inside the body and away from the body surface

cardinal planes

three imaginary perpendicular reference planes that divide the body in half by mass

sagittal plane

plane in which forward and backward movements of the body and body segments occur

frontal plane

plane in which lateral movements of the body and body segments occur

transverse plane

plane in which horizontal body and body segment movements occur when the body is in an erect standing position

- Although most human movements are not strictly planar, the cardinal planes provide a useful way to describe movements that are primarily planar.

mediolateral axis

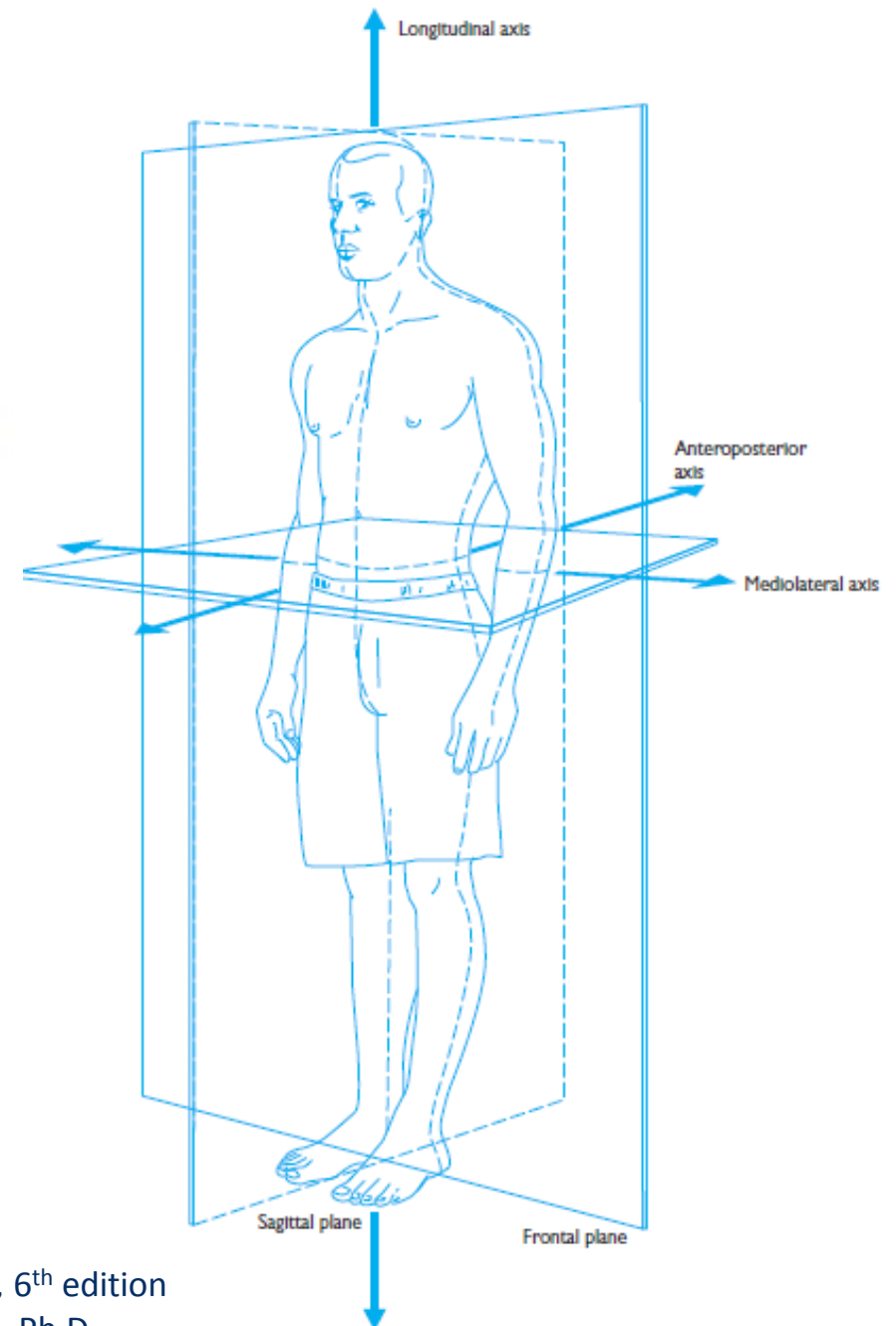
imaginary line around which sagittal plane rotations occur

anteroposterior axis

imaginary line around which frontal plane rotations occur

longitudinal axis

imaginary line around which transverse plane rotations occur



What is anatomical reference position?



- “ erect standing position with all body parts facing forward
- “ considered the starting point for all body segment movements

Directional terms:

superficial: toward the surface of the body

superior: closer to the head

proximal: closer to the trunk

deep: inside the body away from the surface

medial: toward the midline of the body

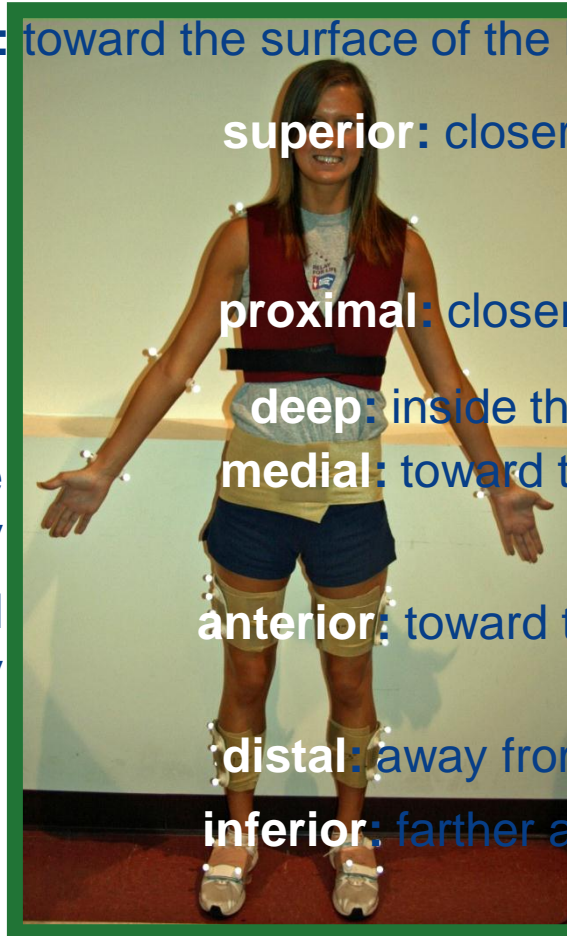
lateral: away from the midline of the body

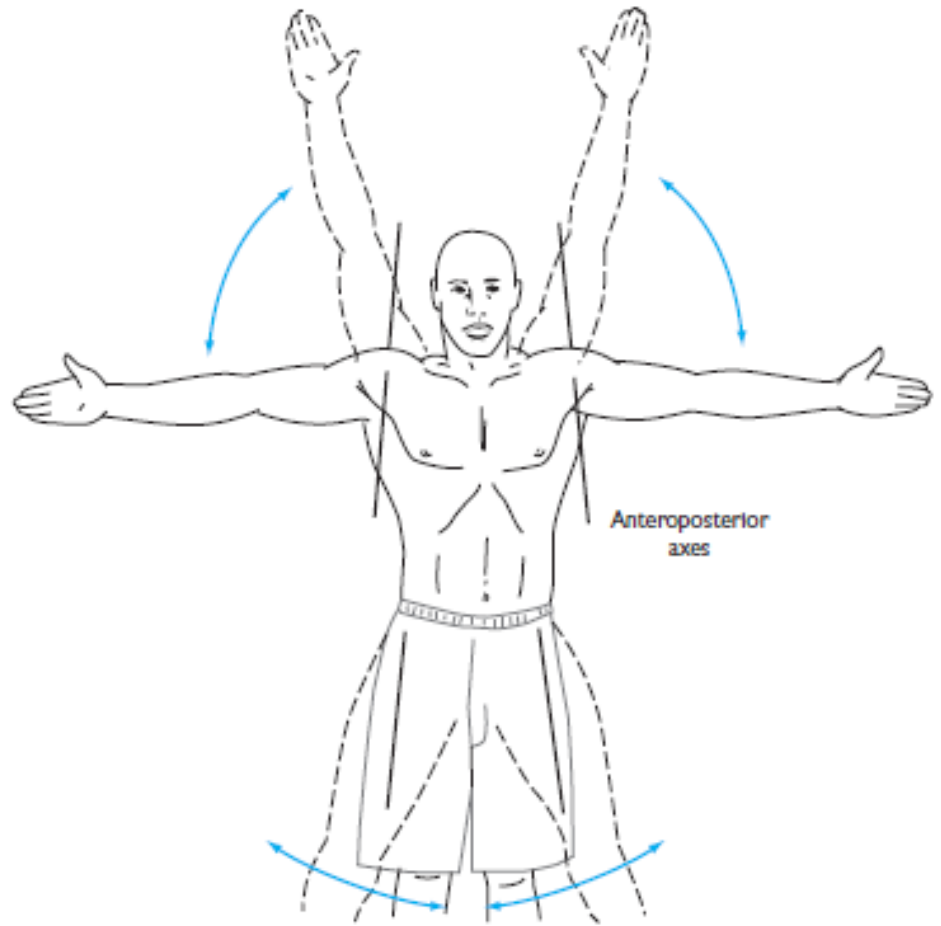
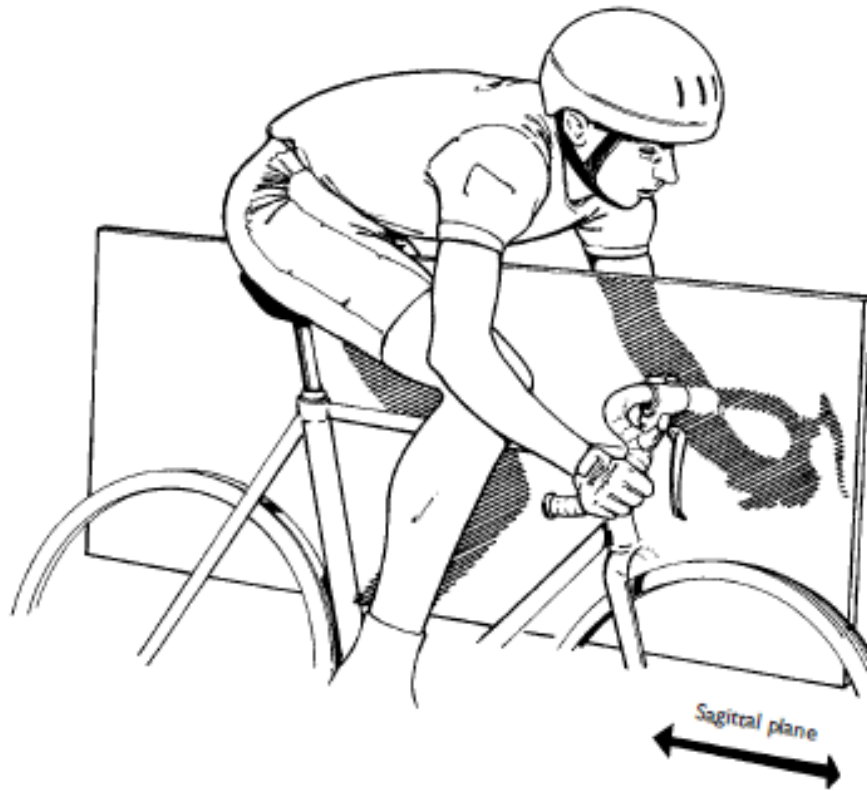
posterior: toward the back of the body

anterior: toward the front of the body

distal: away from the trunk

inferior: farther away from the head

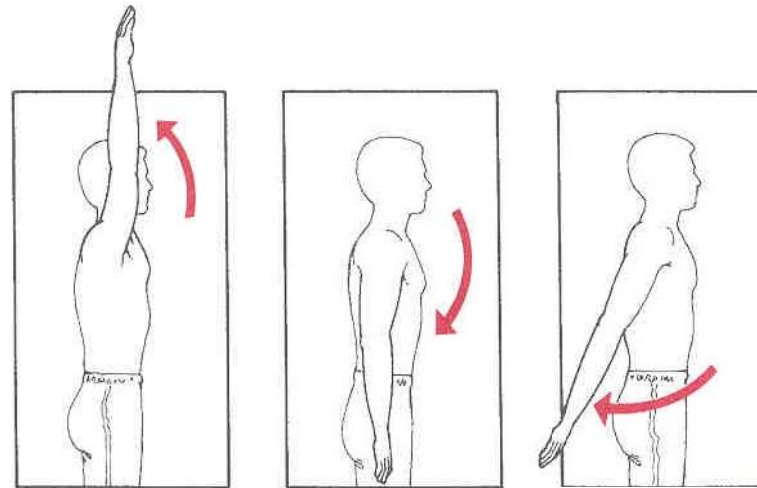




Reference planes:

- “ **sagittal** plane - in which forward and backward movements occur
- “ **frontal** plane - in which lateral movements occur
- “ **transverse** plane - in which rotational movements occur

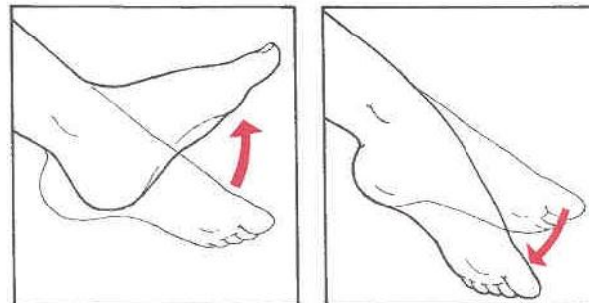
What movements occur in the sagittal plane?



Flexion

Extension

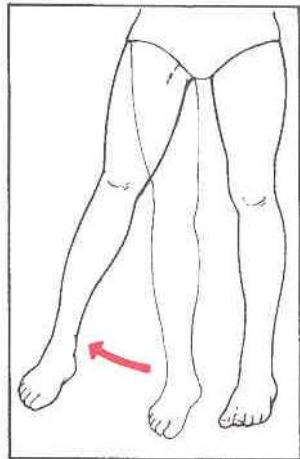
Hyperextension



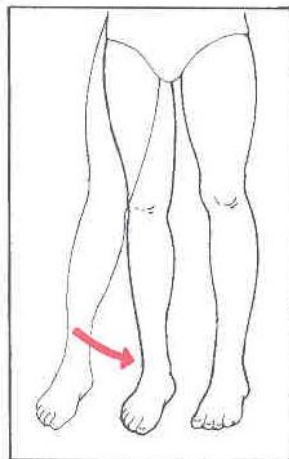
Dorsiflexion

Plantar flexion

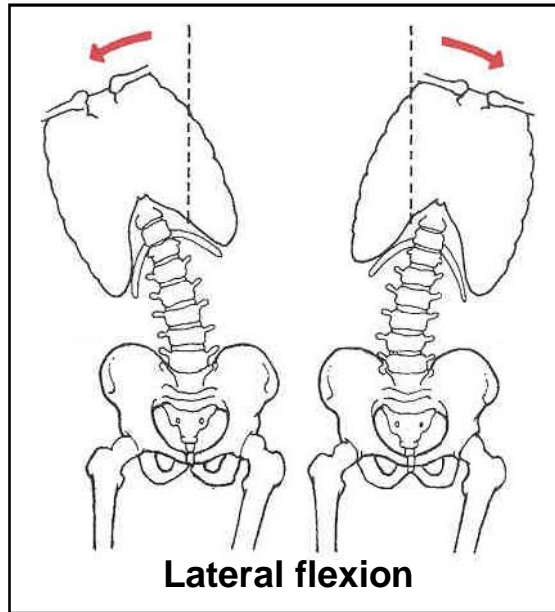
What movements occur in the frontal plane?



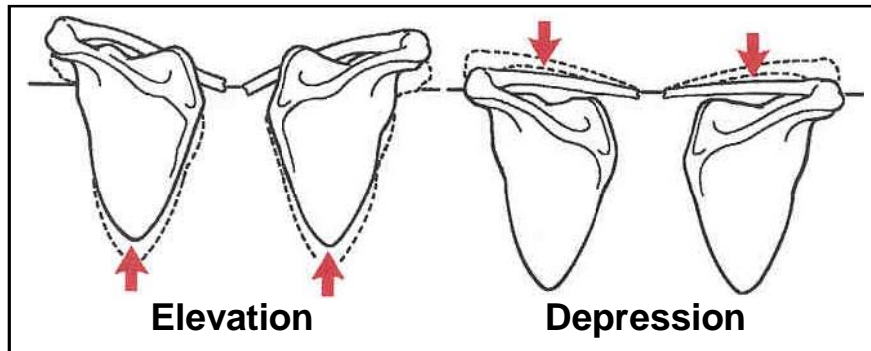
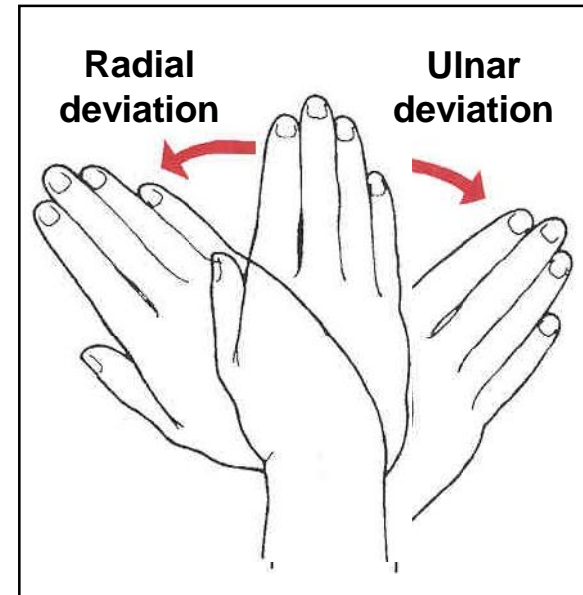
Abduction



Adduction

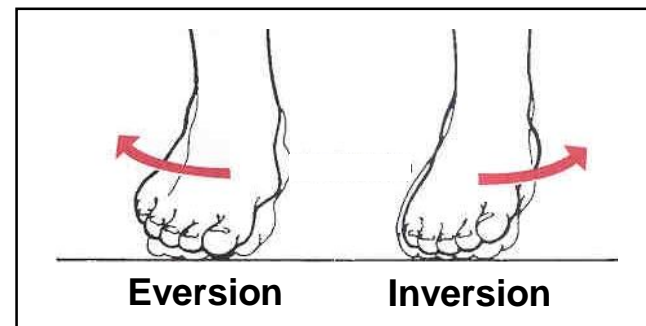


Lateral flexion



Elevation

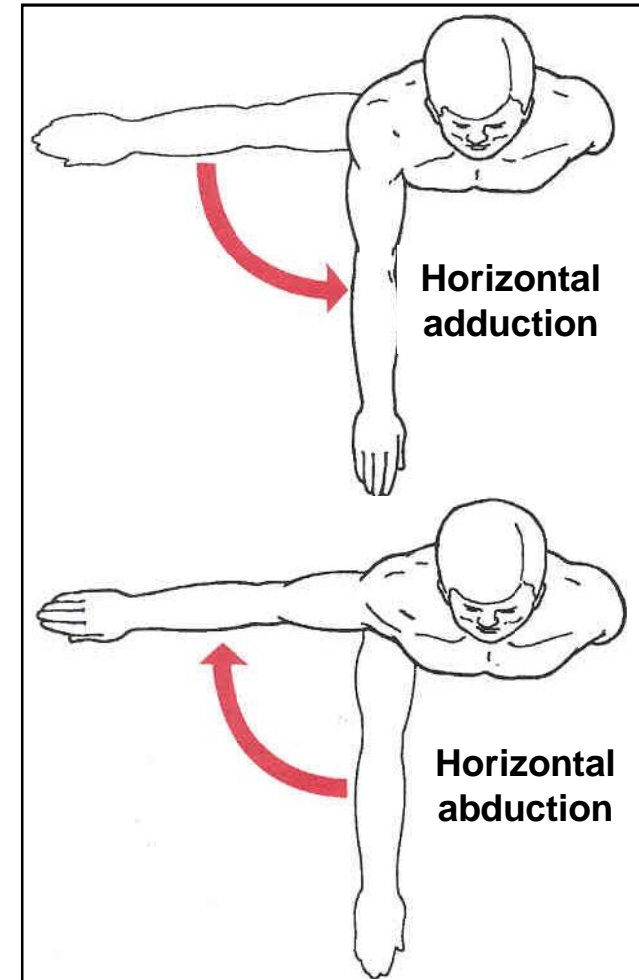
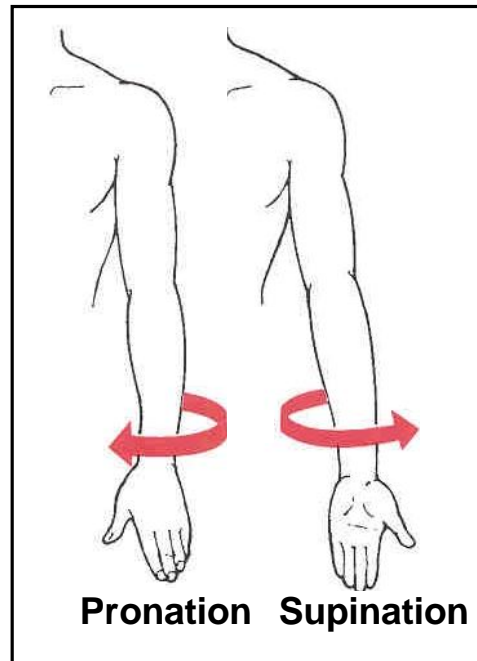
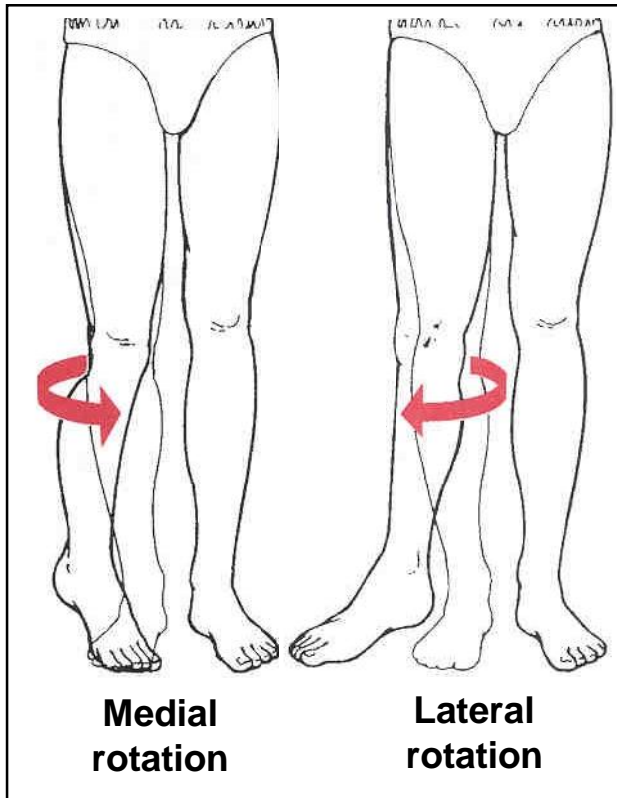
Depression



Eversion

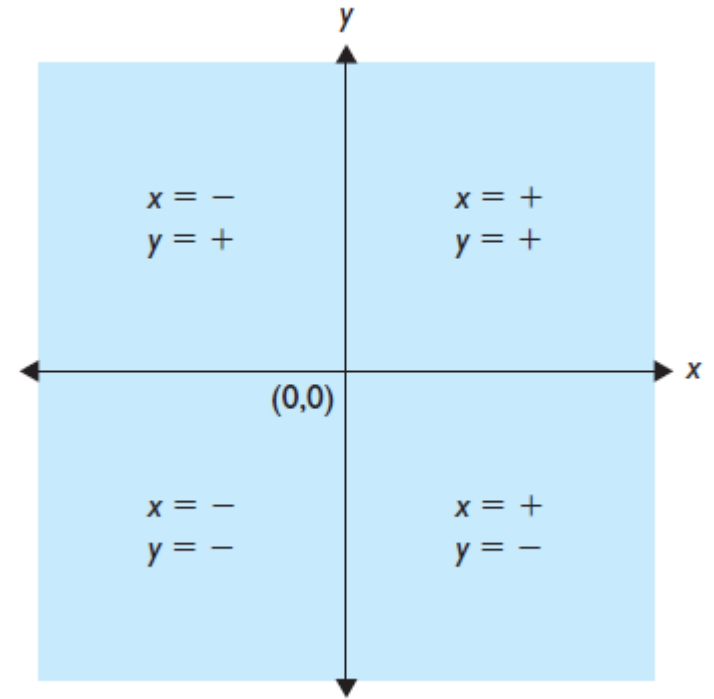
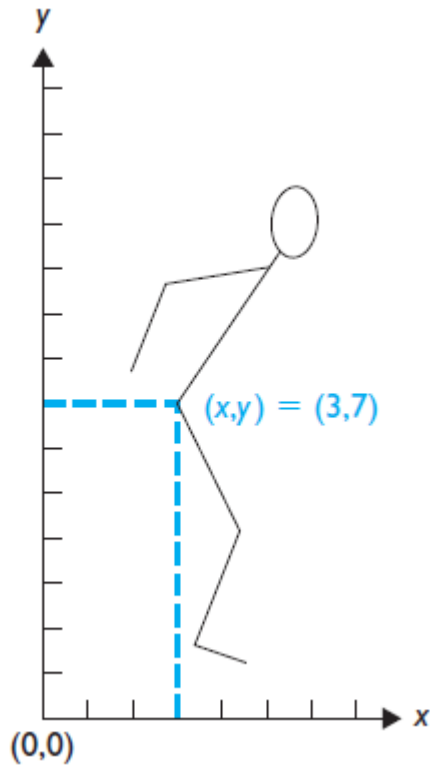
Inversion

What movements occur in the transverse plane?

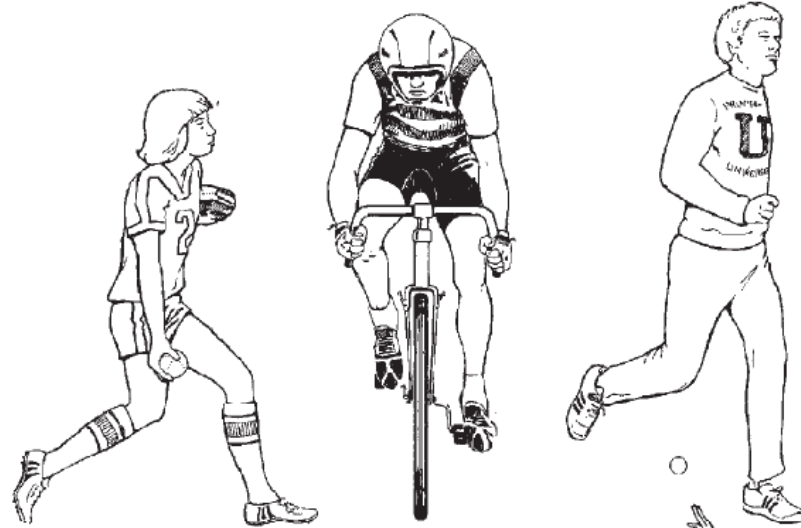




Circumduction



**Primarily planar
skills**



**Multiplanar
skills**

