

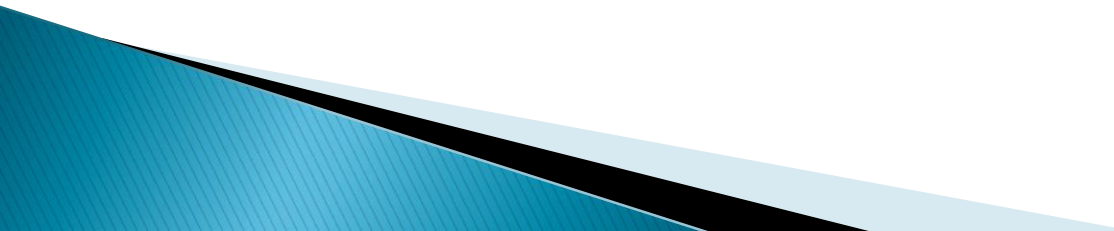
Kinesiology

RHS 341

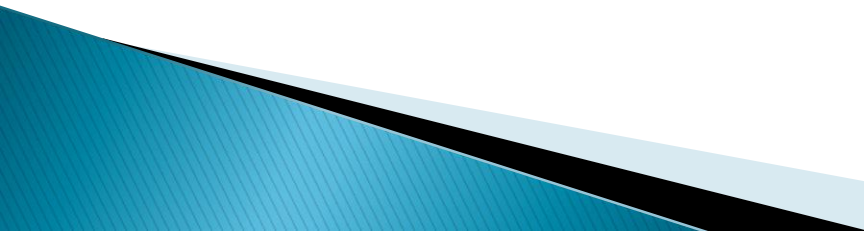
Lecture I

Mrs. Lulu Al Rashed

Master of Physical Therapy

- **Course Title** : **Kinesiology**
 - **Course Number** : **RHS 341**
 - **Credit Hours** : **2 Theory + 1 Practical =
3 hours**
 - **Course Instructor:** **Mrs. Lulu Al Rashed**
- 

Course Description

- ❑ This course deals with the mechanics of human motion from a functional anatomy perspective.
 - ❑ **Special emphasis will be given on:**
 - ▶ the nature of the musculoskeletal system
 - ▶ differences between normal and abnormal posture
 - ▶ analysis of gait (locomotion).
- 

Course Objectives

Upon completion of this course, students should be able to integrate the three major theoretical approaches which are of immediate concern to physiotherapists, which include:

1- Anatomical approach:

in which students identify a body structure (e.g., a muscle or a joint), then describe its potential to produce or allow movement based on its size, geometry, and orientation.

2- Physiological approach:

students are advised to understand the process involved in the initiation, continuation, and control of movement.

3- Mechanical approach:

in which students consider the mechanical factors involved in body motion, such as force, time and distance.

5. Schedule of Assessment Tasks for Students During the Semester

Assessment	Assessment task (e.g. essay, test, group project, examination etc.)	Proportion of Final Assessment
1	1st Midterm Theoretical	20%
2	Practical Midterm exam	10%
3	2nd Midterm exam	20%
4	Presentations and/or papers assignments + continuous evaluation	10%
5	Final Practical Exam	15%
6	Final Theoretical	25%

Required text

Kinesiology: Scientific Basis of Human Motion

- ▶ Nancy Hamilton (Author)
 - ▶ Wendi Weimar (Author)
 - ▶ Kathryn Luttgens
 - ▶ ISBN-10: 0071259511
 - ▶ ISBN-13: 978-0071259514
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Movement Terminology & Biomechanical Principles



Lecture I

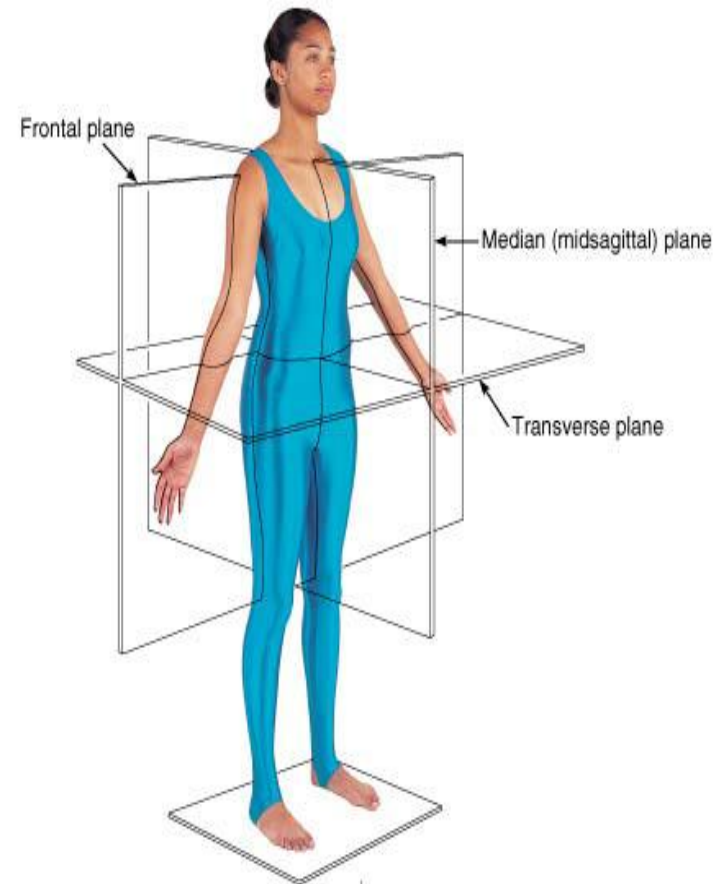
What & Why?

ki·ne·si·ol·o·gy *n.* [Greek *kinesis*, *movement*; *-logy*, *science of.*]

- **Kinesiology** = the study of movement
- It is not enough to know if a movement occurred or not. You have to know
 - **how** the movement was produced
 - and if it was **normal**.
- **If not,**
 - what was the cause of the **abnormality**
 - what must be done to **correct** or **improve it**

Reference positions

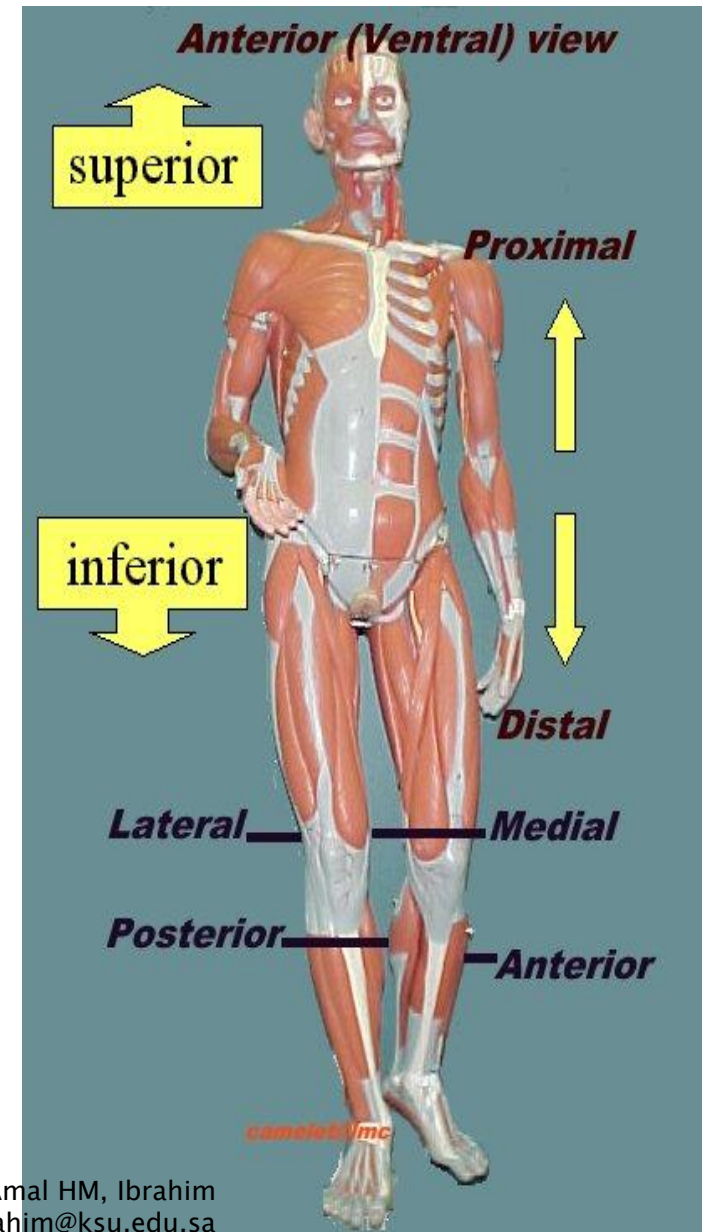
- **Anatomical position**
 - standing in an upright posture, facing straight ahead, feet parallel and close, & palms facing forward
- **Fundamental position**
 - is essentially same as anatomical position except arms are at the sides & facing the body



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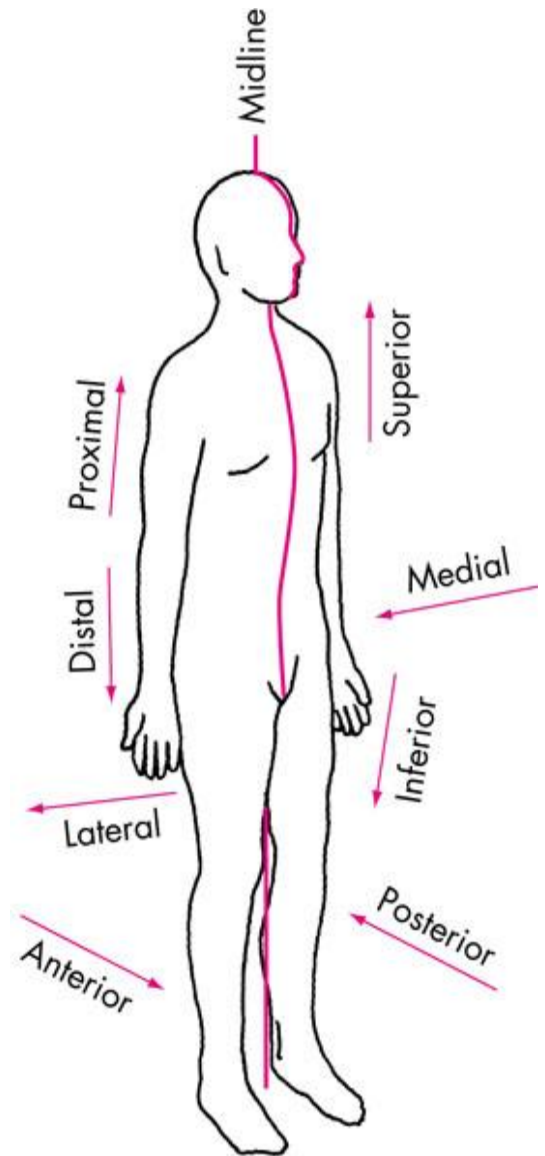
Anatomical directional terminology

- ▶ **Anterior**
 - in front or in the front part
- ▶ **Posterior**
 - behind, in back, or in the rear
- ▶ **Contra lateral**
 - pertaining or relating to the opposite side
- ▶ **Ipsilateral**
 - on the same side



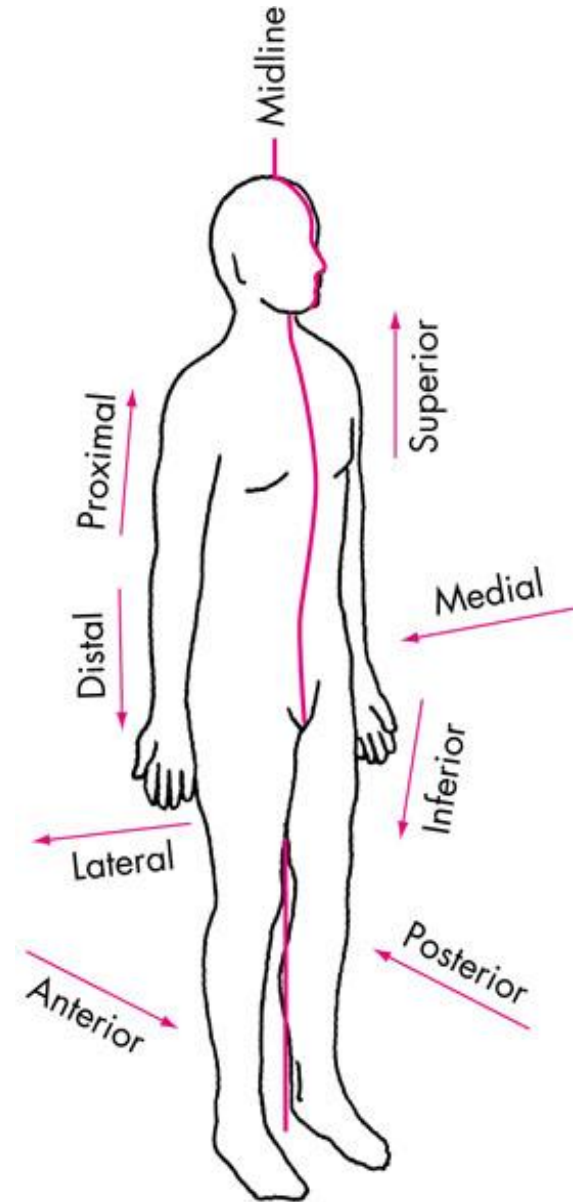
Anatomical directional terminology

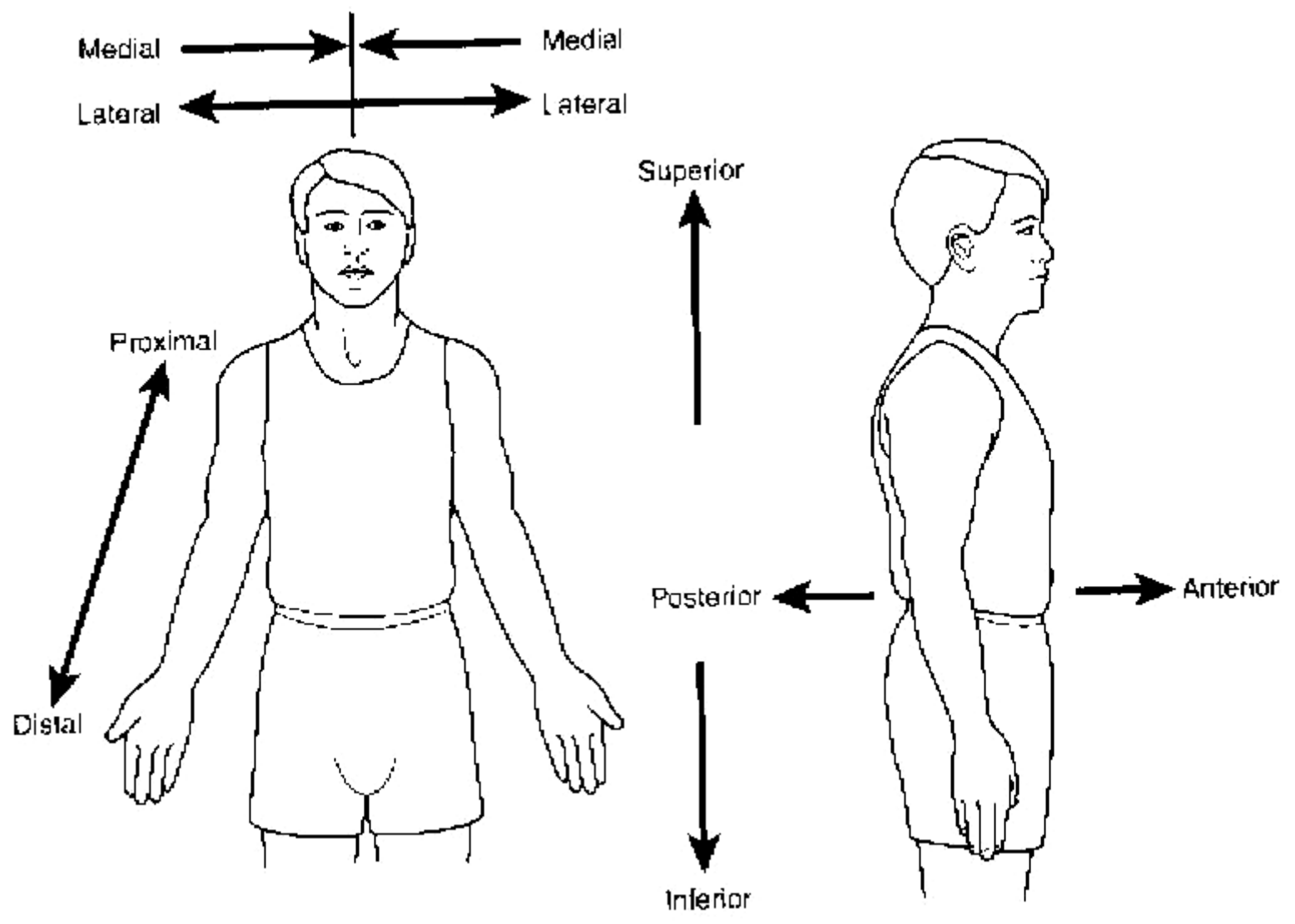
- ▶ **Distal**
 - situated away from the center or midline of the body, or away from the point of origin
- ▶ **Proximal**
 - nearest the trunk or the point of origin



Anatomical directional terminology

- ▶ **Lateral**
 - on or to the side; outside, farther from the median or midsagittal plane
- ▶ **Medial**
 - relating to the middle or center; nearer to the medial or midsagittal plane





Anatomical directional terminology

- **Supine**
 - lying on the back; face upward position of the body
- **Prone**
 - The body lying face downward; stomach lying



Supine



Prone

Direction	Description	Example
Anterior (or ventral)	Towards the front of the body (in front of).	The sternum lies anterior to the heart.
Posterior (or dorsal)	Towards the back of the body (behind).	The heart lies posterior the sternum.
Superior (or cranial)	Above (on top of).	The heart lies superior to the diaphragm.
Inferior (or caudal)	Below (underneath).	The diaphragm lies inferior to the heart.

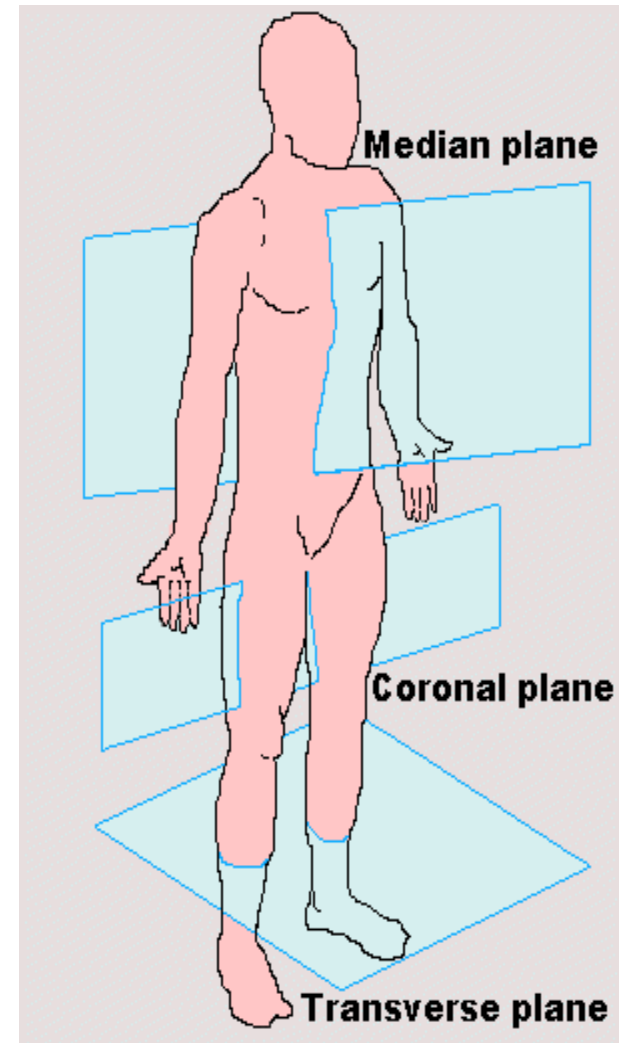
Direction	Description	Example
Lateral	Away from the mid line of the body (towards the sides).	The lungs lie lateral to the heart.
Medial	Towards the mid line of the body (towards the middle).	The heart lies medial to the lungs.
Deep	Away from the body surface (towards the inner body).	The heart is deep to the sternum.
Superficial	Towards the external surface of the body.	The sternum is superficial to the heart.
Proximal	Nearer to the trunk of the body.	The shoulder is proximal to the elbow.
Distal	Furthest from the trunk of the body.	The elbow is distal to the shoulder.

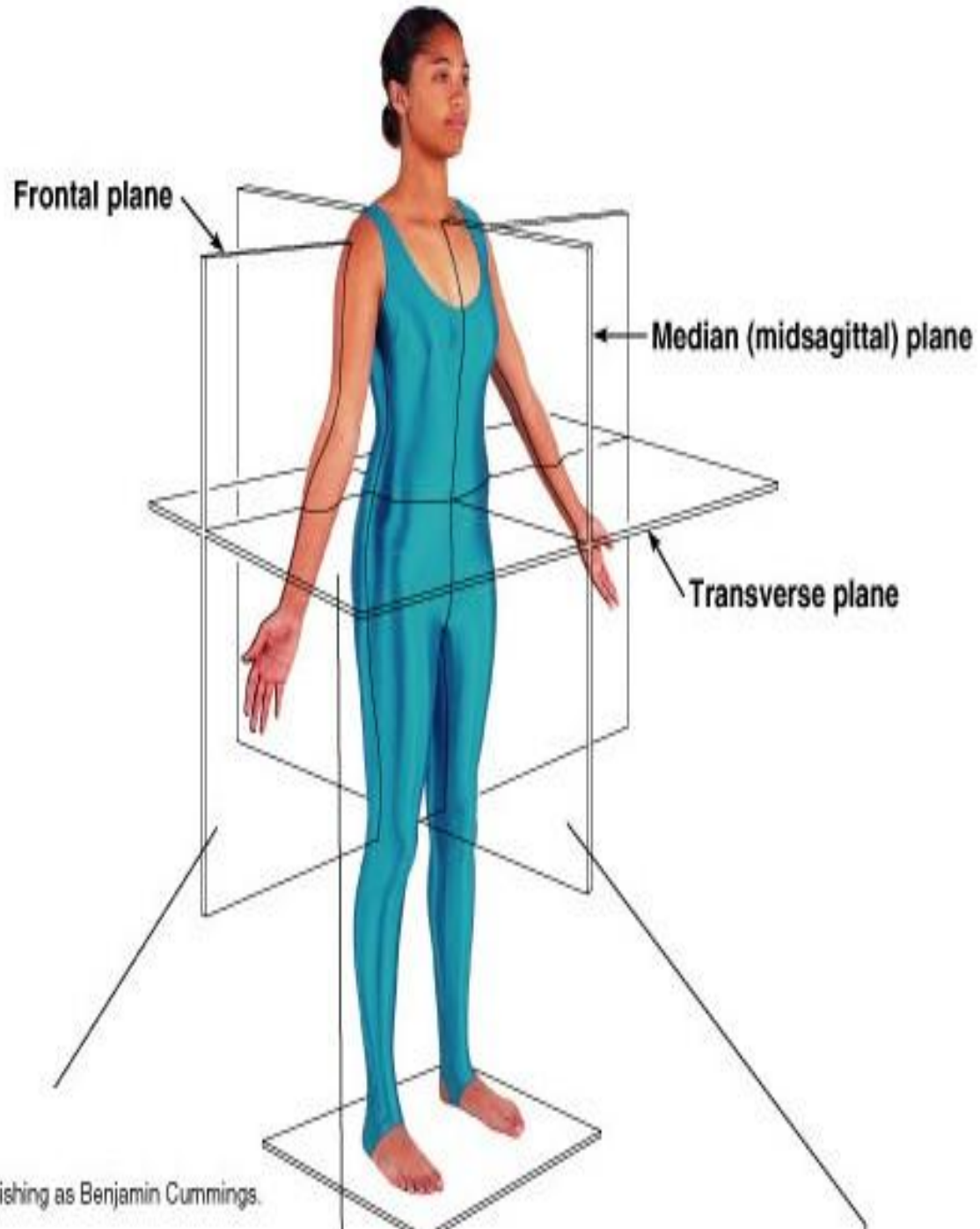
Motion occurs in a **plane** about an **axis**

- **Plane of motion** = an imaginary two-dimensional surface through which a limb or body segment is moved.
- **Axis of rotation** = the axis which has a 90° relationship to the plane of motion and around which the movement takes place

Cardinal planes of motion

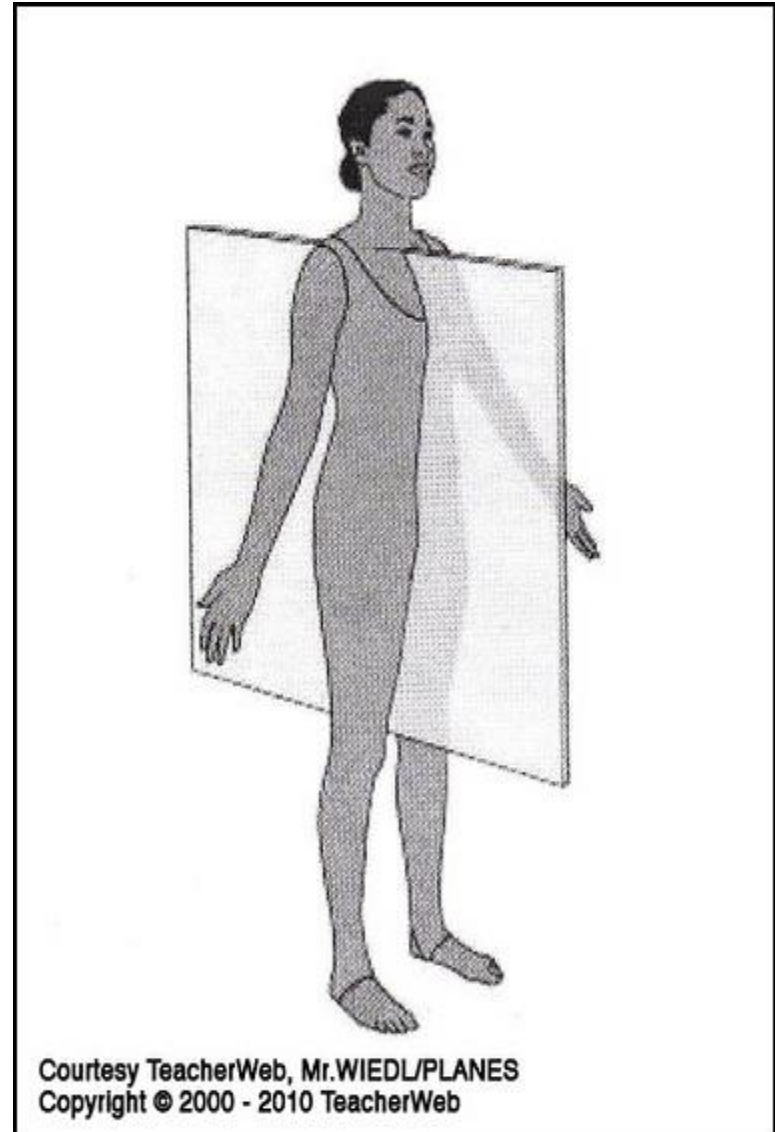
- ▶ 3 basic or traditional
 - in relation to the body, not in relation to the earth
- ▶ Antero–posterior or Sagittal Plane
 median plane.
- ▶ Lateral or Frontal Plane
- ▶ Transverse or Horizontal Plane



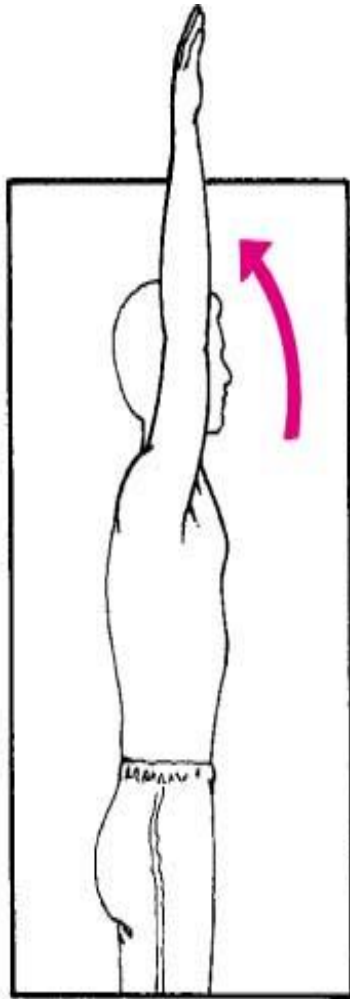


Cardinal planes of motion

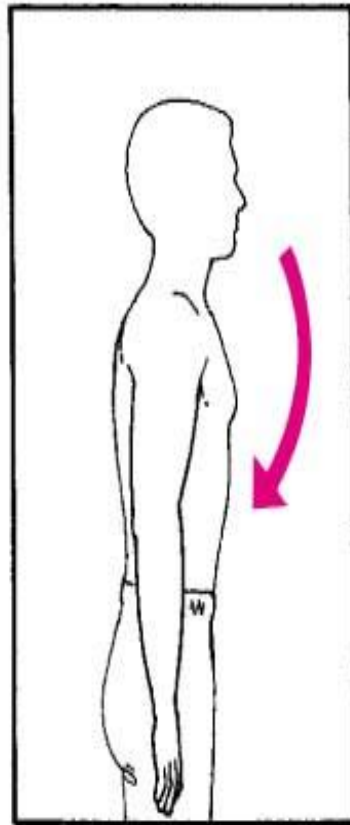
- Antero–posterior or
Sagittal Plane
 - It divides the body into right & left halves



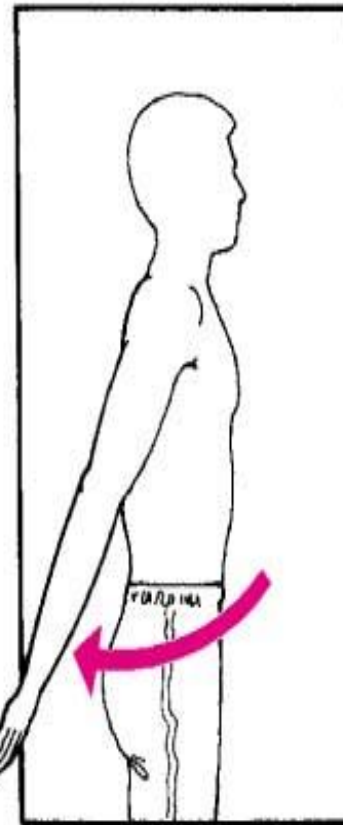
Sagittal plane movements



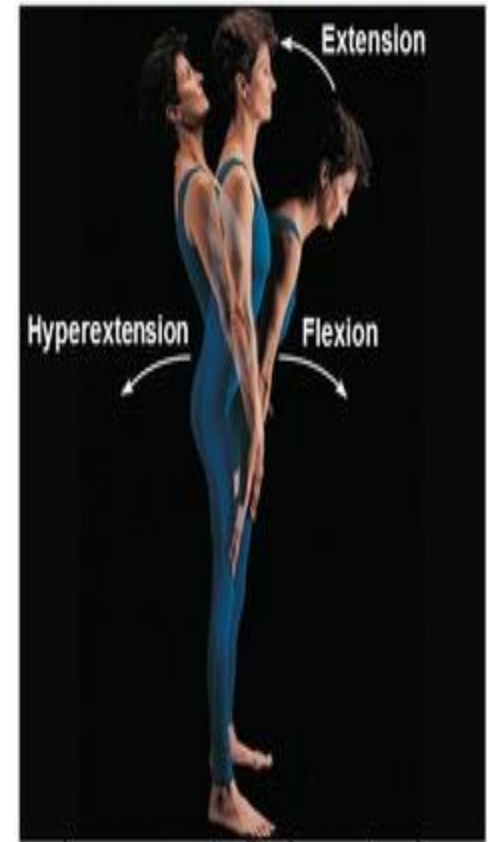
Flexion



Extension

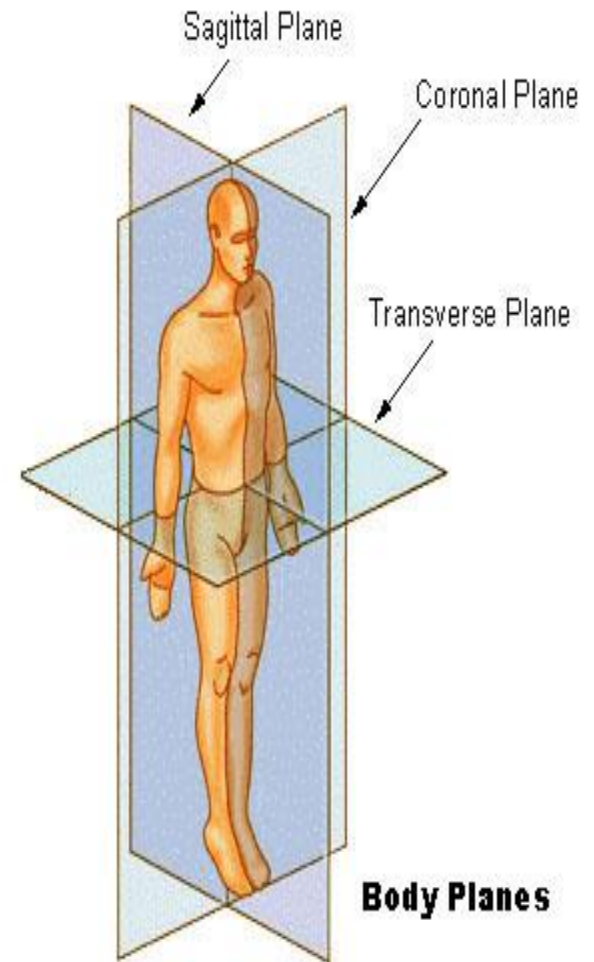


Hyperextension



Cardinal planes of motion

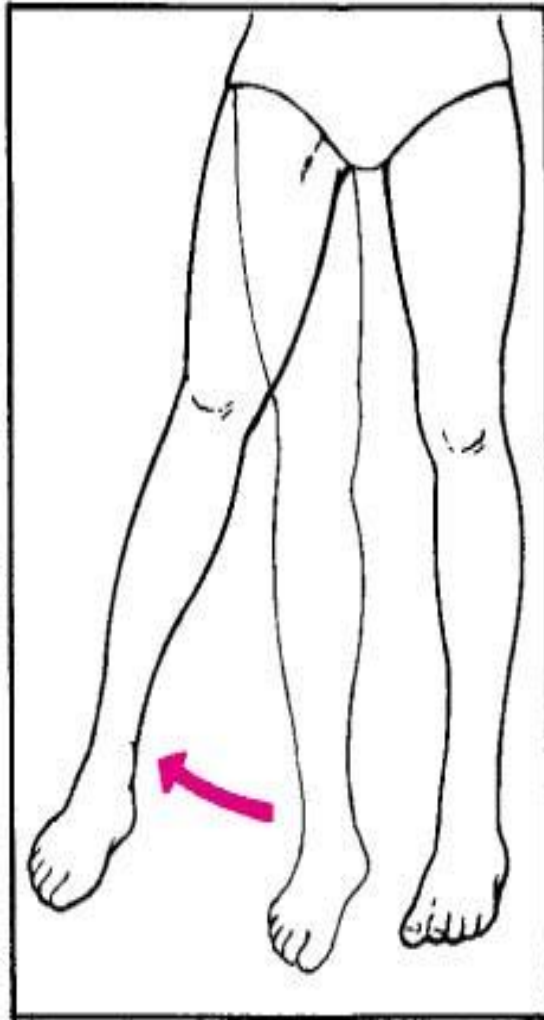
- **Lateral or Frontal Plane**
 - divides the body into (front) anterior & (back) posterior halves



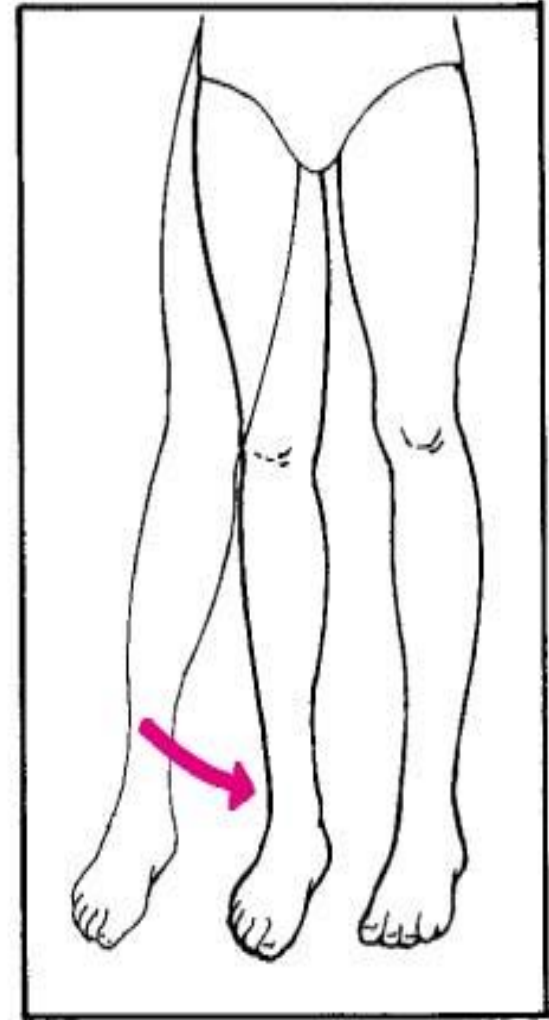
Frontal Plane Movements

Abduction=
away from the
midline

Adduction=
toward the
midline



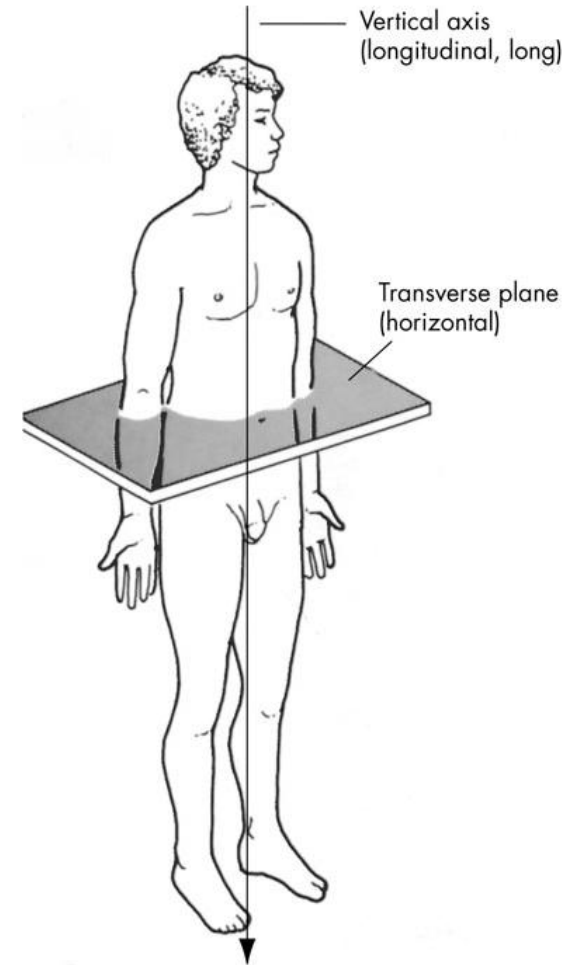
Abduction



Adduction

Cardinal planes of motion

- **Transverse or Horizontal Plane**
 - divides body into (top) superior & (bottom) inferior halves when the individual is in anatomical position
 - Ex. Spinal rotation to left or right

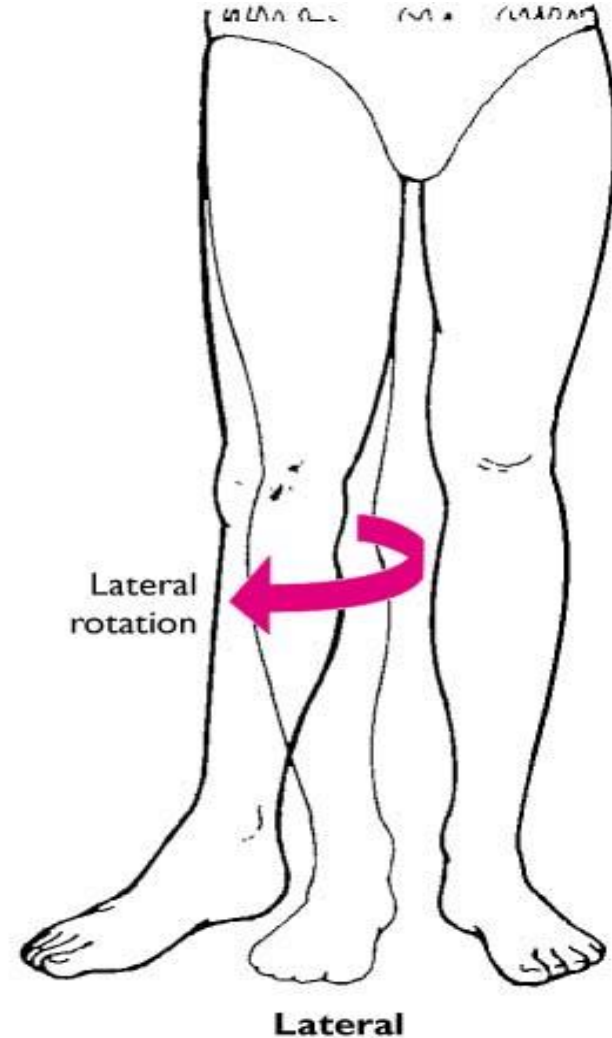
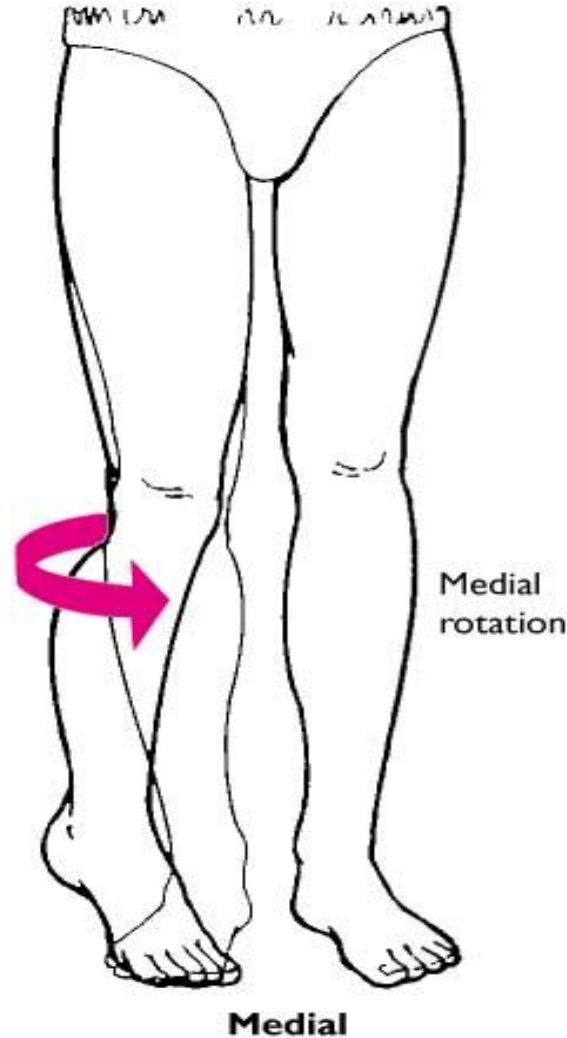


Transverse Plane Movements

❖ Rotation

Lateral (external) rotation= when the bone rotates away from the midline

Medial (internal) rotation= when the bone rotates towards the midline



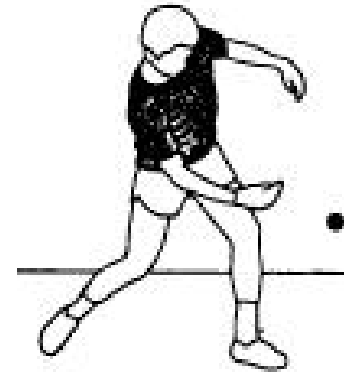
Diagonal Planes of Motion

- ▶ High Diagonal
 - Upper limbs at shoulder joints
 - Overhand skills
 - EX. Baseball Pitch



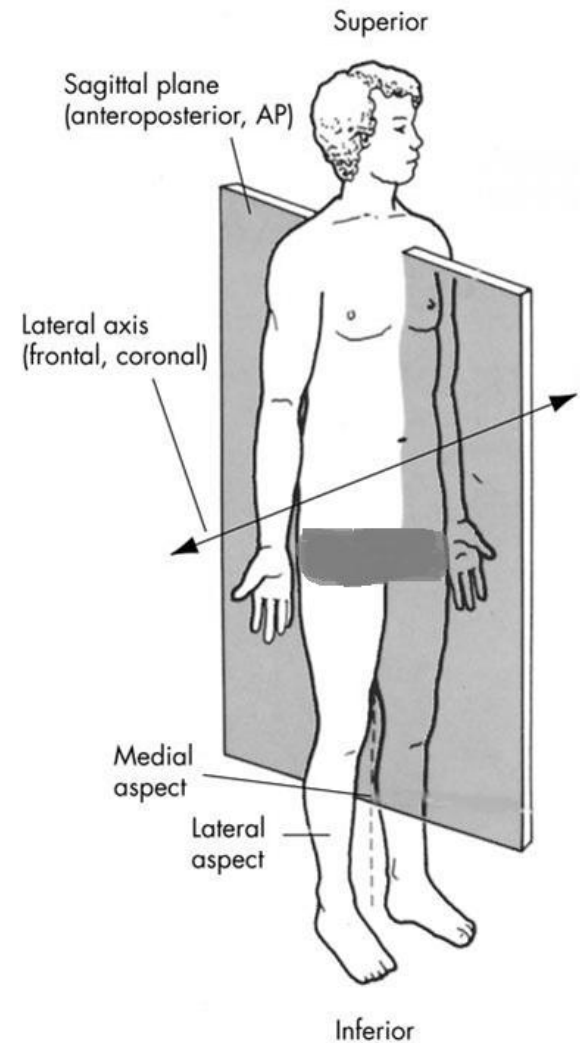
Diagonal Planes of Motion

- ▶ Low Diagonal
 - Upper limbs at shoulder joints
 - Underhand skills
 - EX. Discus Thrower
- ▶ Low Diagonal
 - Lower limbs at the hip joints



Axes of rotation

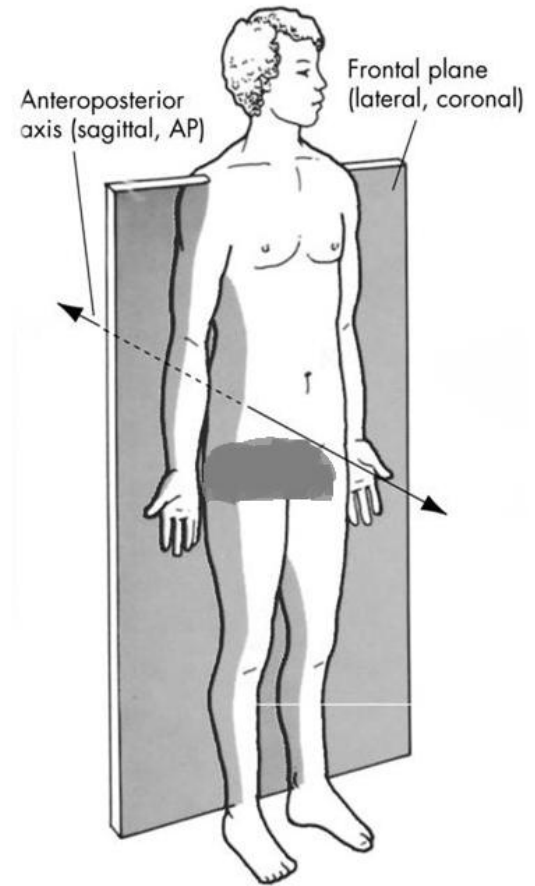
- ▶ Frontal, lateral, or coronal axis
 - Has same orientation as frontal plane of motion & runs from side to side at a right angle to sagittal plane of motion
 - Runs medial / lateral
 - Commonly includes flexion, extension movements



Axes of rotation

▶ Sagittal or antero-posterior axis

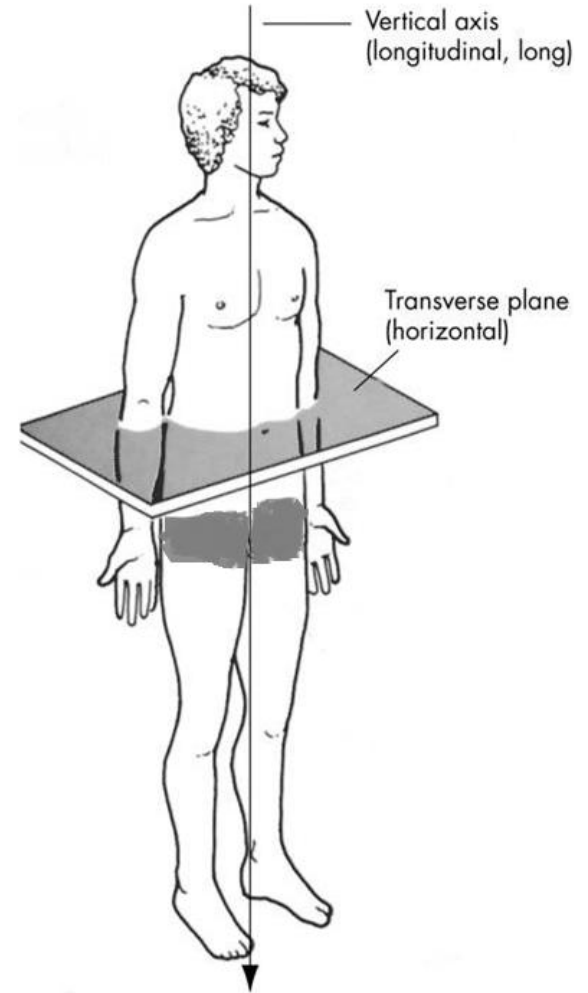
- Has same orientation as sagittal plane of motion & runs from front to back at a right angle to frontal plane of motion
- Runs anterior / posterior
- Commonly includes abduction, adduction movements



Axes of Rotation

▶ Long or vertical axis

- Runs straight down through top of head & is at a right angle to transverse plane of motion
- Runs superior/ inferior
- Commonly includes internal rotation, external rotation movements



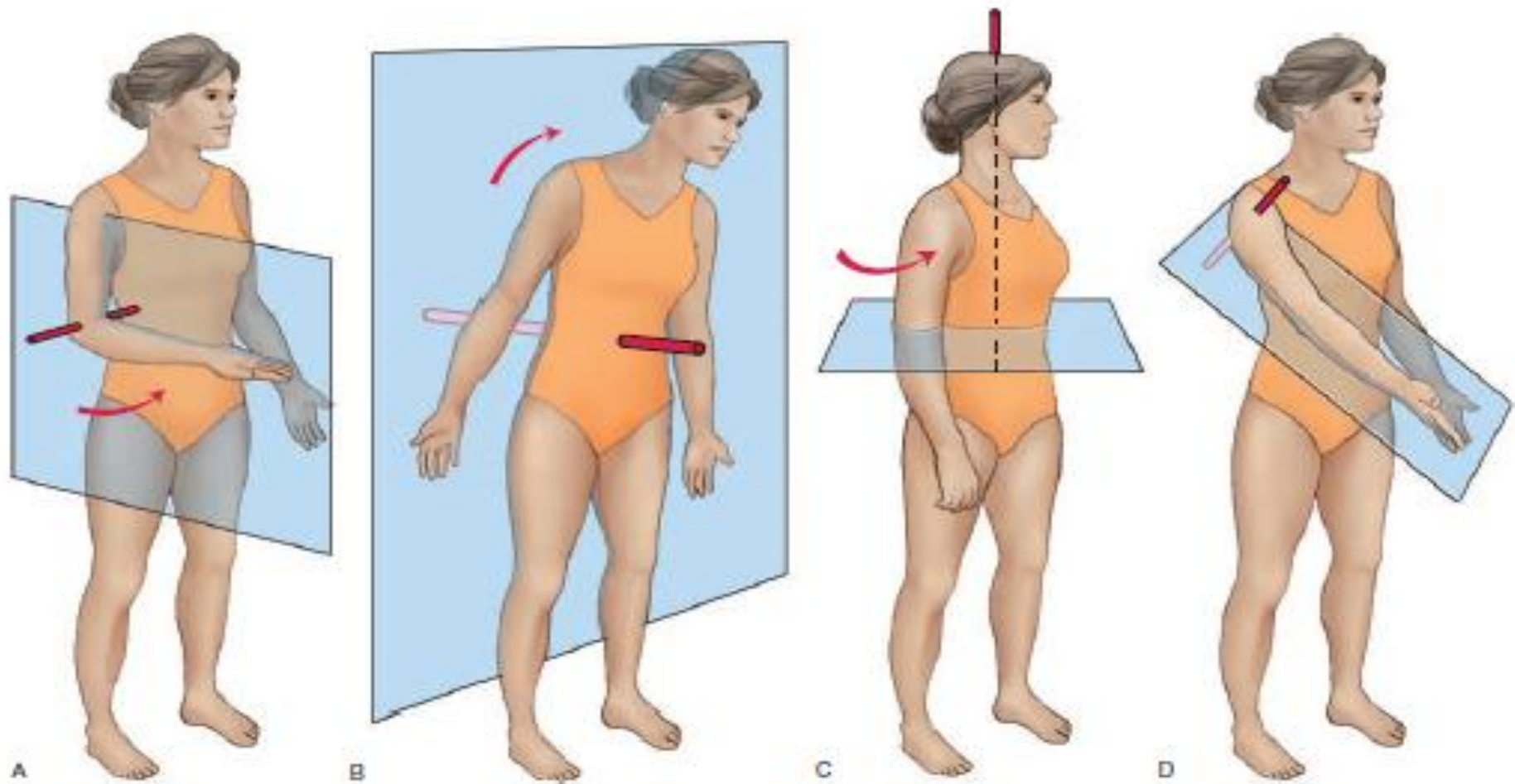
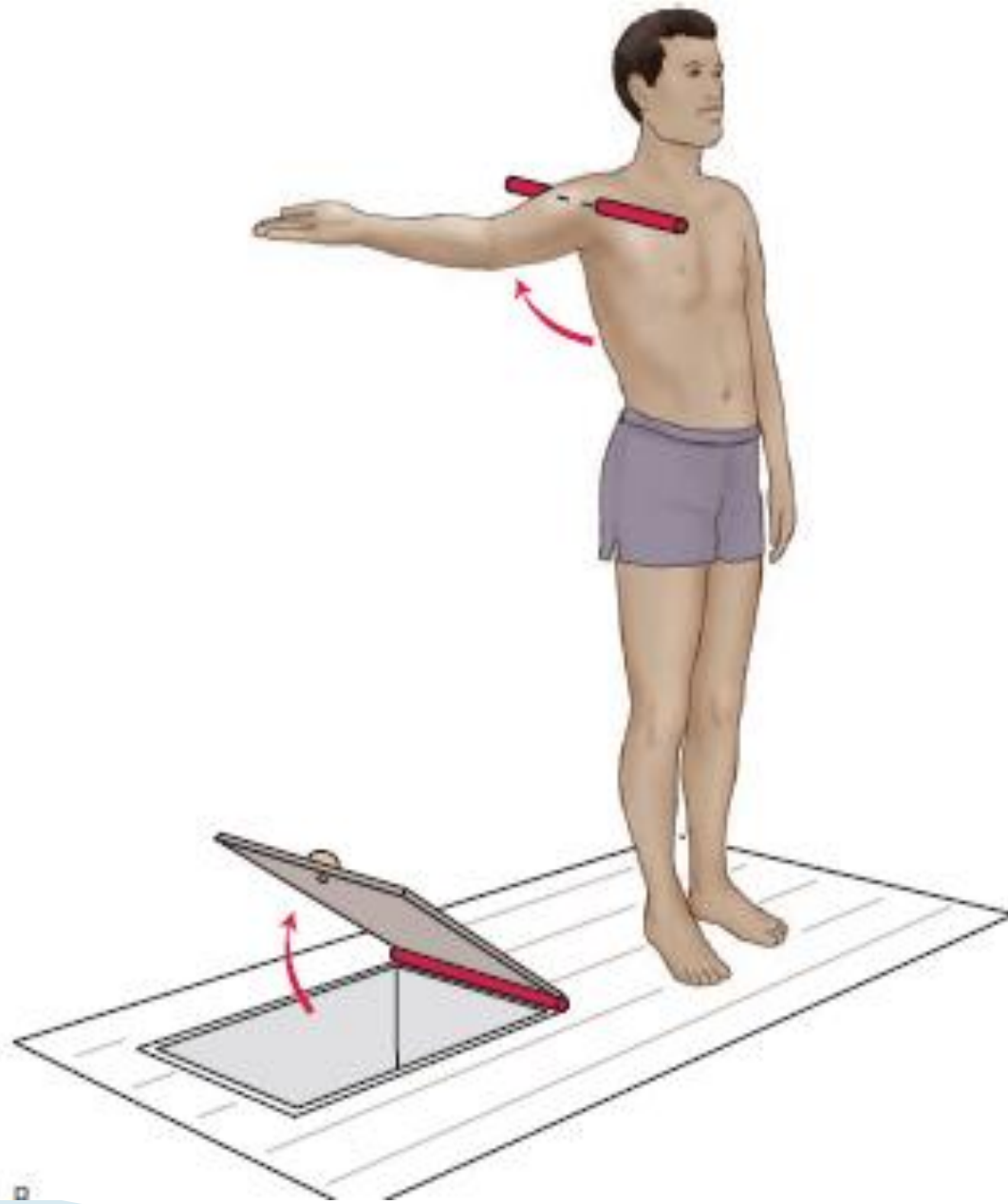


Figure 2-10 A to D, Anterolateral views that illustrate the corresponding axes for the three cardinal planes and an oblique plane; the axes are shown as red tubes. Note that an axis always runs perpendicular to the plane in which the motion is occurring. A, Motion occurring in the sagittal plane; because this motion is occurring around an axis that is running horizontally in a medial to lateral orientation, it is called the *mediolateral axis*. B, Motion occurring in the frontal plane; because this motion is occurring around an axis that is running horizontally in an anterior to posterior orientation, it is called the *anteroposterior axis*. C, Motion occurring in the transverse plane; because this motion is occurring around an axis that is running vertically in a superior to inferior orientation, it is called the *superoinferior axis*, or more simply, the *vertical axis*. D, Motion occurring in an oblique plane; this motion is occurring around an axis that is running perpendicular to that plane (i.e., it is the *oblique axis* for this oblique plane).

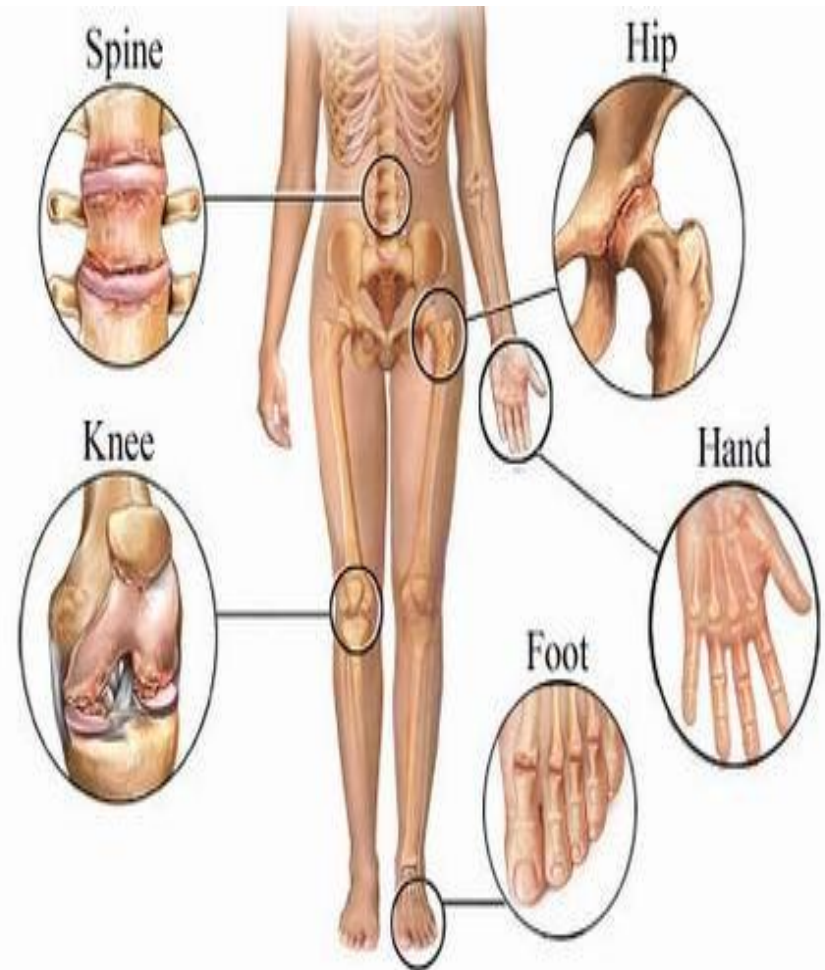


Summary of planes of motion & axis

Plane	Divides the body into:	Example	Axis
Frontal (coronal)	Front & back halves	<ul style="list-style-type: none">•Abduction/adduction•Spinal lateral flexion	Anteroposterior (sagittal) axis
Transverse (horizontal)	Superior & inferior halves	Rotational movements (pronation/supination)	Vertical (longitudinal) axis
Sagittal (anteroposterior)	Right & left halves	<ul style="list-style-type: none">•Flexion/extension•Sit-ups	Mediolateral (frontal) axis

Body Movements Occur at Joints

- **Joints** = articulations between two or more bones and are attached to each other by ligaments or cartilage.
- **Functions of joints**
 - Hold bones together
 - Allow for mobility



Factors Influencing Joint Stability

- A) The shape of articular surfaces.
- B) Ligaments
- C) Muscle Tone



Types of Joints

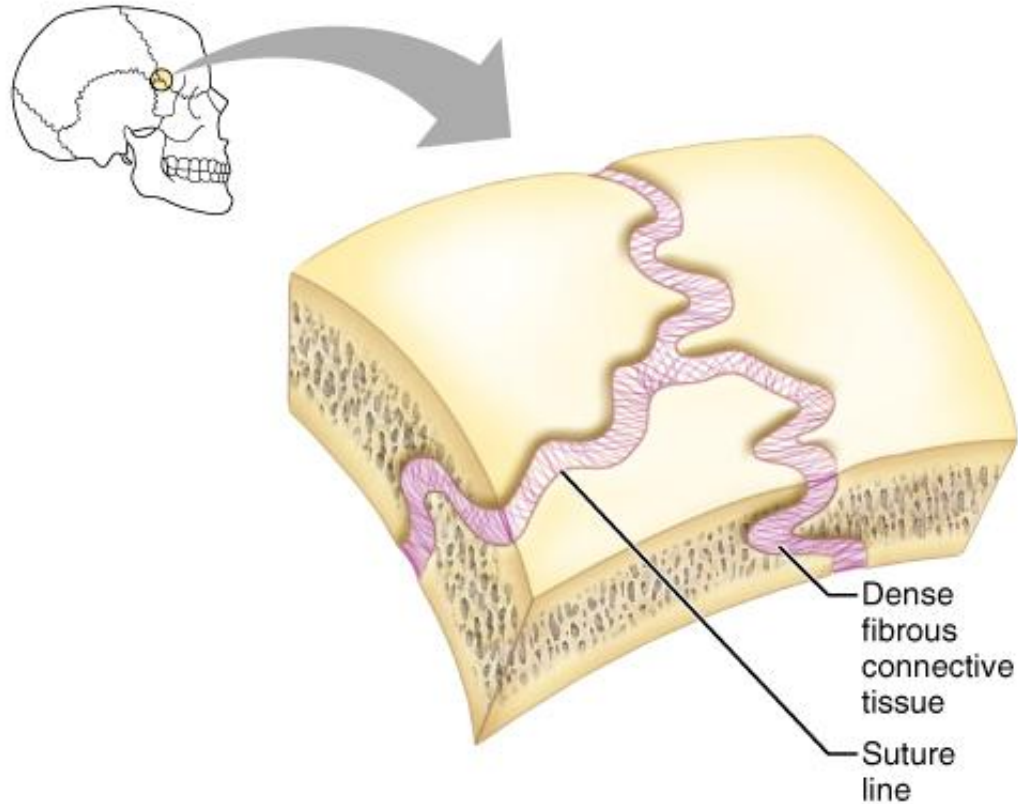
- ▶ Joints can be classified according to the degree and type of movement they allow.

1– Fibrous (or Immovable) Joints.

2– Cartilagenous Joints (slightly movable).

3– Synovial Joints (freely movable).

Fibrous (or Immovable) Joints.

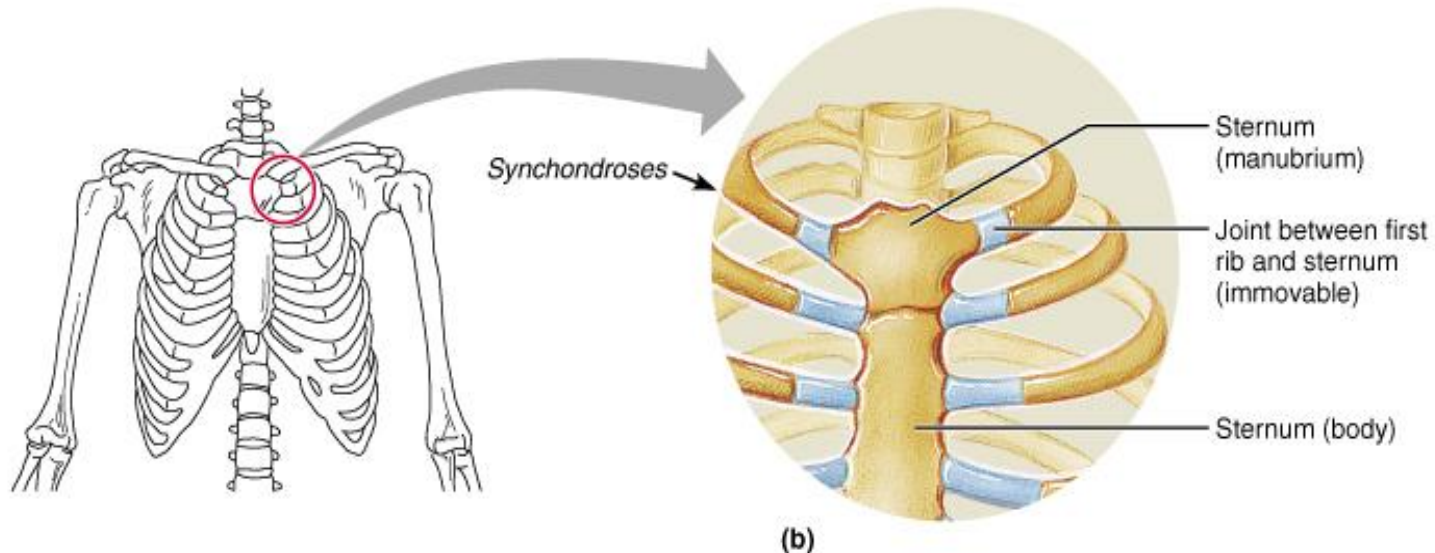


(a) Suture

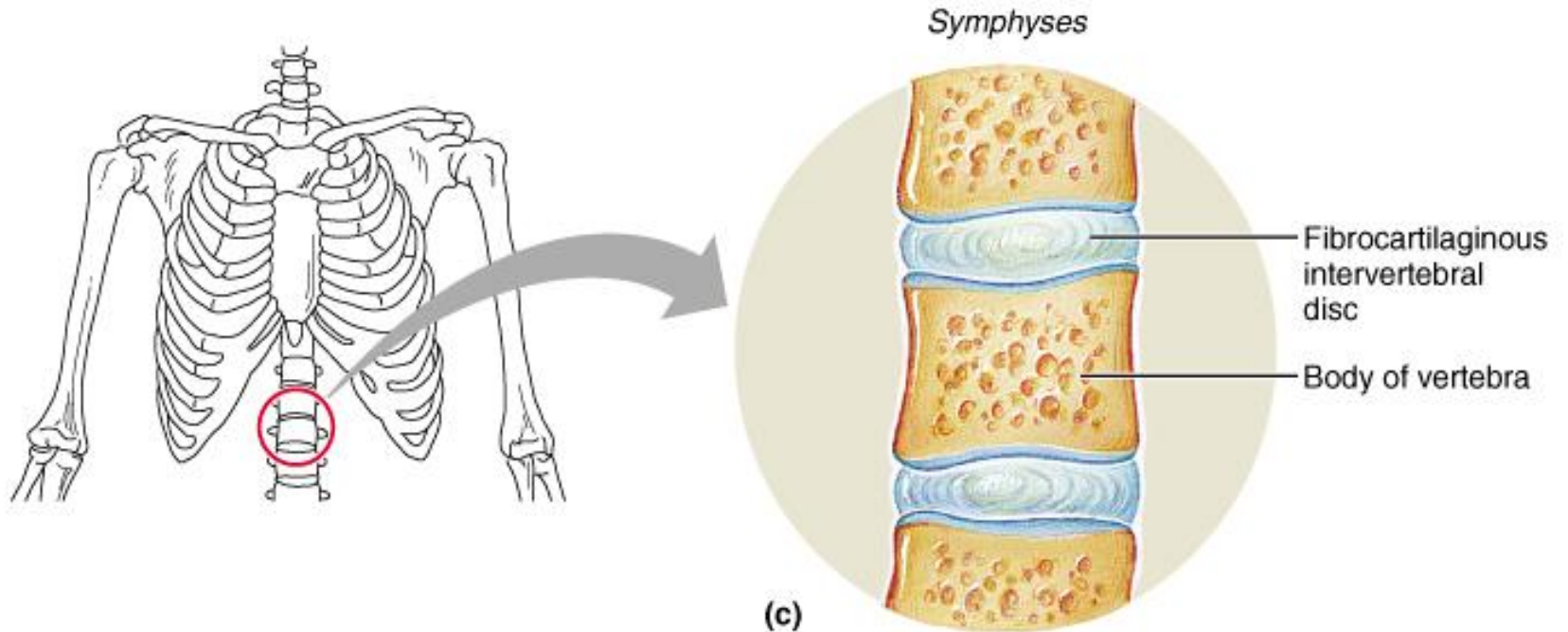
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Cartilaginous Joints

Symphyses = Fibrocartilagenous joint that allows very slight movement



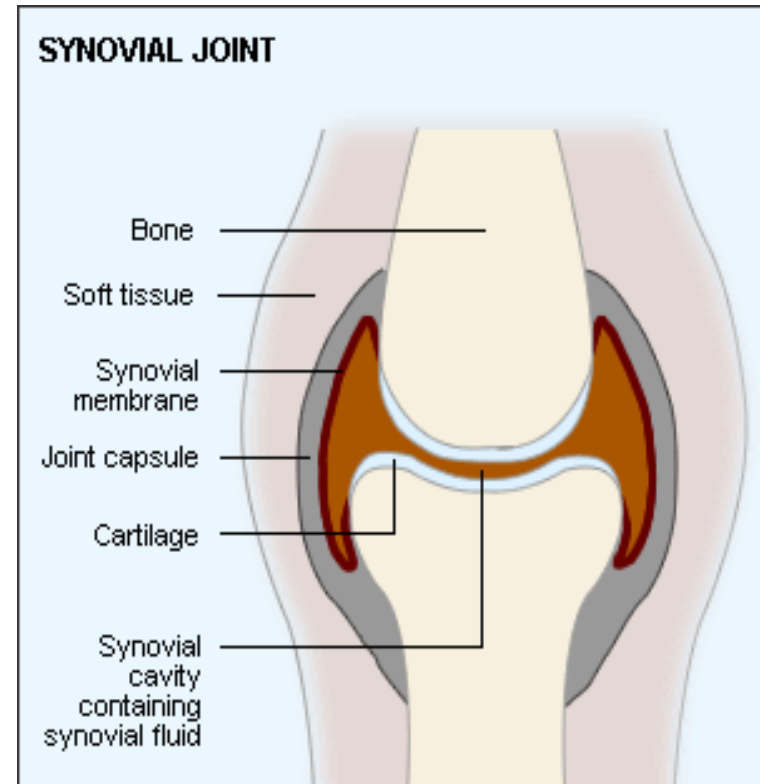
Fibrocartilagenous joint



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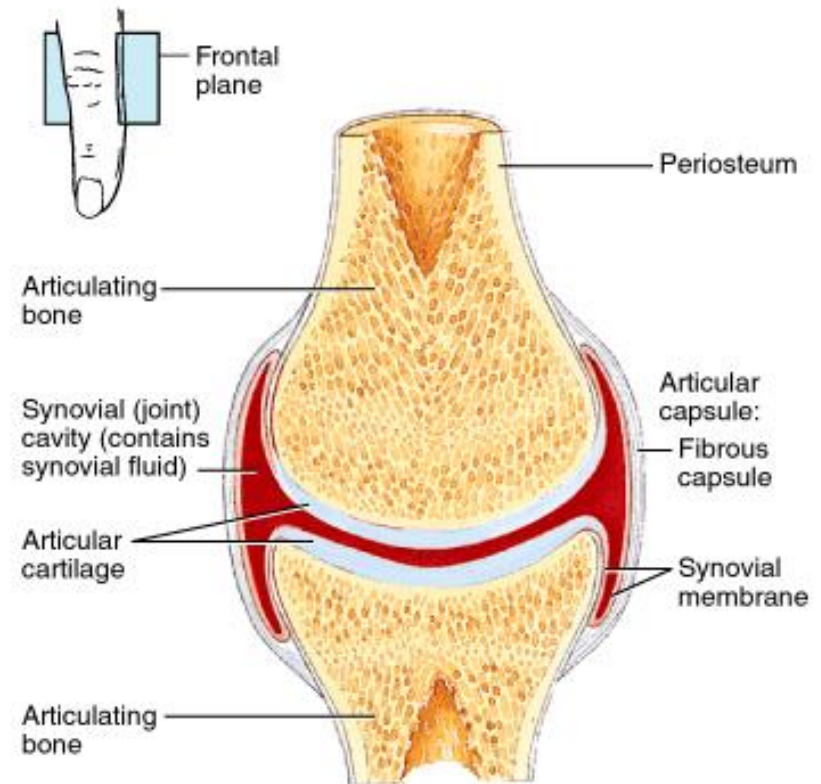
Synovial Joints = freely movable joints

- Most of the joints in the body are of the synovial type.
- The following are the **main characteristics** of a synovial joint:
 - ✓ The ends of the bones are covered with a **layer of smooth hyaline cartilage**, called **articular cartilage** in the joint regions. This **reduces friction** at the point.



Synovial Joints

- ✓ The joint is completely enclosed by a **bag-like capsular ligament** which holds the joint together and helps to contain the **synovial fluid**.

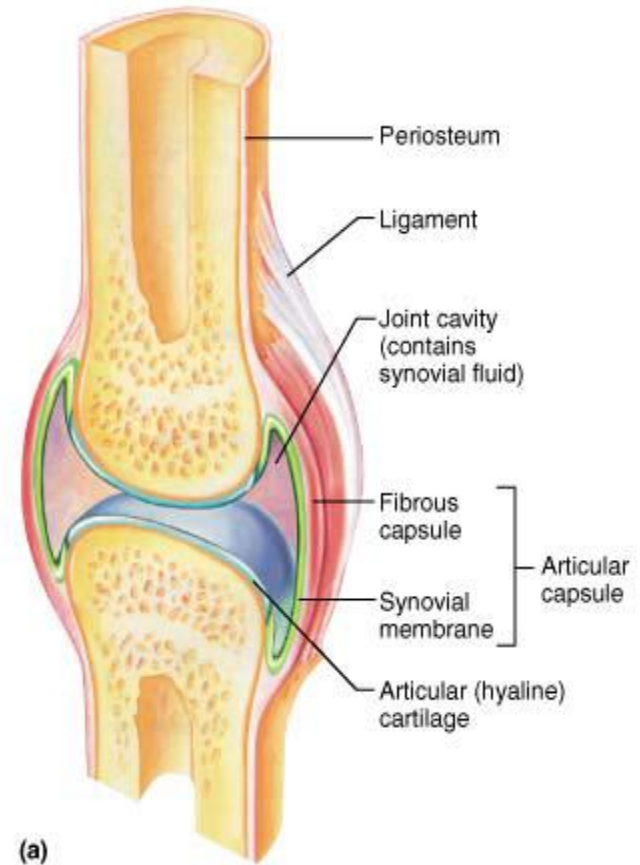


(a) Diagram of frontal section of a typical synovial joint

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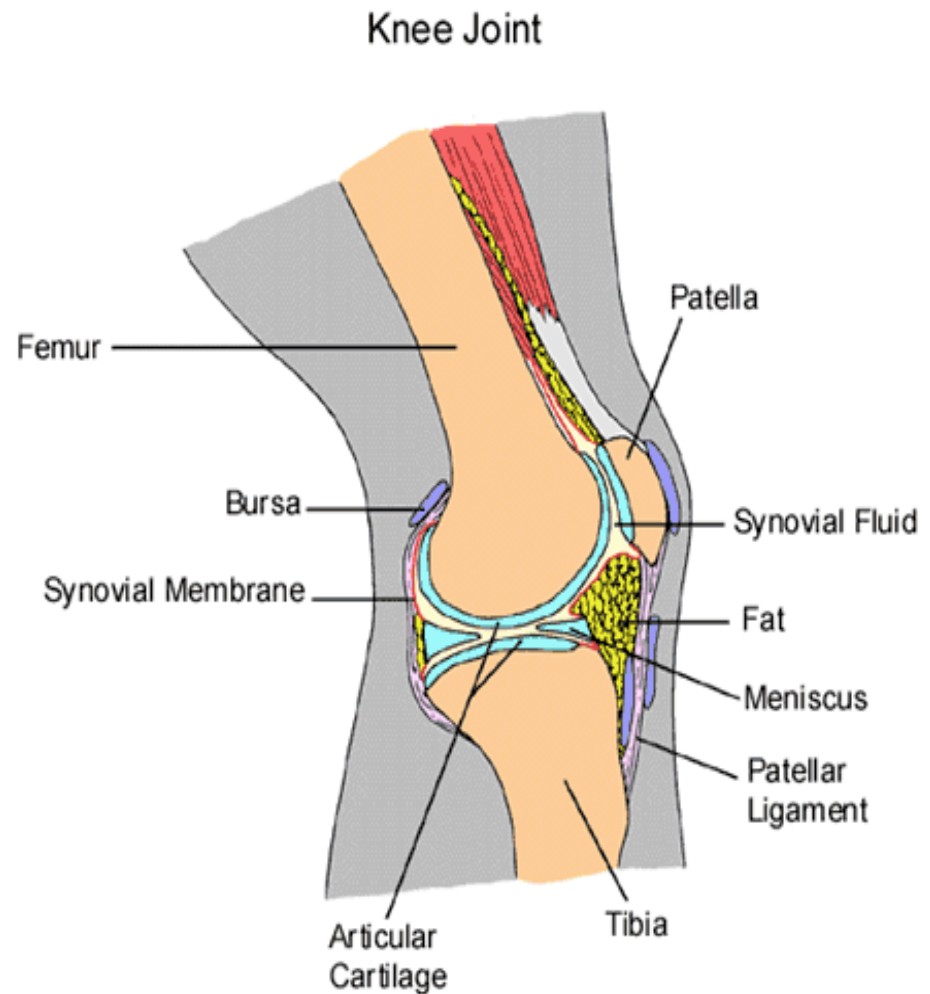
Synovial Joints. Cont.

- ✓ The **capsular ligament** is lined with a **synovial membrane**. This membrane **secretes synovial fluid** into the **synovial cavity** and acts as a **seal, waterproofing the joint**. The synovial fluid **lubricates the joint**.



Synovial Joints. Cont.

- ✓ In addition to the capsule, the bones are also attached and held together by strong, tough **ligaments** made of **dense connective tissue**. These ligaments **prevent dislocation** during normal movement.



Important links

- ▶ <http://quizlet.com/156152/kinesiology-movement-terminology-flash-cards/>