

**COURSE CODE:** ATM 218

**COURSE TITLE:** GENERAL HUMAN ANATOMY & ANATOMY OF THE  
UPPER & LOWER LIMBS & THORAX

**NUMBER OF UNITS:** 2 Units

**COURSE DURATION:** Two hours per week

**COURSE LECTURER:** Dr ADEROYEJE, TEMITOPE G

### **INTENDED LEARNING OUTCOMES**

At the completion of this course, students are expected to:

1. Define the basic anatomy terminologies and give examples
2. Understand and describe the skeleton of the upper and lower limbs and the thorax
3. Understand and describe the attachments and effects of the prime movers of the upper and lower limbs
4. Understand and describe the basic neurovascular supply to the upper and lower limbs
5. Understand and describe the basic anatomical mechanism of the circulatory system; and enumerate major vascular and lymphatic vessels
6. Understand and describe the basic anatomical mechanism of the respiratory system

### **COURSE DETAILS:**

**Week 1:** *Introduction to the basic anatomy terminologies*

**Week 2-3:** *The skeleton of the upper and lower limbs*

**Week 4-5:** *The attachments and effects of the prime movers of the upper and lower limbs*

**Week 5:** *The brachial plexus*

**Week 6-8:** *The basic vascular supply and lymphatic drainage of the upper and lower limbs*

**Week 9-10:** *The basic anatomical mechanism of the circulatory system; and enumerate major vascular and lymphatic vessels*

**Week 11:** *The basic anatomical mechanism of the respiratory system*

**Week 12:** *Revision*

## RESOURCES

- **Lecturer's Office Hours:**

- Dr. Aderoyeje T. G. Day of the week:

Time:

**Course lecture Notes:** <http://www.edouniversity.edu.ng/oer/compsc/cmp122.pdf>

- **Books:**

- *Moore Clinically Oriented Anatomy* by Keith L. Moore, Arthur F. Dalley and Anne M. R. Agur. International Edition

- **Internet**

*The Clinically Oriented Anatomy website (<http://thePoint.lww.com/COA6e>)*

**Assignments:**

- Multiple parts (2 or 3).
- Must be done in C/C++
- Homeworks + Project: ~ 30% of final grade.

- **Exams:**

- Final, comprehensive (according to university schedule): ~ 70% of final grade

**Assignments & Grading**

- **Academic Honesty:** All classwork should be done independently, unless explicitly stated otherwise on the assignment handout.

- You may discuss general solution strategies, but must write up the solutions yourself.

- If you discuss any problem with anyone else, you must write their name at the top of your assignment, labeling them “collaborators”.

- **NO LATE HOMEWORKS ACCEPTED**

- Turn in what you have at the time it's due.

- All homeworks are due at the start of class.

- If you will be away, turn in the homework early.

- Late assignments (projects) will not be accepted, but penalized according to the percentages given on the syllabus.



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# LECTURE 1: BASIC ANATOMICAL TERMINOLOGIES

## Introduction

Anatomical terminologies introduce and make up a large part of medical terminology. The proper use of terms in the correct way is imperative when communicating anatomical information, to ensure understanding by healthcare professionals and scientists worldwide. Health professionals must also know the common and colloquial terms people are likely to use when they describe their complaints. Furthermore, common terms people will understand must be used when explaining their medical problems to them. It is therefore necessary that the common terms equivalent for anatomical terms be learned and used appropriately when needed. *Terminologia Anatomica* (TA) lists anatomical terms both in Latin and as English equivalents (e.g., the common shoulder muscle is *musculus deltoideus* in Latin and *deltoid* in English). Unfortunately, the terminology commonly used in the clinical arena may differ from the official terminology. Because this discrepancy may be a source of confusion, many texts tend to clarify commonly confused terms by placing the unofficial designations in parentheses when the terms are first used—for example, *pharyngotympanic tube* (auditory tube, eustachian tube) and *internal thoracic artery* (internal mammary artery).

*Eponyms*, terms incorporating the names of people, are not used in the new terminology because they give no clue about the type or location of the structures involved. Further, many eponyms are historically inaccurate in terms of identifying the original person who describe a structure or assign its function, and do not conform to an international standard. Notwithstanding, commonly used eponyms appear in parentheses in some anatomy texts when these terms are first used—such as *sternal angle* (angle of Louis).

## Structure of terms

Anatomy is a descriptive science and requires names for the many structures and processes of the body. Most terms employed are derived from Latin and Greek, thence medical language may seem difficult at first; however, as the origin of terms are reflected upon, the words make sense. For example, the term *gaster* is Latin for stomach or belly. Therefore, the oesophagogastric junction is the site where the oesophagus connects with the stomach, gastric acid is the digestive juice secreted by the stomach, and a digastric muscle is a muscle divided into two bellies.

Many terms provide information about a structure's shape, size, location, or function or about the resemblance of one structure to another. For example, some muscles have descriptive names to indicate their main characteristics. The *deltoid muscle*, which covers the point of the shoulder, is triangular, like the symbol for *delta*, the fourth letter of the Greek alphabet. The suffix *-oid* means “like”; therefore, *deltoid* means like delta. *Biceps* means two-headed and *triceps* means three-headed. Some muscles are named according to their shape—the *piriformis muscle*, for example, is pear shaped (L. *pirum*, pear + L. *forma*, shape or form). Other muscles are named according to their location. The *temporal muscle* is in the temporal region (temple) of the cranium (skull). In some cases, actions are used to describe muscles—for example, the *levator scapulae* elevates the scapula (L. shoulder blade). Anatomical terminology applies logical reasons for the names of muscles and other parts of the body, and if you learn their meanings and think about them as you read and dissect, it will be easier to remember their names.

## Abbreviations

Abbreviations of terms are used for brevity in medical histories and texts generally; such as in tables of muscles, arteries, and nerves. Clinical abbreviations are used in discussions and descriptions of signs and symptoms. Learning to use these abbreviations also speeds note taking. Common anatomical and clinical abbreviations are provided in the Clinically Oriented Anatomy website (<http://thePoint.lww.com/COA6e>). More extensive lists of common medical abbreviations may be found in the appendices of comprehensive medical dictionaries (e.g., *Stedman's Medical Dictionary*, 28th ed.).

## Anatomical Position

All anatomical descriptions are expressed in relation to one consistent position, ensuring that descriptions are not ambiguous (Figs. I.1 and I.2). One must visualize this position in the mind when describing patients (or cadavers), whether they are lying on their sides, supine (recumbent, lying on the back, face upward), or prone (lying on the abdomen, face downward). The **anatomical position** refers to the body position as if the person were standing upright with the:

- head, gaze (eyes), and toes directed anteriorly (forward),
- arms adjacent to the sides with the palms facing anteriorly, and
- lower limbs close together with the feet parallel.

This position is adopted globally for anatomicomedical descriptions. By using this position and appropriate terminology, you can relate any part of the body precisely to any other part. It should also be kept in mind, however, that gravity causes a downward shift of internal organs (viscera) when the upright position is assumed. Since people are typically examined in the supine position, it is often necessary to describe the position of the affected organs when supine, making specific note of this exception to the anatomical position.

## Anatomical Planes

Anatomical descriptions are based on four imaginary planes (median, sagittal, frontal, and transverse) that intersect the body in the anatomical position (Fig. I.2):

- The **median plane**, the vertical plane passing longitudinally through the body, divides the body into right and left halves. The plane defines the midline of the head, neck, and trunk where it intersects the surface of the body. *Midline* is often erroneously used as a synonym for the median plane.
- **Sagittal planes** are vertical planes passing through the body *parallel to the median plane*. *Parasagittal* is commonly used but is unnecessary because any plane parallel to and on either side of the median plane is sagittal. However, a plane parallel and near to the median plane may be referred to as a *paramedian plane*.
- **Frontal (coronal) planes** are vertical planes passing through the body *at right angles to the median plane*, dividing the body into anterior (front) and posterior (back) parts.
- **Transverse planes** are horizontal planes passing through the body *at right angles to the median and frontal planes*, dividing the body into superior (upper) and inferior (lower) parts. Radiologists refer to transverse planes as *transaxial*, which is commonly shortened to *axial planes*. Since the number of sagittal, frontal, and transverse planes is unlimited, a reference point (usually a visible or palpable landmark or vertebral level) is necessary to identify the location or level of the plane, such as a “transverse plane through the umbilicus” (Fig. I.2C).

Sections of the head, neck, and trunk in precise frontal and transverse planes are symmetrical, passing through both the right and left members of paired structures, allowing some comparison. The main use of anatomical planes is to describe *sections* (Fig. I.3):

- **Longitudinal sections** run lengthwise or parallel to the long axis of the body or of any of its parts, and the term applies regardless of the position of the body. Although median, sagittal, and frontal planes are the standard (most commonly used) longitudinal sections, there is a 180° range of possible longitudinal sections.

- **Transverse sections**, or cross sections, are slices of the body or its parts that are cut at right angles to the longitudinal axis of the body or of any of its parts. Because the long axis of the foot runs horizontally, a transverse section of the foot lies in the frontal plane (Fig. I.2C).

- **Oblique sections** are slices of the body or any of its parts that are not cut along the previously listed anatomical planes. In practice, many radiographic images and anatomical sections do not lie precisely in sagittal, frontal, or transverse planes; often they are slightly oblique.

Anatomists create sections of the body and its parts anatomically, and clinicians create them by planar imaging technologies, such as computerized tomography (CT), to describe and display internal structures.

## Terms of Relationship and Comparison

Various adjectives, arranged as pairs of opposites, describe the relationship of parts of the body or compare the position of two structures relative to each other (Fig. I.4). Some of these terms are specific for comparisons made in the anatomical position, or with reference to the anatomical planes:

**Superior** refers to a structure that is nearer the **vertex**, the topmost point of the cranium (Mediev. L., skull).

**Cranial** relates to the cranium and is a useful directional term, meaning toward the head or cranium.

**Inferior** refers to a structure that is situated nearer the sole of the foot.

**Caudal** (L. *cauda*, tail) is a useful directional term that means toward the feet or tail region, represented in humans by the coccyx (tail bone), the small bone at the inferior (caudal) end of the vertebral column.

**Posterior** (dorsal) denotes the back surface of the body or nearer to the back.

**Anterior** (ventral) denotes the front surface of the body. **Rostral** is often used instead of anterior when describing parts of the brain; it means toward the rostrum (L. for beak); however, in humans it denotes nearer the anterior part of the head (e.g., the frontal lobe of the brain is rostral to the cerebellum).

**Medial** is used to indicate that a structure is nearer to the median plane of the body. For example, the 5th digit of the hand (little finger) is medial to the other digits.

**Lateral** stipulates that a structure is farther away from the median plane. The 1st digit of the hand (thumb) is lateral to the other digits.

**Dorsum** usually refers to the superior aspect of any part that protrudes anteriorly from the body, such as the dorsum of the tongue, nose, penis, or foot. It is also used to describe the posterior surface of the hand, opposite the **palm**. Because the term dorsum may refer to both superior and posterior surfaces in humans, the term is easier to understand if one thinks of a quadrupedalplantigrade animal that walks on its palms and soles, such as a bear. The **sole** is the inferior aspect or bottom of the foot, opposite the dorsum, much of which is in contact with the ground when standing barefoot. The surface of the hands, the feet, and the digits of both corresponding to the dorsum is the **dorsal surface**, the surface of the hand and fingers corresponding to the palm is the **palmar surface**, and the surface of the foot and toes corresponding to the sole is the **plantar surface**.

### Combined terms

Combined terms describe intermediate positional arrangements:

**Inferomedial** means nearer to the feet and median plane—for example, the anterior parts of the ribs run inferomedially

**Superolateral** means nearer to the head and farther from the median plane.

Other terms of relationship and comparisons relate primarily to the body's surface or its central core:

**Superficial, intermediate, and deep** describe the position of structures relative to the surface of the body or the relationship of one structure to another underlying or overlying structure.

**External** means outside of or farther from the center of an organ or cavity, while **internal** means inside or closer to the center, independent of direction.

**Proximal and distal** are used when contrasting positions nearer to or farther from the attachment of a limb or the central aspect of a linear structure, respectively.

### Terms of Laterality

Paired structures having right and left members (e.g., the kidneys) are **bilateral**, whereas those occurring on one side only (e.g., the spleen) are **unilateral**. Designating whether you are referring specifically to the right or left member of bilateral structures can be critical, and is a good habit to begin at the outset of one's training to become a health professional. Something occurring on the same side of the body as another structure is **ipsilateral**; the right thumb and right great (big) toe are ipsilateral, for example. **Contralateral** means occurring on the opposite side of the body relative to another structure; the right hand is contralateral to the left hand.

### Terms of Movement

Various terms describe movements of the limbs and other parts of the body (Fig. I.5). Most movements are defined in relationship to the anatomical position, with movements occurring within, and around axes aligned with, specific anatomical planes. While most movements occur at joints where two or more bones or cartilages articulate with one another, several non-skeletal structures exhibit movement (e.g., tongue, lips, eyelids). Terms of movement may also be considered in pairs of opposing movements: Flexion and extension movements generally occur in sagittal planes around a transverse axis (Fig. I.5A & B).

**Flexion** indicates bending or decreasing the angle between the bones or parts of the body. For most joints (e.g., elbow), flexion involves movement in an anterior direction.

**Extension** indicates straightening or increasing the angle between the bones or parts of the body. Extension usually occurs in a posterior direction. The knee joint, rotated 180° to other joints, is exceptional in that flexion of the knee involves posterior movement and extension involves anterior movement.

**Dorsiflexion** describes flexion at the ankle joint, as occurs when walking uphill or lifting the front of the foot and toes off the ground (Fig. I.5I).

**Plantarflexion** bends the foot and toes toward the ground, as when standing on your toes. Extension of a limb or part beyond the normal limit—**hyperextension** (overextension)—can cause injury, such as “whiplash” (i.e., hyperextension of the neck during a rear-end automobile collision).

Abduction and adduction movements generally occur in a frontal plane around an anteroposterior axis (Fig. I.5E & G). Except for the digits, **abduction** means moving away from the median plane (e.g., when moving an upper limb laterally away from the side of the

body) and **adduction** means moving toward it. In *abduction of the digits* (fingers or toes), the term means spreading them apart—moving the other fingers away from the neutrally positioned 3rd (middle) finger or moving the other toes away from the neutrally positioned 2<sup>nd</sup> toe. The 3rd finger and 2nd toe *medially* or *laterally abduct* away from the neutral position. *Adduction of the digits* is the opposite—bringing the spread fingers or toes together, toward the neutrally positioned 3rd finger or 2nd toe. Right and left lateral flexion (lateral bending) are special forms of abduction for only the neck and trunk (Fig. I.5J). The face and upper trunk are directed anteriorly as the head and/or shoulders tilt to the right or left side, causing the midline of the body itself to become bent sideways. This is a compound movement occurring between many adjacent vertebrae. As you can see by noticing the way the thumbnail faces (laterally instead of posteriorly in the anatomical position), the thumb is rotated 90° relative to the other digits (Fig. I.5F). Therefore, the thumb flexes and extends in the frontal plane and abducts and adducts in the sagittal plane.

**Circumduction** is a circular movement that involves sequential flexion, abduction, extension, and adduction (or in the opposite order) in such a way that the distal end of the part moves in a circle (Fig. I.5H). Circumduction can occur at any joint at which all the above-mentioned movements are possible (e.g., the shoulder and hip joints).

**Rotation** involves turning or revolving a part of the body around its longitudinal axis, such as turning one's head to face sideways (Fig. I.5G). *Medial rotation* (internal rotation) brings the anterior surface of a limb closer to the median plane, whereas *lateral rotation* (external rotation) takes the anterior surface away from the median plane.

Pronation and supination are the rotational movements of the forearm and hand that swing the distal end of the radius (the lateral long bone of the forearm) medially and laterally around and across the anterior aspect of the ulna (the other long bone of the forearm) while the proximal end of the radius rotates in place (Fig. I.5D).

**Pronation** rotates the radius medially so that the palm of the hand faces posteriorly, and its dorsum faces anteriorly. When the elbow joint is flexed, pronation moves the hand so that the palm faces inferiorly (e.g., placing the palms flat on a table). *Pronation of the foot* actually refers to a combination of eversion and abduction that results in lowering of the medial margin of the foot (the feet of an individual with flat feet are pronated)

**Supination** is the opposite rotational movement, rotating the radius laterally and uncrossing it from the ulna, returning the pronated forearm to the anatomical position. When the elbow joint is flexed, supination moves the hand so that the palm faces superiorly. *supination of the foot* generally implies movements resulting in raising the medial margin of the foot, a combination of inversion and adduction.

**Eversion** moves the sole of the foot away from the median plane, turning the sole laterally (Fig. I.5I). When the foot is fully everted, it is also dorsiflexed.

**Inversion** moves the sole of the foot toward the median plane (facing the sole medially). When the foot is fully inverted it is also plantarflexed.

**Opposition** is the movement by which the pad of the 1<sup>st</sup> digit (thumb) is brought to another digit pad (Fig. I.5C). This movement is used to pinch, button a shirt, and lift a teacup by the handle.

**Reposition** describes the movement of the 1st digit from the position of opposition back to its anatomical position.

**Protrusion** is a movement anteriorly (forward) as in protruding the mandible (chin), lips, or tongue (Fig. I.5L).

**Retrusion** is a movement posteriorly (backward), as in retruding the mandible, lips, or tongue.

**Protraction** and **retraction** are used most commonly for anterolateral and posteromedial movements of the scapula on the thoracic wall, causing the shoulder region to move anteriorly and posteriorly (Fig. I.5M).

**Elevation** raises or moves a part superiorly, as in elevating the shoulders when shrugging, the upper eyelid when opening the eye, or the tongue when pushing it up against the palate (roof of mouth) (Fig. I.5K).

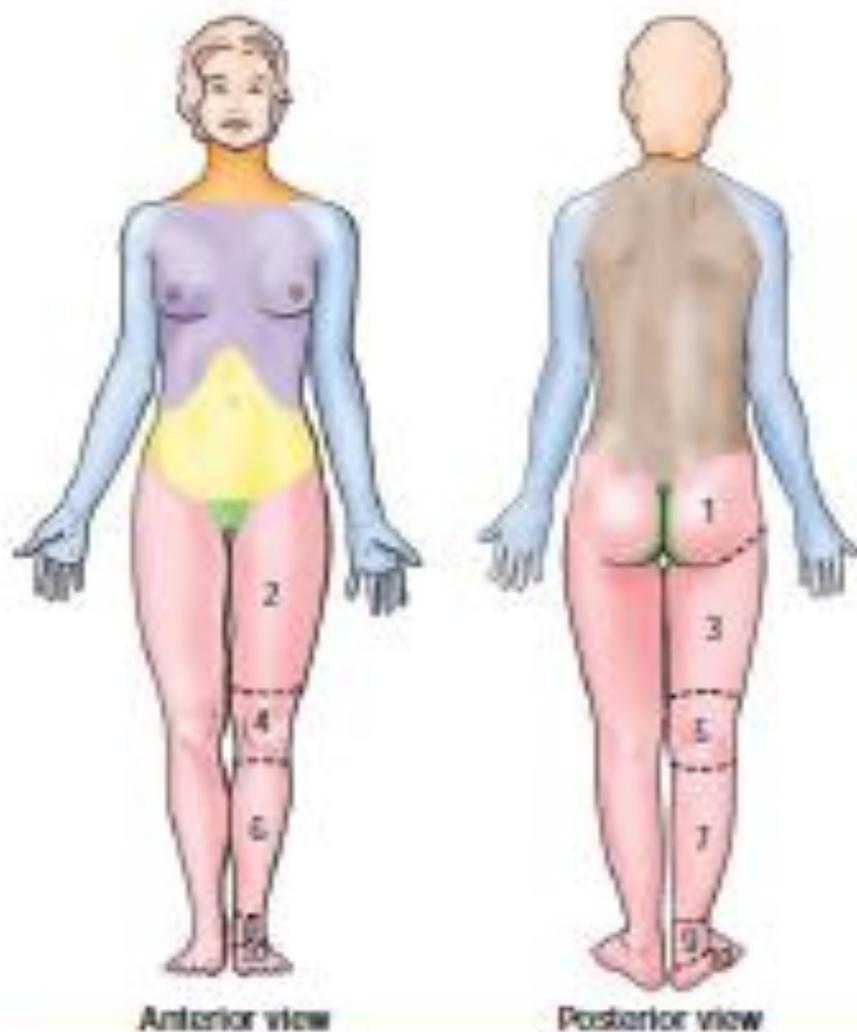
**Depression** lowers or moves a part inferiorly, as in depressing the shoulders when standing relaxed, the upper eyelid when closing the eye, or pulling the tongue away from the palate.



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### Key Major Parts of the Body

|  |  |   |  |
|--|--|---|--|
|  Head |  Thorax |  Abdomen         |  Lower limb |
|  Neck |  Back   |  Pelvis/perineum |  Upper limb |



### Key Regions of Lower Limb

|                            |  |
|----------------------------|--|
| 1 - Gluteal region         | 6 - Anterior leg region                |
| 2 - Anterior thigh region  | 7 - Posterior leg region               |
| 3 - Posterior thigh region | 8 - Anterior talocrural (ankle) region |
| 4 - Anterior knee region   | 9 - Posterior talocrural region        |
| 5 - Posterior knee region  | 10 - Foot region                       |

FIGURE 1.1 Major parts of the body and regions of the lower limb.

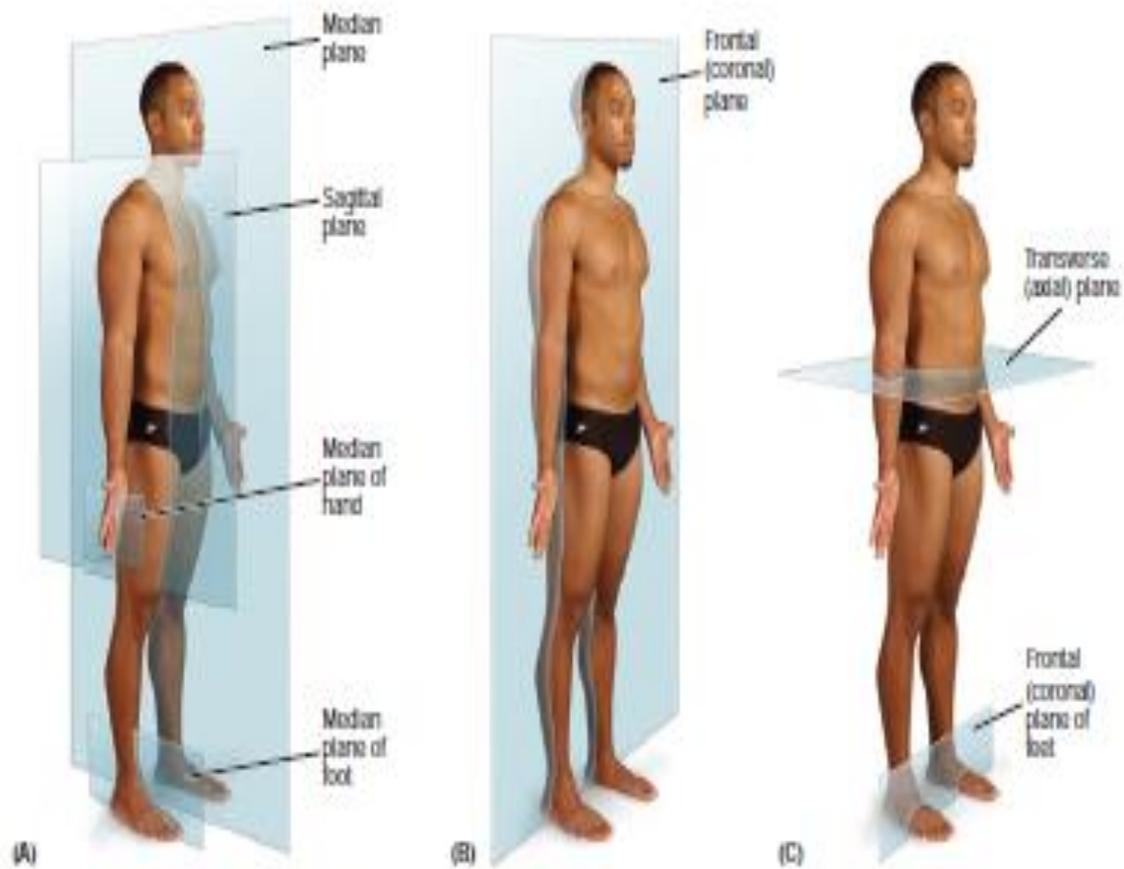
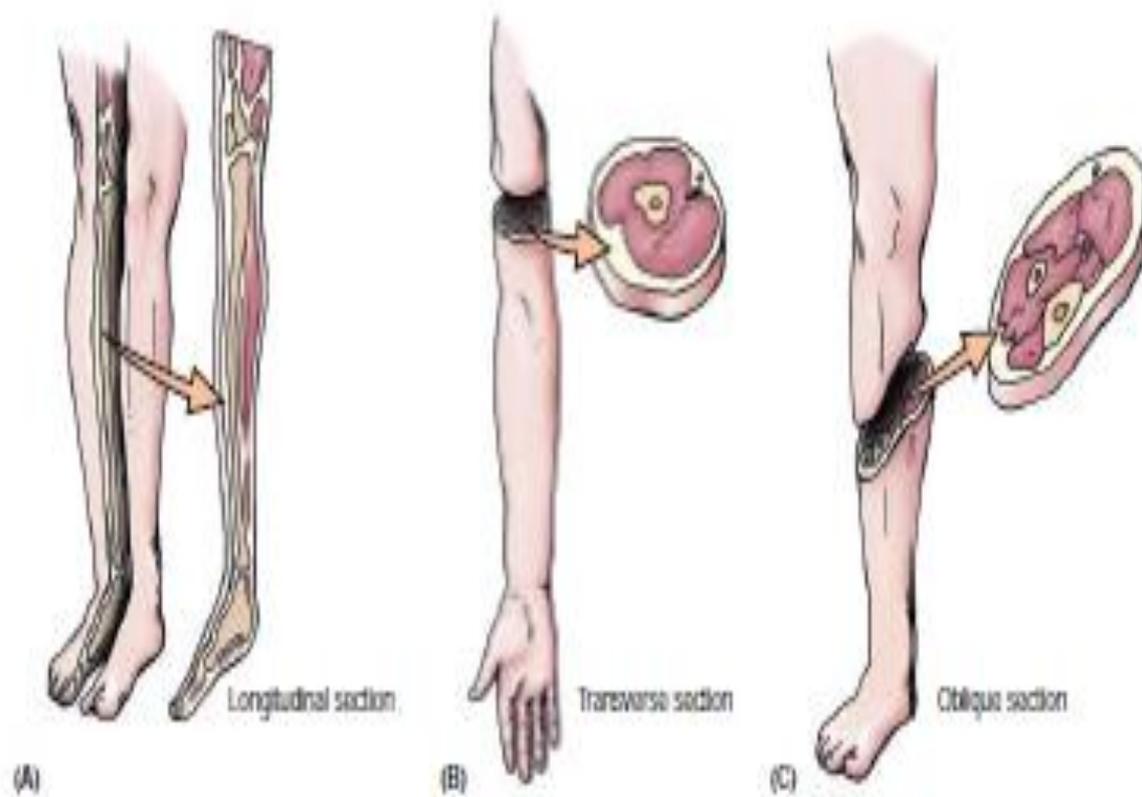


FIGURE 1.2. Anatomical planes. The main planes of the body are illustrated.



**FIGURE 1.1** Sections of the limbs. Sections may be obtained by anatomical sectioning or medical imaging techniques.

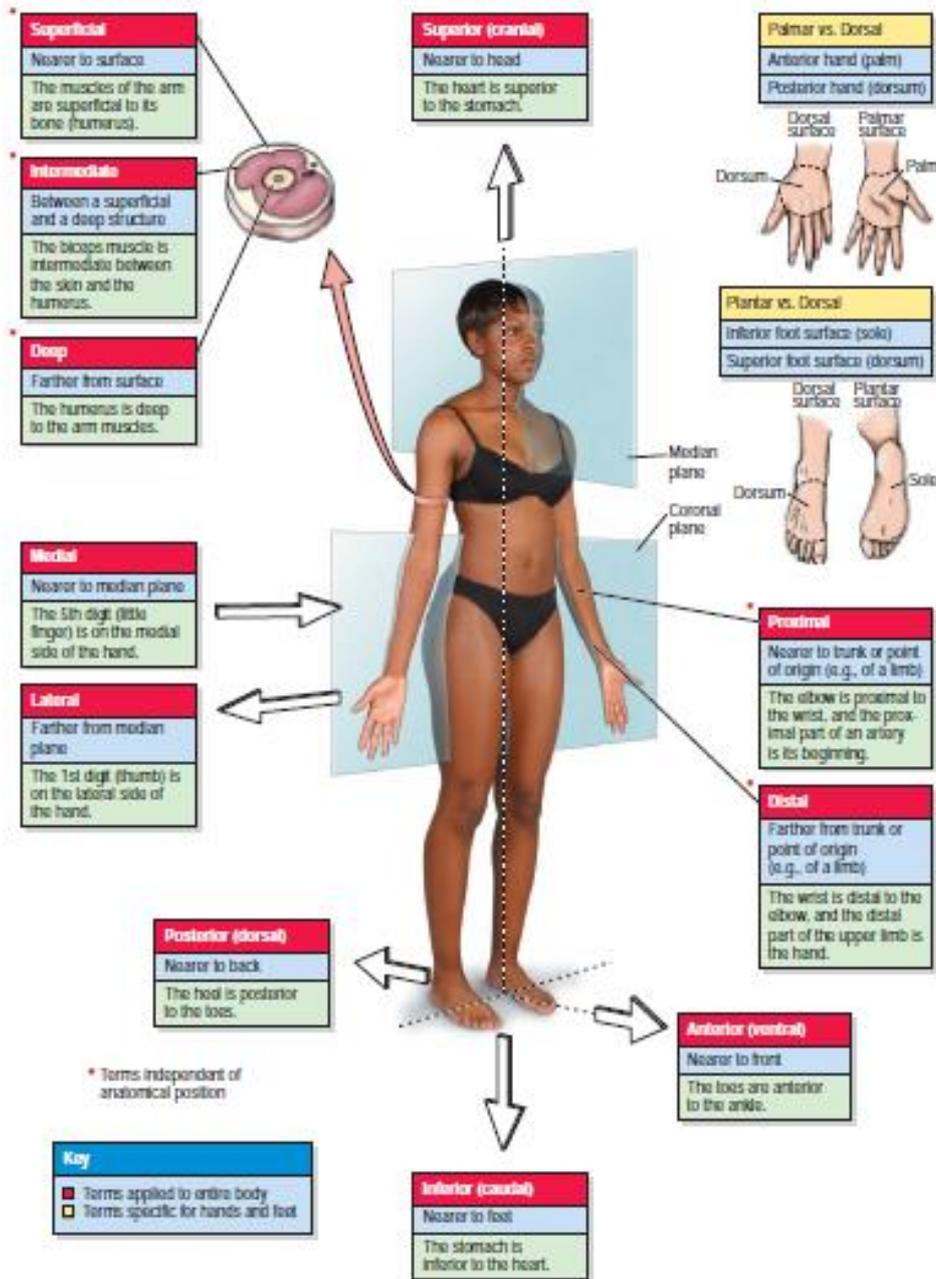
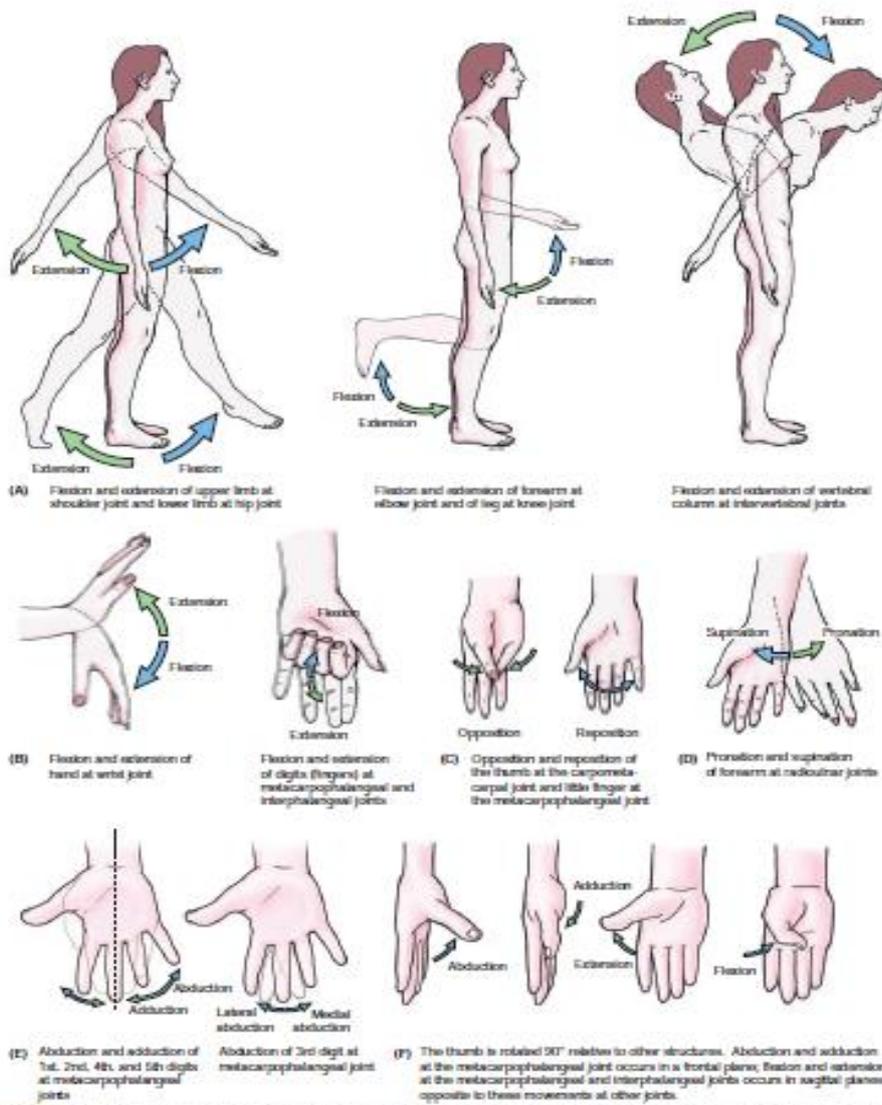


FIGURE 1.4. Terms of relationship and comparison. These terms describe the position of one structure relative to another.



**FIGURE 1.5. Terms of movement.** These terms describe movements of the limbs and other parts of the body; most movements take place at joints, where two or more bones or cartilages articulate with one another.

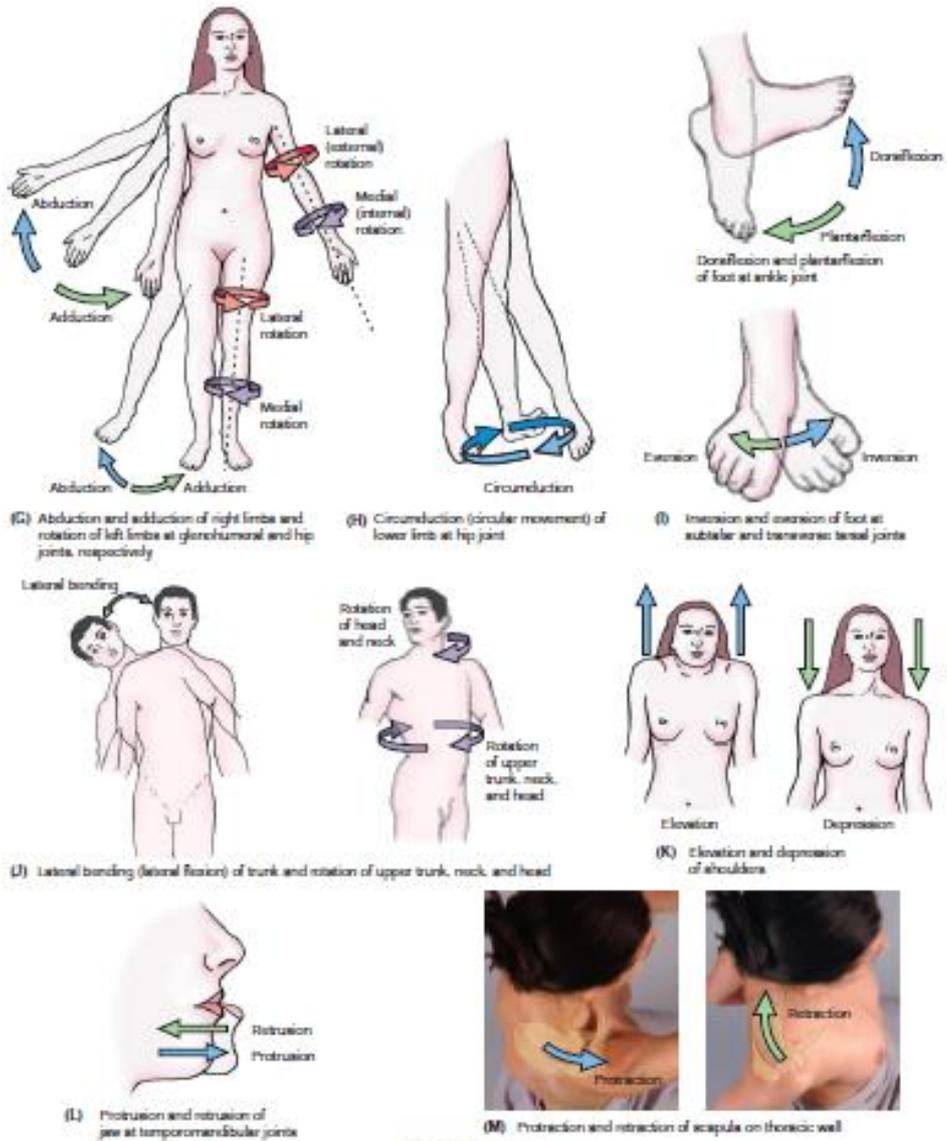


FIGURE 1.5. (Continued)



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