PART ONE

Foundational Concepts of Myology and Kinesiology
1

Anatomical Terminology and Body Movements

CHAPTER OUTLINE

ANATOMICAL TERMINOLOGY
Anatomical Position
Body Regions
Planes of Reference
Directional Terms
Anterior
Posterior
Superior
Inferior
Proximal
Distal
Medial
Superficial
Deep

MOVEMENTS
Flexion
Extension
Rotation
Abduction
Adduction
Circumduction
Horizontal Abduction
Horizontal Adduction

Inversion of the Foot
Eversion of the Foot
Elevation
Depression
Protraction
Retraction
Upward Rotation
Downward Rotation
Chapter Summary
Workbook
Palpation Exercises
Review Exercises

KEY TERMS
Anatomical position: a standard body position that is used to provide consistent orientation to the body from which directional terms are referenced. Body is standing erect while head, feet, and palms face forward.

Cephalic region: region of the head
Cranium: includes top and back of the head
Thorax: region of the body between the neck and abdomen
Sagittal plane: plane that divides the body into left and right sections
Frontal (coronal) plane: plane that divides the body into front and back sections
Transverse plane: plane that divides the body into upper and lower sections
Anterior: front or toward the front
Posterior: back or toward the back
Superior: above
Inferior: below
Proximal: closer to the trunk, typically used in reference to an extremity
Distal: farther from the trunk, typically used in reference to an extremity

Medial: closer to the midline
Lateral: farther from the midline
Ipsilateral: pertaining to the same side
Contralateral: pertaining to the opposite side
Unilateral: one-sided, typically either right- or left-sided
Bilateral: two-sided, typically right- and left-sided
Superficial: closer to the surface
Deep: farther from the surface
Flexion: bending movement that occurs at a joint
Dorsiflexion: ankle movement, in which the top of the foot moves toward the front of the leg
Plantarflexion: ankle movement, in which the sole of the foot moves downward, toward the back of the leg, or causes us to rise up on our toes.
Lateral flexion: movement of neck, trunk, or lower spine that involves bending to the side
Extension: straightening movement that occurs at a joint
ANATOMICAL TERMINOLOGY

This chapter is designed to provide you with the terminology needed to study the muscles and movements of the body. We begin with a study of anatomical language. Massage therapists frequently communicate with each other and with other health care professionals, as well as with clients. Anatomical language allows you to communicate with precision and clarity about anatomical structures and locations, and the health issues that your clients may be facing. In addition, you will need to understand anatomical language as you look at the many illustrations included in this text. The pictures are shown from different perspectives and angles and are labeled with anatomical terms to help you understand the orientation of the picture. For many students, the study of anatomical language is like learning a foreign language. Give yourself enough study time to grasp the terms we will use.

After we cover anatomical language, we will explore the names of the movements we can perform. Understanding the terms that describe our body’s movements will be essential for studying the muscles and their actions.

Anatomical Position

Anatomical position refers to a standard body position that is used to give us a consistent orientation to the body from which directional terms are referenced (determined). Western anatomical position includes the following characteristics:
1. Standing erect (upright)
2. Arms at the sides
3. Facing forward (both head and feet)
4. Palms facing forward

Body Regions

Anatomists have divided the body into several distinct regions and named them with specific anatomical language. The head or cephalic region is subdivided into the cranium and face. The cranium includes the top and back of the head, and the face includes the area from the eyebrows down to the chin. The neck region lies between the head and the chest. The thorax is the region between the neck and the abdomen. The front of the thorax is typically called the chest, and the back of the thorax is commonly called the upper and mid back. The abdominal region lies between the thorax and the pelvis, and the pelvic region is the area between the abdomen and the lower extremities. When combined, the thorax, abdomen, and pelvis make up the trunk. In addition, the armpit area is called the axilla, and the front of the elbow is the antebrachial area. The groin area is called the inguinal area.

The extremities are divided into distinct areas, as well. In anatomical language, the arm is defined as the body part between the shoulder and the elbow. The forearm is defined as the body part between the elbow and the wrist. In anatomical language, the thigh is defined as the body part between the hip and the knee, and the leg is defined as the body part between the knee and the ankle.

Figure 1-1 shows a person in anatomical position, with body regions labeled.

**Hyperextension**: the movement of extension beyond anatomical position

**Rotation**: a turning movement that occurs at a joint

**Supination**: a turning movement that occurs within the forearm, causing the forearm to rotate laterally

**Pronation**: a turning movement that occurs within the forearm, causing the forearm to rotate medially

**Abduction**: a movement bringing a body part away from the midline or out to the side of the body

**Adduction**: a movement bringing a body part closer to the midline or across the midline of the body

**Circumduction**: movement of a body part in a circular direction, combining flexion, extension, adduction, and abduction

**Horizontal abduction**: movement of a limb in a horizontal manner away from the midline of the body

**Horizontal adduction**: movement of a limb in a horizontal manner toward and/or across the midline of the body

**Inversion of the foot**: movement of the sole of the foot inward toward the midline

**Eversion of the foot**: movement of the sole of the foot outward toward the side

**Elevation**: upward movement

**Depression**: downward movement

**Protraction**: movement in an anterior or forward direction

**Retraction**: movement in a posterior or backward direction

**Upward rotation**: turning movement of the shoulder blade or scapula, such that the right scapula turns counterclockwise or the left scapula or shoulder blade turns clockwise

**Downward rotation**: turning movement of the shoulder blade or scapula, such that the right scapula turns clockwise or the left scapula or shoulder blade turns counterclockwise
FIGURE 1-1 • Anatomical position showing the body regions.

Planes of Reference
The anatomical planes of reference are another tool useful for describing the body. Anatomical structures can be depicted from different perspectives to illustrate particular views. The plane that divides the body into right and left sections is called a **sagittal plane**. The plane that divides the body into front and back (**anterior** and **posterior**) sections is called a **frontal** or **coronal plane**. The plane that divides the body into upper and lower portions is called a **transverse plane**.

Figure 1-2 illustrates the planes of the body: A = sagittal, B = frontal or coronal, C = transverse.

Directional Terms
Directional terms allow us to communicate precisely about the locations of bodily structures. We will use these terms frequently to describe the locations of muscles and their attachment sites to bones.

**Anterior**
**Anterior** (or ventral) refers to the front of the body or the front of a body part, or closer to the front. (**Palmar** is a similar term, referring to the palm of the hand.) Examples of using the term include the following: The eyes and nose are on the anterior aspect of the face. A client complained of soreness in his anterior thighs.

**Posterior**
**Posterior** (or dorsal) refers to the back of the body or the back of a body part, or closer to the back. Examples of using the term include the following: The spine is most palpable on the posterior aspect of the body. A client has a sunburn on his posterior neck.

**Superior**
**Superior** (or cephalad) means above or refers to a location closer to the top of the head. This term is generally applied to the head, neck, and trunk (and not the extremities). Examples of using the term include the following: The chin is superior to the navel. A client’s headache is felt directly superior to her eyes.

**Inferior**
**Inferior** (or caudal) means below or closer to the feet. This term is generally used when referring to a location in the head, neck, and/or trunk. Examples of using the term include the following: The chin is inferior to the nose. A client is experiencing back pain directly inferior to the 12th rib.
Proximal

Proximal means closer to the core of the body. This term is generally used when describing a location on a limb. On the upper limb, proximal means closer to the shoulder joint, and on the lower limb, proximal means closer to the hip joint. Examples of using the term include the following: The elbow is proximal to the wrist. A client has a hairline fracture in her left, proximal femur (bone of the thigh).

Distal

Distal means farther from the trunk of the body. Distal also means closer to the tips of the toes or fingers. This term is used when describing a location on a limb. On the upper limb, distal means farther from the shoulder joint and closer to the fingertips. On the lower limb, distal means farther from the hip joint and closer to the tips of the toes. Examples of using the term include the following: The wrist is distal to the elbow. A client has osteoarthritis in the most distal joints of her fingers. Massage therapists’ fingertips should be distal to their fingernails.

Medial

Medial means closer to the midline or mid-sagittal plane. This term applies to all parts of the body. Examples of using the term include the following: The nose is medial to the ears. A client complains of muscle tension in his right medial thigh.

Lateral

Lateral means closer to the side or farther away from the midline. This term applies to all parts of the body. Examples of using the term include the following: The hips are lateral to the navel. A client has a bruise on the lateral aspect of his right forearm. Note: Without anatomical position, there would not be consistency in defining the lateral side the forearm. Why?

Ipsilateral

Ipsilateral means located on or pertaining to the same side of the body, either the right or left. An example of using this term is as follows: A client has an ipsilateral shortening of the trapezius and levator scapula muscles on the right side.

Contralateral

Contralateral means located on or pertaining to the opposite side of the body. Two examples of the use of this term include: A lesion on the brain will commonly cause contralateral paralysis. A muscle, such as the right SCM, which is located on the right side of the neck, causes the neck to rotate to the left. This action is called contralateral rotation of the neck.

Unilateral

Unilateral means one-sided, referring to the right side only or the left side only. Two examples of the use of this term follow: One can experience a unilateral lung collapse. When a muscle, such as the SCM neck muscle, contracts unilaterally, it causes lateral flexion of the neck.

Bilateral

Bilateral means two-sided. An example of using the term is as follows: When the SCM muscles contract bilaterally—meaning that both right and left SCM muscles contract simultaneously—the result is flexion of the neck.

Superficial

Superficial means closer to the surface of the body. Examples of using the term include the following: The sternum (breast bone) is superficial to the heart. A client has a strain in his biceps brachii, the most superficial muscle in the anterior arm.

Deep

Deep means farther away from the surface. Examples of using the term include the following: The stomach is deep to the abdominal muscles. A client has shin splints because she tore a muscle in the deep posterior leg compartment.
Figure 1-3 uses arrows to illustrate directional terms.

**MOVEMENTS**

Movement happens at joints. We will discuss the significance of joints in Chapter 2. The goal of this section is to help you become familiar with the language used to describe the names of the particular movements we perform. Movements are named in terms of the body parts that move, or in terms of the joint at which movement occurs, or both.

**Flexion**

The movement involved in bending is called **flexion**. Any joint you can bend can perform flexion. For example, when you bend your elbow, you are flexing it. When you bend your knee, you are flexing it. When you bend your fingers, you are flexing them.

Flexion is usually a forward movement (except for the knee and toes). When you move your arm forward, you are flexing it. When you move your thigh forward, you are flexing it. When you move your fingers forward, you are flexing them. Of course, use of the word “forward” is from the perspective of anatomical position.

Flexion can also be seen as decreasing the angle between bones or body parts. Elbow flexion involves decreasing the angle between the forearm and the arm, and flexion of the knee involves decreasing the angle between the thigh and leg.

Examples of flexion are listed below:

1. **Flexion of the forearm, elbow, or forearm at the elbow** (these are all equivalent). This movement bends the elbow.
2. **Flexion of the arm, humerus, shoulder, or arm at the shoulder** (these are all equivalent). This movement brings the arm forward.
3. **Flexion of the hand, wrist, or hand at the wrist**. This movement brings the palmar surface of the hand closer to the anterior forearm.
4. **Flexion of the head or neck**. Technically, these can be different, depending on where specific movement occurs. That is, flexion of the head can mean a forward movement at the atlanto-occipital joint only, or it can mean a forward movement of the joints between the
cervical vertebrae. Sometimes, we have to determine the meaning through the context in which it is used.

5. Flexion of the trunk or spine. This movement bends a person forward.

6. Flexion of the leg, knee, or leg at the knee. This movement bends the knee.

7. Flexion of thigh (or femur), hip, or femur at hip. This movement brings the thigh forward.

8. Flexion of the foot at the ankle has special names. Dorsiflexion is moving the foot so that the toes point toward the nose, and plantarflexion is moving the foot so that the toes point toward the ground.

Flexion to the side, or side bending, is called lateral flexion. We can perform lateral flexion of the head, neck, trunk, and spine by bending the named body part to one side.

**Extension**

The movement involved in straightening is called extension. Any joint you can “straighten” permits extension. Straightening your elbow or knee is extending it. One can also think of extension as increasing the angle between bones. Think about relevance to the elbow and knee again. Extension can involve moving back to anatomical position after flexing any joint. Generally, extension involves moving a body part back. Moving your arm back is extension of the arm.

Examples of extension are as follows:

1. Extension of the forearm, elbow, or forearm at the elbow. This movement straightens the elbow.

2. Extension of the arm (or humerus), shoulder, or arm at the shoulder. This movement moves the arm posteriorly.

3. Extension of the hand, wrist, or hand at wrist. This movement involves bringing the dorsal side of the hand toward the posterior forearm.

4. Extension of the head or neck. These movements involve bringing the head or neck posteriorly.

5. Extension of the trunk or spine. This movement brings the spine backward, or straightens the spine from a flexed position.

6. Extension of the leg, knee, or leg at the knee. This movement straightens the knee.

7. Extension of the thigh (or femur), hip, or femur at the hip. This movement involves moving the thigh posteriorly.

   Note: In the field of massage therapy, hyperextension typically refers to the position of a joint being extended past anatomical position.

**Rotation**

Any movement that involves turning is rotation. Think of rotation around an axis, if that is helpful. At the shoulder and hip joints, rotation is specified as medial (turning toward the midline) or lateral (turning toward the side). Anywhere in the spine, rotation is simply described as rotation to the left or rotation to the right.

Examples of rotation are as follows:

1. Rotation of the head (sometimes included as part of rotation of the neck; left or right). This movement involves turning the head to the right or left.

2. Medial (sometimes called internal) or lateral (sometimes called external) rotation of the arm, which is equivalent to medial (or internal) or lateral (or external) rotation of the shoulder. Medial rotation involves turning the arm inward toward the midline of the body, and lateral rotation involves turning the arm outward away from the midline of the body.

3. Medial (internal) or lateral (external) rotation of the thigh is also called medial (or internal) or lateral (or external) rotation of the hip or lateral rotation of the femur. Medial rotation involves turning the thigh inward toward the midline of the body, and lateral rotation involves turning the thigh outward away from the midline of the body.

4. Rotation of the trunk to the right or rotation of the spine to the left. This movement turns the trunk to the right or left.

5. Rotation of the forearm has special names: supination is movement of the hand and forearm laterally, generally toward a position in which the palm faces up. Pronation is a movement of the forearm and hand medially, generally toward a position in which the palm faces down.

**Abduction**

Abduction is a movement away from the midline of the body, or a movement out to the side of the body. This definition suits abduction of the hip/thigh or shoulder/arm. In addition, abduction of the digits (fingers and toes) involves moving the fingers away from the midline of the hand (third digit or middle finger) or moving the toes away from the midline of the foot (second digit of foot). In other words, spreading the fingers or toes is abducting them.

Examples of abduction include the following:

1. Abduction of the arm, which is equivalent to abduction of the shoulder. This movement moves the arm out to the side of the body.

2. Abduction of the hip, which is equivalent to abduction of the thigh. This movement moves the thigh out to the side of the body.

**Adduction**

A movement toward the midline of the body, and/or across the midline of the body is known as adduction. This definition suits adduction of the hip/thigh or shoulder/arm. In
addition, adduction of the digits (fingers and toes) involves moving the fingers toward the midline of the hand (third digit or middle finger) or moving the toes toward the midline of the foot (second digit of foot). In other words, bringing the fingers or toes closer together is adducting them.

Examples of adduction include the following:
1. Adduction of the arm or shoulder. This is a movement of the arm toward and across the body from a position of arm abduction.
2. Adduction of the hip or thigh. This is a movement of the thigh toward and across the body from a position of hip abduction.

Circumduction
Circumduction is a combination of four movements: abduction, adduction, extension, and flexion, all done continuously, so that the distal end of the moving body part traces a circle. Circumduction can occur only at joints that permit flexion, extension, adduction, and abduction.

Examples of circumduction include the following:
1. Circumduction of the arm or shoulder. This movement combines flexion, extension, abduction, and adduction of the shoulder joint.
2. Circumduction of the thigh or hip. This movement combines flexion, extension, abduction, and adduction of the hip joint.
3. Circumduction of the fingers at the metacarpophalangeal joints (knuckles). This movement combines flexion, extension, and radial and ulnar deviation of each digit at the metacarpophalangeal joint. Radial deviation moves a single digit or the whole hand toward the lateral forearm. Ulnar deviation is the movement of a single digit or of the whole hand toward the medial side of the forearm.
4. Circumduction of the head and trunk is debatable, because the joints between the individual vertebrae that make up the neck (between C2 and T1) do not perform adduction or abduction. However, the joints of the neck can perform lateral flexion, and the combined neck movements of flexion, extension, and lateral flexion to both the right and left mimic circumduction.

Horizontal Abduction
Horizontal abduction of the arm or shoulder is a movement of the arm along the transverse (horizontal) plane away from the body.

Horizontal Adduction
Horizontal adduction is a movement of the arm or shoulder in a horizontal or transverse plane toward and across the midline of the body.

Inversion of the Foot
Inversion is a movement in which the soles of the foot move toward the midline of the body (soles point in). (In some references, inversion may be referred to as supination. Technically, supination is a term indicating a combination of inversion, ankle dorsiflexion, and adduction of the ankle.)

Eversion of the Foot
Eversion is a movement in which the soles of the foot move away from the midline (soles point out). (In some references, eversion may be referred to as pronation of the foot. Technically, the term pronation of the foot means a combination of eversion of the foot, combined with abduction and plantarflexion of the ankle.)

Elevation
Elevation is an upward or superior movement. Elevation applies to the scapula (shoulder blade) and mandible (lower jaw bone).

Depression
Depression is a downward or inferior movement. Depression applies to the scapula (shoulder blade) and mandible (lower jaw bone).

Protraction
Protraction is an anterior or forward movement of the scapula or mandible.

Retraction
Retraction is a posterior movement of the scapula or mandible.

Upward Rotation
Upward rotation is a scapular movement, in which the scapula turns so that the glenoid fossa, a bone marking on the lateral, superior aspect of the scapula, turns upward. The glenoid fossa is the socket into which the humerus (arm bone) fits to form the shoulder joint. This rotation of the scapula is necessary for our arm to abduct beyond 90 degrees.

Downward Rotation
Downward rotation is a movement in which the scapula turns so that the glenoid fossa turns down. This scapular movement permits a greater range of arm movement when reaching down and back behind our body.

Figure 1-4 demonstrates these movements of the body.
PART 1 FOUNDATIONAL CONCEPTS OF MYOLOGY AND KINESIOLOGY

Arm and Elbow movement

Leg movement

Lower Arm and Hand movement

Ankle and Foot movement

Scapula movement

Jaw movement

Head and Neck movement

Trunk and Spine movement

FIGURE 1-4 • Body movements.
CHAPTER SUMMARY

A thorough knowledge of anatomical language is necessary for the study of myology and the practice of massage therapy. We will use the terminology covered in this chapter throughout the text. In addition, this language is commonly used in communication between health care practitioners and in documentation by health care practitioners of all kinds, including massage therapists.

WORKBOOK

Palpation Exercises

Palpate or locate the following areas on your body:

1. Palpate the scapula (shoulder blade). Trace this triangular bone, located in the lateral upper back. Find the border or edge of the scapula that is closest to the spine. It is easier to locate this border of the scapula when the elbow is flexed and the arm is placed behind the body. Find the lateral border as well.

2. Palpate your anterior sternum (breast bone). Find the superior aspect of the sternum and gently find the pointy inferior aspect, which is called the xiphoid process.

3. Trace the superior border of your clavicle (collar bone) from medial to lateral.

4. Palpate your anterior leg (remember, the leg does not include the thigh). Notice where you can feel soft tissue and where you feel bone.

5. Palpate your medial forearm. Remind yourself of the difference between medial and lateral and the importance of anatomical position when distinguishing medial and lateral.

6. Palpate your posterior arm (remember, the arm does not include the forearm). Why do you suppose it feels fleshy?

7. Palpate your proximal, anterior forearm. Distinguish this from your distal anterior forearm. Which half of the anterior forearm is more muscular, the proximal half or the distal half?

8. Palpate your lateral thigh. Compare it to the medial thigh in terms of sensitivity.

9. Can you find the most distal bone in your thumb?

10. Find the lateral edges of the sternum (breast bone) and trace your ribs medially to laterally.

Review Exercises

Write the appropriate terms in the spaces below:

1. List four characteristics of anatomical position:
   a. _________________________________________
   b. _________________________________________
   c. _________________________________________
   d. _________________________________________

2. Which plane divides the body into right and left sections?
   _________________________________________

3. Which plane divides the body into anterior and posterior sections?
   _________________________________________

4. The chin is inferior to ___________________________
   _________________________________________

5. Name a body part superior to the navel: ______________
   _________________________________________

6. Name a structure medial to the shoulders: _____________
   _________________________________________

7. Name a structure on the anterior aspect of the body: ______
   _________________________________________

8. Name something distal to your knees: _________________

9. What side of your head is covered when you wear a hood?
   _________________________________________

10. Which joint is directly proximal to the hand? _____________
   _________________________________________