

Chapter 6 – Part 2: The Musculoskeletal System

Review pages 110-120 of the textbook for this section of the workbook

DEFINE YOUR KNOWLEDGE

Musculoskeletal System

The muscular system is made up of muscles, bones, joints, bursa, ligaments, and tendons. There are over 600 muscles that make connections with the skeleton and allow humans to move around. There are 3 types of muscles that together make up approximately 40% of our body weight.

1. **Smooth muscles** are involuntary, or not under a person's control. These muscles help control specific body functions such as the intestines and artery contractions.
2. **Skeletal muscles** are what most people think of when discussing muscles. They are what help us move around and perform different activities. They are voluntary muscles that can be strengthened with exercise and resistance. Skeletal muscles are made up of individual muscle fibers and when grouped together become a muscle.
3. **Cardiac muscles** are muscles that form the heart. They have fibers like skeletal muscles but are involuntary contractors like smooth muscles. This muscle is not considered part of the musculoskeletal system.

Muscle Groups of the Body

Study the muscle tables on the following pages and review the information provided on pages 114-120 of the textbook. As you read about each one and where it attaches, try and perform the actions described in the book. Often learning what the muscle does makes it easier to remember.

MUSCLES AND THEIR COMMON PROBLEMS	
MUSCLE NAME	COMMON PROBLEMS WHEN MUSCLE IS TIGHT, SHORTENED, OR WEAK
MUSCLES OF THE HEAD, NECK, AND UPPER TRUNK	
Scalenus Anterior, Medius, & Posterior	Painful conditions of the neck, shoulder, and arm because hypertonic muscle puts pressure on a bundle of nerves, called the <i>brachial plexus</i> , and the subclavian artery.
Sternocleidomastoideus	Headache and neck pain can result from heavy whiplash movements (for example, car accident, boxing punch, etc.).
Trapezius	Upper fibers of this muscle, when tight or shortened, can cause neck pain or stiffness and headaches.
Levator Scapulae	Upper fibers of this muscle, when tight or shortened, can cause neck pain or stiffness and headaches.
Rhomboids (Minor & Major)	When tight: Soreness or aching between shoulder blades can occur. When overstretched: Rounded shoulders are both symptomatic of, and exacerbated by, overstretched rhomboids (which tend to get overstretched more than becoming too tight).
MUSCLES OF THE LOWER TRUNK	
Erector Spinae (Sacrospinalis)	Lifting without bending the knees or keeping the back erect or holding an object too far in front of the body (common when waiting tables) can injure or damage these muscles.
External & Internal Obliques	Injury to the lumbar spine can result if muscle is too weak because abdominal muscle tone contributes to stability of the lumbar spine.
Transversus Abdominis	Injury to the lumbar spine can result if muscle is too weak because abdominal muscle tone contributes to stability of the lumbar spine.
Rectus Abdominis	Injury to the lumbar spine can result if muscle is too weak because abdominal muscle tone contributes to stability of the lumbar spine.
Quadratus Lumborum	Bending sideways or lifting from sideways position too quickly can refer pain to the hip and gluteal area, causing low back pain.
Iliopsoas (Psoas Major & Iliacus)	Low back pain due to increase in lumbar curve (lordosis).
MUSCLES OF THE SHOULDER AND UPPER ARM	
Serratus Anterior	“Winged scapula” (looking like an angel’s wing) can occur, especially when holding a weight in front of the body. This is also a feature when the nerve to this muscle is damaged.
Pectoralis Minor	When this muscle is tight or shortened, it can restrict the expansion of the chest.
Pectoralis Major	Arm wrestling and other strength activities that force medial rotation and adduction can damage the insertion of the muscle. When muscle is tight, it can restrict the expansion of the chest and the lateral rotation/abduction of the shoulder.

MUSCLE NAME	COMMON PROBLEMS WHEN MUSCLE IS TIGHT, SHORTENED, OR WEAK
LatissimusDorsi	When weakened, can cause shoulder and back pain as proper posture, arm extension, adduction, and internal rotation are affected.
Deltoideus	When weakened, can cause overuse of the rotator cuff and pectoral muscle complex.
Supraspinatus	Shoulder joint dislocation can occur during strenuous activity.
Infraspinatus	Shoulder joint dislocation can occur during strenuous activity.
Teres Minor	Shoulder joint dislocation can occur during strenuous activity.
Subscapularis	Twisting the arm behind the back (as in an overzealous restraining hold) or struggling to free oneself from that position may damage the insertion of this muscle.
Teres Major	Sharply jerking the arm forwards, as in throwing a stone to skim it across the lake, can severely damage this muscle.
Biceps Brachii	Lifting heavy objects too suddenly can severely damage this muscle. When the muscle is chronically tight or shortened, flexion deformity of the elbow can occur (elbow cannot be fully straightened).
Brachialis	When this muscle is chronically tight or shortened, flexion deformity of the below can occur (elbow cannot be fully straightened).
Triceps Brachii	Throwing with excessive force can damage this muscle. When this muscle is chronically tight or shortened, extension deformity of the elbow can occur (elbow cannot be fully flexed), although it is not very common.
MUSCLES OF THE FOREARM AND HAND	
Brachioradialis	When overused, can cause pain with flexion, pronation, and supination.
MUSCLES OF THE HIP AND THIGH	
Gluteus Maximus	Often found to be weak as much of the population sits in the workplace, creating pelvic and spinal imbalances through hypertonicity of lumbar paraspinal, piriformis, and hamstring muscle groups.
Tensor Fasciae Latae	When muscle is chronically tight or shortened, pelvic imbalances can occur, leading to pain in hips, lower back, and lateral area of the knee.
Gluteus Medius	When muscle is chronically tight or shortened, pelvic imbalances can occur, leading to pain in hips, lower back, and knees.
Gluteus Minimus	When muscle is chronically tight or shortened, pelvic imbalances can occur, leading to pain in hips, lower back, and knees.
Piriformis	When muscle is chronically tight or shortened, hypertonic muscle may squeeze the sciatic nerve, causing "piriformis syndrome," which is sciatic pain that begins in the buttocks.

MUSCLE NAME	COMMON PROBLEMS WHEN MUSCLE IS TIGHT, SHORTENED, OR WEAK
Deep Lateral Hip Rotators	When muscle is chronically tight or shortened, the person stands with the feet turned outward.
Hamstrings	Sudden lengthening of the muscle without sufficient warm-up can severely damage this muscle. Low back pain, knee pain, leg length discrepancies, and restriction of stride length can also occur.
Adductors	Side splits or high side kicks without a sufficient warm-up can severely damage this muscle. When muscle is chronically tight or shortened, the flexibility of the groin can be jeopardized (adductors tend to be tighter in men than in women).
Gracilis	Side splits or high side kicks without a sufficient warm-up can severely damage this muscle. When muscle is chronically tight or shortened, the flexibility of the groin can be jeopardized.
Sartorius	Being over-ambitious with yoga exercises in cross-legged or lotus position can severely damage this muscle (although the knee is likely to be damaged first). When this muscle is chronically tight or shortened, pain or damage to the inside of the knee can occur.
Quadriceps	Low back pain can result if muscle is chronically tight or shortened. Knee pain and lack of knee stability can result as well, especially if the muscle is tight and weak.
MUSCLES OF THE LEG AND FOOT	
Gastrocnemius	Explosive jumping or landing badly when jumping down may rupture the tendocalcaneus (Achilles tendon) at its junction with the muscle belly. Constant wearing of high-heeled shoes tends to cause this muscle to shorten, which can affect postural integrity.
Soleus	Explosive jumping or landing badly when jumping down may rupture the tendocalcaneus (Achilles tendon) at its junction with the muscle belly. Constant wearing of high-heeled shoes tends to cause this muscle to shorten, which can affect postural integrity. Tight and painful calves can also result when this muscle is tight or shortened.

MUSCLES: WHERE ARE THEY LOCATED AND HOW ARE THEY UTILIZED?					
MUSCLE NAME	DEFINITION	ORIGIN	INSERTION	ACTION/FUNCTION	SPORTS THAT UTILIZE THESE MUSCLES
MUSCLES OF THE HEAD AND NECK					
Scalenus Anterior, Medius, & Posterior	Deep neck flexor muscle, often overactive/weakened and associated with an anterior head carriage and implicated with Thoracic Outlet Syndrome.	Transverse processes of the cervical vertebrae	Anterior & Medius: First Rib; Posterior: Second Rib	Acting together: Flex neck and raise first rib with strong inhalation; Individually: Laterally flex and rotate neck	Active sports that involve strong respiration (track & field, running, etc.)
Sternocleidomastoideus	Long strap muscle with two heads; often injured at birth and may be partly replaced by fibrous tissue to produce torticollis (wry neck)	Sternal head: Anterior surface of upper sternum; Clavicular head: Medial third of clavicle	Mastoid process of temporal bone (located behind ear)	Contraction of both sides together: Flex neck by drawing head forward, raise sternum and ribs with deep inhalation; One side only: Tilt head towards the same side and rotate head to face the opposite side	Swimming, Rugby, and football
MUSCLES OF THE TRUNK					
Erector spinae (Sacrospinalis)	Comprised of three sets of muscles organized in parallel columns; from lateral to medial: iliocostalis, longissimus, and spinalis	Slips of muscle arising from the sacrum; iliac crest; spinous and transverse processes of the vertebrae; ribs	Ribs; transverse and spinous processes of the vertebrae; occipital bone	Extends and laterally flexes vertebral column; helps maintain correct curvature of spine in erect and sitting positions; steadies vertebral column on pelvis while walking; maintains posture	All sports, especially swimming, gymnastics, and wrestling
External & Internal Obliques	Posterior fibers of external oblique are usually overlapped by the latissimus dorsi, but, in some cases, there is a space between the two, called the <i>lumbar triangle</i> , the weak point of the abdominal wall, situated just above the iliac crest	External: Lower eight ribs; Internal: Iliac crest, lateral two-thirds of inguinal ligament, thoracolumbar fascia (sheet of connective tissue in lower back)	External: Anterior half of iliac crest and into an abdominal aponeurosis that terminates in the linea alba (tendinous band extending downwards from the sternum); Internal: Bottom three or four ribs and linea alba via aponeurosis	Compresses abdomen, helping to support the abdominal viscera against the pull of gravity; contraction of one side bends the trunk laterally to that side and rotates it to the opposite side (e.g. digging with a shovel or raking)	External: Gymnastics, rowing, and Rugby; Internal: Golf, javelin throwing, pole vaulting
Transversus Abdominis	Small muscle that runs transverse and is the deepest of the major abdominal muscles and when weakened is associated with lumbopelvic weakness.	Anterior two-thirds of iliac crest; lateral third of inguinal ligament; costal cartilages of lower six ribs; thoracolumbar fascia	Linea alba via an abdominal aponeurosis (tendinous band extending between sternum and pubis)	Compresses abdomen to help support the abdominal viscera against the pull of gravity; important during sneezing or coughing as it helps maintain posture	Gymnastics, seated rowing, javelin, pole vault
Rectus Abdominis	Divided into three or four bellies by tendinous bands, each sheathed in aponeurotic fibers, which converge centrally to form the linea alba, from the lateral abdominal muscles	Pubic crest and symphysis (front of pubic bone)	Xiphoid process (base of sternum); fifth, sixth, and seventh costal cartilages	Flexes lumbar spine; depresses ribcage (e.g. when getting out of a low chair); stabilizes the pelvis during walking; also associated with "six-pack" abdominal muscles	All sports
Quadratus Lumborum	A strong muscle that helps to move the lower torso; when the lumbar paraspinals are weakened (such as when one sits too much), the QL will contract bilaterally to compensate for the weakness.	Iliac crest; iliolumbar ligament (from the 5th lumbar vertebra to the ilium)	Twelfth rib; transverse processes of upper four lumbar vertebrae (L1-L4)	Laterally flexes vertebral column; fixes 12th rib during deep respiration (like singers' diaphragm); helps extend lumbar part of vertebral column and maintains lateral stability (e.g. bending sideways from sitting to pick up object on floor)	Gymnastics (pommel horse), javelin, tennis serve
Iliopsoas (Psoas Major & Iliacus)	Psoas major and iliacus are considered part of the posterior abdominal wall due to their position and cushioning role for the abdominal viscera; some upper fibers of psoas major may insert by a long tendon into the iliopubic eminence to from the psoas minor, which has little function and is absent in about 40% of people	Psoas major: Transverse processes of all lumbar vertebrae (L1-L5); bodies of 12th thoracic and all lumbar vertebrae (T12-L5); intervertebral discs above each lumbar vertebra; Iliacus: Superior two-thirds of iliac fossa; anterior ligaments of the lumbosacral and sacroiliac joints	Lesser trochanter of the femur	Main flexor of the hip joint (flexes and laterally rotates the thigh, like when kicking a soccer ball); Acting from insertion, it flexes the trunk, like when sitting up from the supine position or walking up an incline/steps	Rock climbing, sprinting (maximizes stride length), and kicking sports

MUSCLE NAME	DEFINITION	ORIGIN	INSERTION	ACTION/FUNCTION	SPORTS THAT UTILIZE THESE MUSCLES
MUSCLES OF THE SHOULDER AND UPPER ARM					
Trapezius	The left and right trapezius muscles create a trapezoid-like shape, which gives this muscle its name	Base of skull (occipital bone); Spinous processes of the seventh cervical (C7) and all thoracic vertebrae (T1-T12)	Lateral third of clavicle; Acromion process; Spine of scapula	Upper fibers: Pull shoulder girdle up and helps prevent depression of the shoulder girdle when a weight is carried on the shoulder; Middle fibers: Retract scapula; Lower fibers: Depress scapula, particularly against resistance, as when using the hands to get up from a chair; Upper & lower fibers together: Rotate scapula, as in elevating the arm above the head (like when painting a ceiling)	Shot put, boxing, and seated rowing
Levator Scapulae	This muscle is deep to the sternocleidomastoid and trapezius muscles and is named after its action of elevating the scapula	Transverse processes of the first three or four cervical vertebrae (C1-C4)	Upper medial (vertebral) border of the scapula (for example, the portion above the spine of the scapula)	Elevates and helps retract the scapula and helps bend the neck laterally (for example, when carrying a heavy bag)	Shot put and weightlifting
Rhomboids (Minor & Major)	Rhomboides major runs parallel to, and is often continuous with, rhomboides minor	Spinous processes of the seventh cervical and upper five thoracic vertebrae (C7-T1)	Medial (vertebral) border of the scapula	Retracts and stabilizes the scapula; Slightly assists in outer range of adduction of arm (from arm overhead to arm at shoulder level, like when opening a drawer)	Archery, seated rowing, wind surfing, and racket sports
Serratus Anterior	Forms the medial wall of axilla and upper five ribs; composed largely of a series of finger-like slips, with the lower slips interdigitate with the origin of the external oblique	Outer surfaces and superior borders of upper eight or nine ribs and the fascia covering their intercostal spaces	Anterior (costal) surface of the medial border of scapula and inferior angle of the scapula	Pulls scapula forward on the ribs and holds it closely into the chest wall; rotates scapula for abduction and flexion of the arm (like pushing or reaching forwards for something barely within reach)	Boxing and shot put
Pectoralis Minor	A flat, triangular muscle lying posterior to, and concealed by, pectoralis major, both forming the anterior wall of the axilla	Outer surfaces of third, fourth, and fifth ribs and fascia of the corresponding intercostal spaces	Coracoid process of the scapula	Draws the scapula forward and downward and raises the ribs during forced inspiration; it is an accessory muscle of inspiration, if the scapula is stabilized by the rhomboids and trapezius (like when pushing on arms of a chair to stand up)	Racket sports (tennis and badminton), baseball pitching, and sprinting
Pectoralis Major	Forms anterior wall of axilla	Medial half or two-thirds of front of clavicle; Sternum and adjacent upper six costal cartilages	Upper shaft of humerus	Adducts and medially rotates humerus and shoulder joint; Horizontally adducts the humerus towards opposite shoulder / Obliquely towards opposite hip (i.e. pulling on rope on a bell, applying deodorant)	Racket sports such as tennis, golf, baseball pitching, gymnastics (rings and high bar), judo, wrestling, and rock climbing
Latissimus Dorsi	A large fan-like muscle that forms the posterior wall of the axilla and, when weakened, will create postural abnormalities from poor arm extension with faulty thoracolumbar control.	Broad sheet of tendon which is attached to the spinous processes of the lower six thoracic vertebrae and all the lumbar and sacral vertebrae (T7-S5); Posterior part of the iliac crest; Lower three or four ribs; Inferior angle of the scapula	Twists to insert into the intertubercular sulcus (bicipital groove) of humerus, just below shoulder joint	Extends flexed arm; Adducts and medially rotates the humerus (draws arm back and inwards towards the body); Chief climbing muscle, since it pulls the shoulder downwards and backwards, and pulls the trunk up to the fixed arms (also active in crawl swimming stroke); Assists in forced inspiration by raising the lower ribs	Climbing, gymnastics (rings and parallel bars), swimming, and rowing
Deltoides	Deltoid is composed of three parts: anterior, middle, and posterior; forms the outer portion of the powerful shoulder complex	Clavicle, acromion process and spine of scapula	Deltoid tuberosity, situated halfway down the lateral surface of the shaft of the humerus	Anterior fibers flex and medially rotate the humerus; Middle fibers abduct the humerus at the shoulder joint; Posterior fibers extend and laterally rotate the humerus (i.e. reaching for something out to the side of you or raising the arm to wave)	Javelin, shot put, racket sports, wind surfing, and weightlifting
Supraspinatus	One of the four members of the rotator cuff, which helps hold the head of the humerus in contact with the glenoid cavity (socket of shoulder joint) of the scapula during movements of the shoulder, thus helping to prevent dislocation of the shoulder joints	Supraspinous fossa of the scapula (hollow above the spine of the scapula)	Greater tubercle at the top of the humerus; Capsule of the shoulder joint	Initiates the process of abduction at the shoulder joint so the deltoid can take over at the later stages of abduction (like when holding shopping bag)	Baseball, golf, and racket sports

MUSCLE NAME	DEFINITION	ORIGIN	INSERTION	ACTION/FUNCTION	SPORTS THAT UTILIZE THESE MUSCLES
MUSCLES OF THE SHOULDER AND UPPER ARM					
Infraspinatus	Another one of the four members of the rotator cuff	Middle two-thirds of dorsal surface of the scapula and below the spine of the scapula	Greater tubercle at the top of the humerus and capsule of the shoulder joint	As a rotator cuff, it helps prevent posterior dislocation of the shoulder joint; laterally rotates humerus (like when brushing back of hair)	Back hand racket sports
Teres Minor	Another one of the four members of the rotator cuff	Upper two-thirds of the lateral edge of the dorsal surface of the scapula	Back of greater tubercle of the humerus and capsule of the shoulder joint	As a rotator cuff, it helps prevent upward dislocation of the shoulder joint; laterally rotates and weakly adducts the humerus	Back hand racket sports
Subscapularis	Another one of the four members of the rotator cuff; also constitutes the greater part of the posterior wall of the axilla	Subscapular fossa (anterior surface of the scapula)	Lesser tubercle at the top of the humerus and capsule of the shoulder joint	As a rotator cuff, it stabilizes the shoulder joint but mainly prevents the head of the humerus from being pulled upwards by the deltoid, biceps brachii, and long head of triceps brachii; medially rotates humerus (like when reaching into your back pocket)	Athletic throwing events, golf, and racket sports
Teres Major	Along with the tendon of the latissimus dorsi, which passes around it, and the subscapularis forms the posterior fold of the axilla	Lower third of the posterior surface of the lateral border of the scapula	Medial lip of intertubercular sulcus (bicipital groove) of humerus (i.e. back of upper shaft of humerus)	Adducts, medially rotates, and extends the humerus from the flexed position (i.e. reaching into your back pocket)	Rowing and cross-country skiing
Biceps Brachii	Operates over three joints and has two tendinous heads at its origin and two tendinous insertions, occasionally having a third head which originates at the insertion of coracobrachialis; short head forms part of the lateral wall of the axilla	Short head: tip of coracoid process of scapula; Long head: supraglenoid tubercle of scapula (area just above socket of shoulder joint)	Radial tuberosity (on medial aspect of upper part of shaft of radius); deep fascia (connective tissue) on medial aspect of forearm	Flexes elbow joint and supinates the forearm (described as muscle that puts in the corkscrew and pulls out the cork); weakly flexes arm at the shoulder; also used when picking up an object and bringing food to your mouth	Boxing, climbing, canoeing, and rowing
Brachialis	Lies posterior to biceps brachii and is the main flexor of the elbow joint; some fibers may be partly used with the brachioradialis	Anterior of lower shaft of humerus	Coronoid process and tuberosity of ulna (area on front of upper part of shaft of ulna)	Flexes elbow joint (like when bringing food to your mouth)	Baseball, boxing, gymnastics
Triceps Brachii	Originates from three heads and is the only muscle on the back of the arm	Long head: Infraglenoid tubercle of the scapula (area just below socket of shoulder joint); Lateral and medial head: Upper and lower half of posterior surface of shaft of humerus respectively	Olecranon process of the ulna (upper posterior area of the ulna, near the point of the elbow)	Extends/straightens the elbow joint; stabilizes the shoulder joint; long head can adduct the humerus and extend it from the flexes position (throwing objects or pushing a door shut)	Basketball or netball (shooting), shot put, pitching a baseball, and volleyball
MUSCLES OF THE FOREARM AND THE HAND					
Brachioradialis	A powerful flexor and rotator of the forearm and is aided by the brachialis muscle	Upper two-thirds of the anterior aspect of lateral supracondylar ridge of humerus (lateral part of the shaft of the humerus 2-3" above elbow joint)	Lower lateral end of radius, just above the styloid process	Flexes elbow joint and assists in pronating and supinating forearm when these movements are resisted (like when turning a corkscrew)	Baseball, cricket, golf, racket sports, and rowing
MUSCLES OF THE HIP AND THIGH					
Gluteus Maximus	The most coarsely fibered and heaviest muscle in the body, forming the bulk of the buttock and helps to provide pelvic stability.	Outer surface of ilium and posterior surface of sacrum and coccyx (over sacroiliac joint)	Upper posterior area of femur and iliotibial tract (long tendon) of fascia lata muscle	Extends and laterally rotates hip joint (forceful extension as in running or rising from sitting); extends trunk and assists in adduction of hip joint	Running, surfing, wind surfing, jumping, weightlifting ('clean' phase, lifting weights up from the floor)
Tensor Fasciae Latae	Lies anterior to gluteus maximus on the lateral side of the hip	Outer edge of iliac crest towards the front	Joins iliotibial tract (long fascia lata tendon) just below the hip, which runs to the upper lateral side of the tibia	Flexes, abducts, and medially rotates the hip joint; Tenses the fascia lata, thus stabilizing the knee (when walking)	Horse riding, hurdling, water skiing

MUSCLE NAME	DEFINITION	ORIGIN	INSERTION	ACTION/FUNCTION	SPORTS THAT UTILIZE THESE MUSCLES
MUSCLES OF THE HIP AND THIGH					
Gluteus Medius	Mostly deep to and therefore obscured by gluteus maximus but appears on the surface between gluteus maximus and tensor fasciae latae; during walking, this muscle prevents the pelvis from dropping towards the non-weight-bearing leg	Upper outer surface of ilium	Lateral surface of greater trochanter (top) of femur	Abducts the hip joint; anterior fibers medially rotate the hip joint while posterior fibers laterally rotate the hip joint slightly (stepping sideways over an object such as a low fence)	All sports requiring side-stepping, especially cross-country skiing and ice skating
Gluteus Minimus	Situated deep to gluteus medius, whose fibers obscure it	Middle outer surface of ilium below origin of gluteus medius	Anterior border of greater trochanter (top) of femur	Abducts and medially rotates hip joint (stepping sideways over an object such as a low fence)	All sports requiring side-stepping, especially cross-country skiing and ice skating
Piriformis	Leaves the pelvis by passing through the greater sciatic foramen	Internal (front) surface of sacrum	Greater trochanter (top) of femur	Laterally rotates hip joint; abducts the thigh when hip is flexed; helps hold head of femur in its socket (taking first leg out of a car)	Swimming (breast strokes) and soccer
Deep Lateral Hip Rotators	Includes the obturator internus, the two gemelli, and quadratus femoris	Obturator internus: inner surface of ischium, pubis, and ilium; Gemellus superior: Ischial spine (lower posterior area of pelvis); Gemellus inferior located just below origin of gemellus superior; Quadratus femoris: lateral edge of ischial tuberosity (sitting bone)	Greater trochanter (top) of femur (except quadratus femoris which inserts just behind and below the others)	Laterally rotates hip joint and helps hold head of femur in its socket (acetabulum)	Swimming (breast strokes) and soccer
Hamstrings	Consists of three muscles; from medial to lateral, they are: semimembranosus, semitendinosus, and biceps femoris	Ischial tuberosity (sitting bone); biceps femoris originates from the back of the femur	Semitendinosus: back of medial condyle of tibia (upper inside part of tibia); semitendinosus: upper medial surface of shaft of tibia; biceps femoris: head (top) of fibula and lateral condyle of tibia (upper outside part of tibia)	Flexes knee joint and extends the hip joint; semimembranosus and semitendinosus also medially rotate the lower leg when knee is flexed; biceps femoris laterally rotates the lower leg when the knee is flexed (during running, hamstrings slow down the leg at the end of its forward swing and prevent the trunk from flexing at the hip joint)	Sprinting, hurdling, soccer (especially back kicks), jumping and weightlifting (upper portion of hamstrings only)
Adductors	Adductor magnus is largest of adductor group, which also includes adductor brevis and longus; Adductor longus is the most anterior and the lateral border of its upper fibers form the medial border of the femoral triangle (sartorius forms the lateral boundary; the inguinal ligament forms the superior boundary)	Anterior part of pubic bone (ramus); adductor magnus also takes origin from the ischial tuberosity	Whole length of medial side of femur from the knee to the hip	Adducts and laterally rotates hip joint; adductors longus and brevis also flex the extended femur and extend the flexed femur (bringing second leg in/out of a car)	Horse riding, judo, wrestling, hurdling, soccer (side passes), swimming (breast strokes), and general maneuvering on court (crossover steps and side shifting)

MUSCLE NAME	DEFINITION	ORIGIN	INSERTION	ACTION/FUNCTION	SPORTS THAT UTILIZE THESE MUSCLES
MUSCLES OF THE HIP AND THIGH					
	(sartorius forms the lateral boundary; the inguinal ligament forms the superior boundary)				steps and side shifting)
Gracilis	Descends down the medial side of the thigh in front of semimembranosus	Lower margin of pubic bone	Upper part of the medial surface of the shaft of the tibia	Adducts hip joint and flexes knee joint; Medially rotates knee joint when flexed (used when sitting with knees pressed together)	Horse riding, hurdling, and soccer
Sartorius	Most superficial muscle of the anterior thigh; the medial border of the upper third of this muscle forms the lateral boundary of the <i>femoral triangle</i>	Anterior superior iliac spine (i.e. the most anterior point of the ilium)	Upper part of the medial surface of the tibia	Flexes hip joint, helping to bring the leg forward in walking or running; laterally rotates and abducts hip joint; flexes knee joint; assists in medial rotation of the tibia on the femur after flexion (in essence, it places the heel on the knee of the opposite limb, like when setting cross-legged)	Ballet, skating, and soccer
Quadriceps	Four muscles: rectus femoris, vastus lateralis, vastus medialis, and vastus intermedius; all cross the knee joint, but rectus femoris is only one that with two heads of origin and crosses hip joint	Rectus femoris: front part of ilium (anterior inferior iliac spine); area above hip socket; Vastus group: upper half of shaft of the femur	Patella, then via patellar ligament into the upper anterior part of the tibia (tibial tuberosity)	Vasti: extends the knee joint; Rectus femoris: extends the knee joint and flexes the hip joint (particularly in a combination as in kicking a ball); Quadriceps as a whole straighten the knee when rising from sitting, or during walking or climbing.	Cycling, Fell running (push off phase and knee stability when running), skiing, all jump events, kicking sports (soccer, karate), and weightlifting
MUSCLES OF THE LEG AND FOOT					
Gastrocnemius	Part of the composite muscle known as <i>triceps surae</i> , which forms the prominent contour of the calf and is also comprised of the soleus and plantaris; the bellies of this muscle, along with plantaris, also form the inferior part of the <i>popliteal fossa</i> , found at the back of the knee	Medial head: lower posterior surface of femur above medial condyle; Lateral head: lateral condyle and lower posterior surface of the femur	Posterior surface of calcaneus (heel bone) via the calcaneal tendon (Achilles tendon), which is a fusion of the tendons of gastrocnemius and soleus	Plantar flexes (points) the foot at the ankle joint; assists in flexion of knee joint; main propelling force in walking and running (used when standing on "tip-toes")	Sports requiring running and jumping, like sprinting, high jump, long jump, volleyball, and basketball; ballet; trampoline exercises; and used when pushing off the wall in swimming
Soleus	Part of the <i>triceps surae</i> ; the calcaneal tendon of this muscle and gastrocnemius is the thickest and strongest tendon in the body	Upper posterior surfaces of tibia and fibula	With gastrocnemius via calcaneal tendon into posterior surface of the calcaneus (heel bone)	Plantar flexes ankle joint and is frequently in contraction during standing to prevent the body from falling forwards at the ankle joint (to offset the line of pull through the body's center of gravity); ultimately helps maintain upright posture and is used mostly when standing on one's "tip-toes"	Sports requiring running and jumping, like sprinting, high jump, long jump, volleyball, and basketball; ballet; trampoline exercises; and used when pushing off the wall in swimming