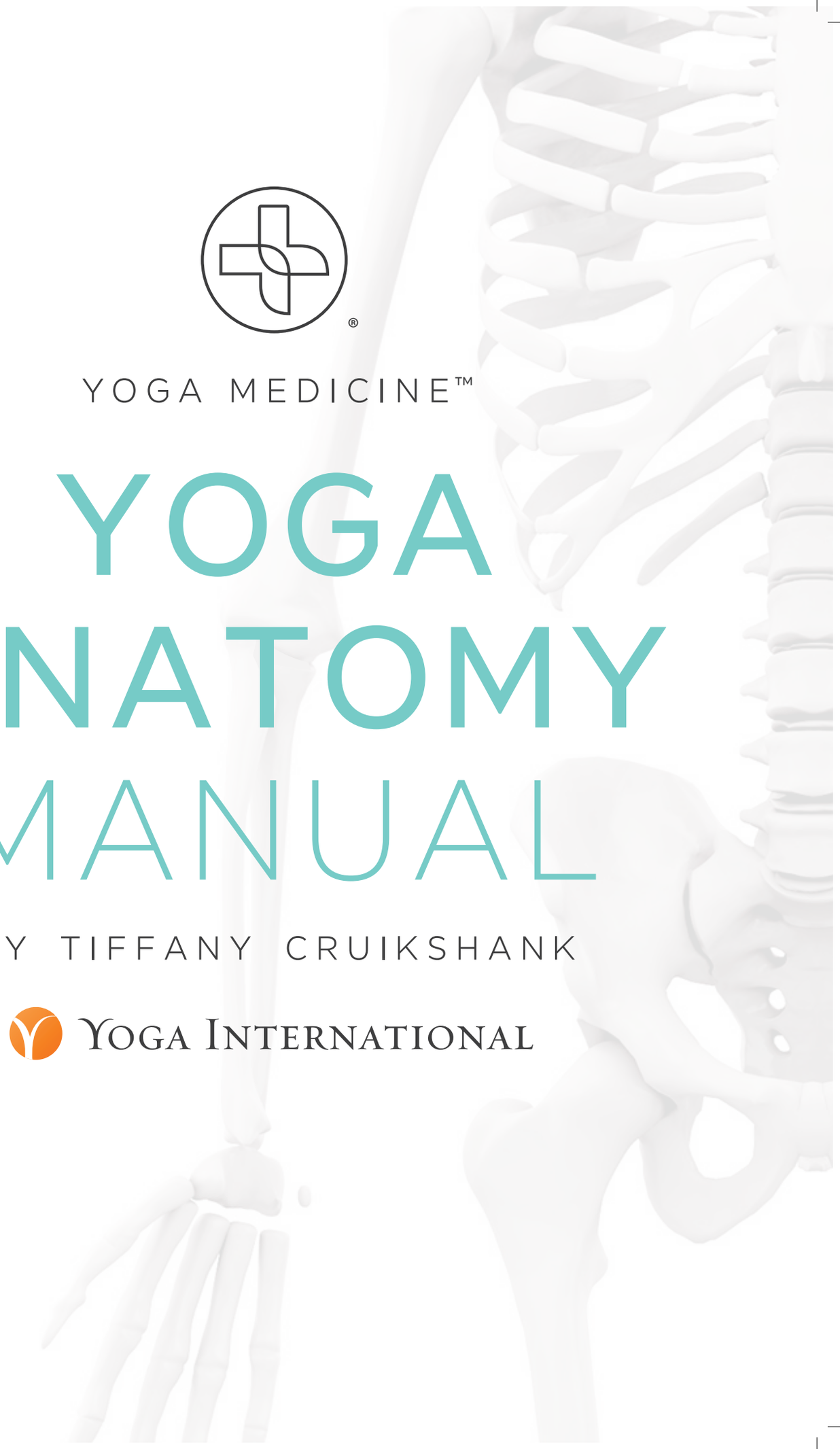
YOGA MEDICINE™

YOGA ANATOMY MANUAL

BY TIFFANY CRUIKSHANK



YOGA INTERNATIONAL

SECTION 1

INTRODUCTION TO ANATOMY

Anatomy

1.1 Introduction

What follows is a brief overview of the anatomy and physiology of the human body. Keep in mind that the human body is a complex and dynamic system that is constantly changing. Our understanding of the body is also constantly changing as we continue to learn and understand that the body is not a set of separate parts but a finely tuned machine that is dependent on every other part of the system. In this anatomy course we will deconstruct the parts of the body to give you a foundational understanding of how the body works; however, keep in mind that the inner workings of the body are much more complex. In order to understand the complexities of the body you will need a clear understanding of the foundational information. This is where we will focus our attention.

Please keep in mind that there is always more to learn in this subject. We have distilled the information down to the most important and relevant topics for a new teacher to understand the effects of the yoga practice on our bodies.

1.2 Download the Manual

1.3 Preparing for the Course

1.4 Overview of What's to Come

1.5 Terminology

MEDIAL close to the midline

LATERAL away from the midline

PROXIMAL closer to the trunk
(refers to the limbs)

DISTAL away from the trunk
(refers to the limbs)

SUPERIOR above or toward the head

INFERIOR below or away from the head

ANTERIOR toward the front of the body

POSTERIOR toward the back of the body

1.6 Intro to Bones

The skeleton provides structure and support for the body and acts as the levers that the muscles manipulate. The outside of the bone is solid and covered with a sensitive membranous cover called the periosteum, while the inside is porous and spongy.

BONES

- Support the body
- Protect the organs and tissues
- Store minerals that make the bone hard (calcium, phosphorus...)
- Act as levers that the muscles can move

The marrow produces red and white blood cells as well as platelets. Bones are two-thirds minerals or rigid tissue and one-third collagen/organic matter or elastic tissue. This allows our bones to be stiff and supportive but to also bow slightly and absorb shock. Our bones will grow and become stronger with applied stress to them, via gravity, muscular contractions, yoga, really any movement against some sort of resistance. Our bones are constantly being remodeled (broken down, reabsorbed, and rebuilt). Every two years your bone cells are replaced. This process slows with aging, inadequate nutrients, stress, smoking, alcohol, menopause, and lack of exercise. However, every time a muscle pulls on the periosteum of the bone, it stimulates growth.

1.7 Bones and Reference Points to Know

- **SCAPULA:** spine, fossae, coracoid, acromion
- **CLAVICLE:** AC joint
- **STERNUM**
- **HUMERUS:** greater and lesser tuberosity, bicipitlal groove
- **RADIUS**, **ULNA**, **CARPALS**
- **ILIUM:** iliac crest, ASIS, PSIS
- **ISCHIUM:** ischial tuberosity
- **PUBIS**
- **SACRUM:** SI
- **ACETABULUM**
- **FEMUR:** greater and lesser trochanter
- **PATELLA**
- **FIBULA, TIBIA, TARSALS**

1.8 Reference Points of Spine

- **7 CERVICAL** vertebrae (C1-7) with a natural lordosis
- **12 THORACIC** vertebrae (T1-12) with a natural kyphosis
- **5 LUMBAR** vertebrae (L1-5) with a natural lordosis
- **SACRUM** with a slight natural kyphosis
- **COCCYX**

1.9 Joints and Ligaments

JOINTS

Where two bones meet; there are three major types:

1. FIBROUS
Join flat bones together with very limited movement (skull and pelvic bones)

2. CARTILAGINOUS
Slightly movable with cartilage between the bones (vertebra, ribs/sternum)

3. SYNOVIAL
Freely movable, surrounded by a ligamentous joint capsule that secretes synovial fluid to lubricate the joint; includes:

Types of Synovial Joints

- Hinge (knee)
- Gliding joints (AC)
- Ball and socket (hip)

CARTILAGE

Strong and dense to provide a smooth joint surface and absorb shock (labrum, meniscus, plus all synovial joints have hyaline cartilage covering articulating bones); however, has no direct blood supply and so

must receive nutrients from the bone or synovial fluid. There is no direct nerve innervation to this tissue so pain signaling is limited here.

1. ARTICULAR CARTILAGE

Covers parts of the bone that touch each other; hard, but smooth gliding surface

2. FIBROCARTILAGE

A type of cartilage that contains fibrous bundles of collagen, such as that of the intervertebral disks in the spinal cord

CAPSULE

Surrounds/encapsulates joint and helps lubricate

LIGAMENTS

Connect bone to bone

- Mostly collagen, small amount of elastin allows very minimal stretching
- Contain sensory nerves that communicate with the muscles and central nervous system to warn the brain of overstretching
- Ligaments have very little blood supply and therefore heal very slowly
- Critical component to the passive stability of the joints

LIGAMENTS TO KNOW

1. Medial collateral ligament (MCL)
2. Lateral collateral ligament (LCL)
3. Anterior cruciate ligament (ACL)
4. Posterior cruciate ligament (PCL)

1.10 Tendons, Skeletal Muscles, and Contractions

TENDONS

Connect muscle to bone

- A connective tissue extension of the muscle fibers
- Also have very little elasticity, even less than ligaments, and can be overstretched or torn away from their attachments.
- Can become inflamed from chronic repetitive motions of the muscles, leading to tendonosis
- Also have very little blood supply so heal very slowly like the ligaments

SKELETAL MUSCLES

- Produce movement by pulling on bones, composed of motor units bundled into muscle fibers. Depending on the movement, different muscle fibers of each muscle may contract or relax to perform precise movements.
- Highly elastic with good blood flow (which helps them recover from injury much easier), contraction of the muscles moves blood and lymph through the tissues; however, in states of chronic contraction the circulation is decreased, causing inflammation, hypoxia, and sometimes fibrous (scar) tissue buildup.
- Muscles usually act as a coordinated group. Even when a muscle is relaxed a few muscle cells stay contracted (muscle tone) to keep them ready to respond. Unfortunately many of us carry too much tension in certain areas and not enough in others, causing biomechanical discrepancies as a result; this is where the awareness aspect of yoga is so transformational.
- Help the ligaments support the joints and when strong and well toned can help prevent injury.

TYPES OF MUSCLE CONTRACTION

1. **CONCENTRIC**
   Shortens the muscle to create movement
2. **ECCENTRIC**
   The muscle lengthens as it contracts
3. **ISOMETRIC**
   Tension without movement

KNOW

1. **AGONIST:** prime mover
2. **ANTAGONIST:** opposes the prime mover
3. **SYNERGIST:** assists the prime mover

1.11 Fascia

Our fascia is like the Saran Wrap around us that holds everything together. Our fascia acts like a web to support, position, and shape the body. Research has shown that fascia does contain contractile cells and is able to contract in a smooth, muscle-like manner and consequently influence musculoskeletal dynamics and postural patterns. The fascia connects and integrates our movements to allow the muscles to support and assist each other. This is why when we move it isn't just one or two muscles performing the action as you might see in the textbooks, but is rather a symphony of contractions to support and spread out the effort so no one area takes all the pressure. Unfortunately, poor posture or biomechanics can reprogram the fascia to hold the tissues improperly and even change joint position and function over time, leading to uneven wearing on the joints. The good news is that through yoga or other forms of therapy these patterns can slowly be reprogrammed over time!

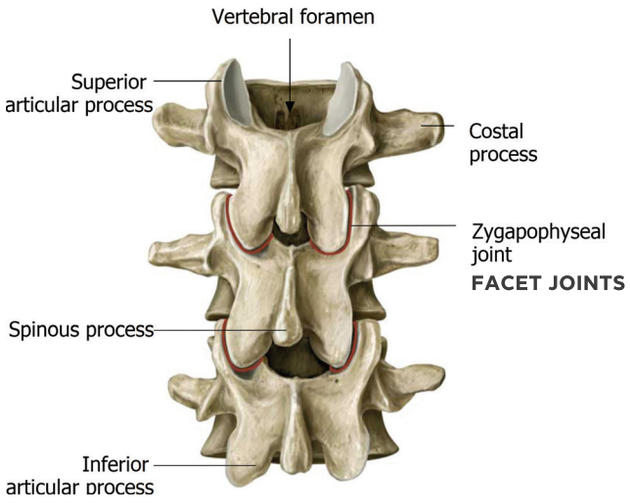
1.12 Spinal Structures

FACET JOINTS

The facet joints are the “bony knobs” that meet between each vertebra that link the vertebrae together and give them the flexibility to move against each other. There are two facet joints between each pair of vertebrae, one on each side. The facet joints give the spine its flexibility and stability.

The facet joints are synovial joints covered with articular cartilage, a slick, spongy material that allows the bones to glide against one another without much friction. Synovial fluid inside the joint keeps the joint surfaces lubricated, like oil lubricates the parts of a machine. This fluid is contained inside the joint by the joint capsule, a watertight sac of soft tissue and ligaments that fully surrounds and encloses the joint.

The facet joints also comprise two of the three weight-bearing points of the spine with the vertebral body, with the disc being the third weight-bearing point on the spine.

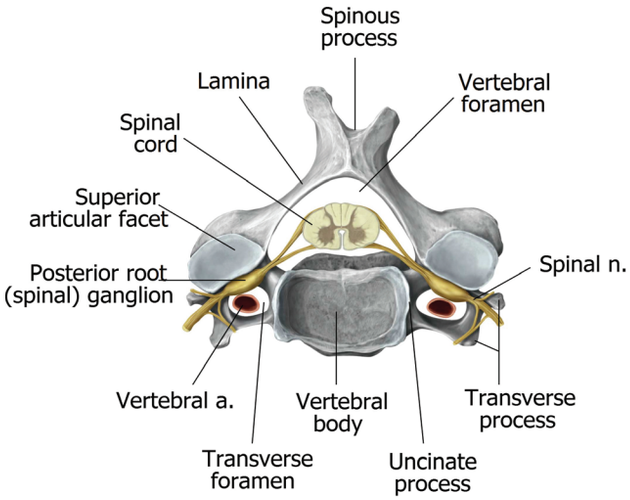


FACET JOINTS

SPINAL CORD

The spinal cord is a column of millions of nerve fibers that carry messages from your brain to the rest of your body. It extends from the brain to the area between the end of your first lumbar vertebra and top of your second lumbar vertebra. Below this level, the spinal canal contains a group of nerve fibers, called the caude equina. Each vertebra has a hole in the center, so that when they stack on top of each other they form a hollow tube that holds and protects the entire spinal cord and its nerve roots.

A protective membrane called the dura mater covers the spinal cord. The dura mater forms a watertight sac around the spinal cord and the spinal nerves. Inside this sac, the spinal cord is surrounded by spinal fluid.



NERVE ROOTS

The spinal cord branches off into 31 pairs of nerve roots, which exit the spine through small openings on each side of the vertebra called neural foraminae. The two nerve roots in each pair go in opposite directions when traveling through the foraminae. The nerve root allows nerve signals to travel to and from your brain to the rest of your body.

The nerves in each area of the spinal cord connect to specific parts of your body. The nerves of the cervical spine go to the upper chest and arms. The nerves of the thoracic spine go to the chest and abdomen. The nerves of the lumbar spine reach to the legs, pelvis, bowel, and bladder. These nerves coordinate and control all the body's organs and parts, and allow you to control your muscles and to feel sensations. If your body is being hurt in some way, your nerves signal the brain. Damage to the nerves themselves can cause pain, tingling, or numbness in the area where the nerve travels. Without nerve signals, your body would not be able to function.

1.13 Movements of the Body

SPINAL DISCS

The discs are like shock absorbers between the bones of the spine and are designed to help the back stay flexible while resisting forces in many different planes of motion. Each disc has two parts:

- A firm, tough outer layer (annulus fibrosus). The outer portion of this layer contains nerves. If the disc tears in this area, it can become quite painful.
- A soft, jelly-like core (nucleus puposus). This part of the disc contains proteins that can cause the tissues they touch to become swollen and tender. If these proteins leak out to the nerves of the outer layer of a disc they can cause a great deal of pain.

Unlike other tissues of the body, there is no direct blood supply to the discs.

- The cervical spine has the most movement in all directions with the top two vertebrae (atlas/C1 and axis/C2) specifically designed to allow for yes and no movements of the skull.
- The thoracic spine has very limited flexion and extension due to the attachment of the ribs, more lateral flexion, and even more rotation.
- The lumbar spine allows for the most flexion and extension with less lateral flexion and even less rotation.

1.14 Recap the Basics

NOTES

1.15 Movements of the Body

KNOW

- **SHOULDER:** flexion, extension, abduction, adduction, internal rotation and external rotation
- **SCAPULA:** protraction and retraction, elevation and depression, upward and downward rotation
- **FOREARM:** pronate and supinate
- **HIP:** flexion, extension, abduction, adduction, internal rotation and external rotation
- **ANKLE:** inversion, eversion, dorsiflexion, plantarflexion
- **SPINE:** flexion, extension, lateral flexion (left and right), rotation (left and right), and axial extension (lengthening the midline)
- **PELVIS:** anterior and posterior tilt

SECTION 2
THE SHOULDER

2.1 Intro to the Shoulder

SHOULDER COMPLEX

Involves three different bones:.

1. Clavicle
2. Scapula
3. Humerus

KNOW

- Glenohumeral joint is the main shoulder joint, where humerus sits in the glenoid fascia.
- Shoulder joint tends toward mobility and away from stability.
- To create stability and integrity in shoulder joint we need to stabilize both the scapula and humerus.

2.2 Differentiating Between Superficial and Deep Muscles

CHARACTERISITCS OF SUPERFICIAL MUSCLES

- Bigger
- More powerful
- Can see, palpate, and connect to easier
- Lying right under skin
- Prime movers
- Create visible movements

CHARACTERISTICS OF DEEP MUSCLES

- Smaller
- Closer to joint
- Primary function is stabilization
- Deeper under skin
- “Mindfulness muscles”
- More subtle
- Precursor to the ability of superficial muscles to fire and move more efficiently

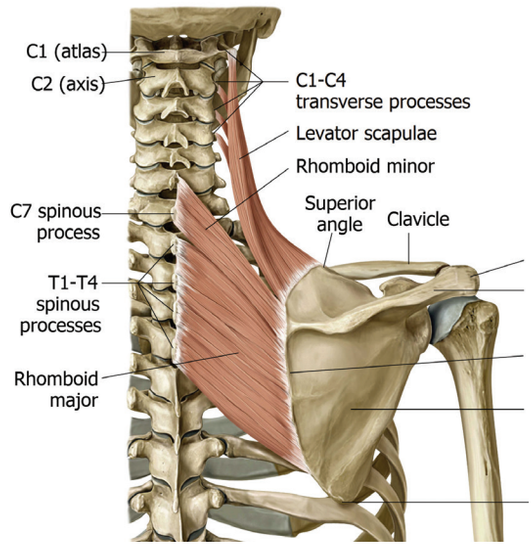
KNOW

- When superficial muscles override deep muscles, more wear and tear is created in the joint.
- Crucial to have cohesion and balance between the superficial and deep muscles.

2.3 Muscles of the Shoulder: Scapular Stabilizers

1. RHOMBOIDS MAJOR & MINOR

Origin: Spinous process of C7-T5
Insertion: Medial border of scapula
Action: Retract scapula, stabilize scapula
Poses:



Atlas of Anatomy, 2nd ed., Fig. 21.29 B, Illustrator: Karl Wesker,
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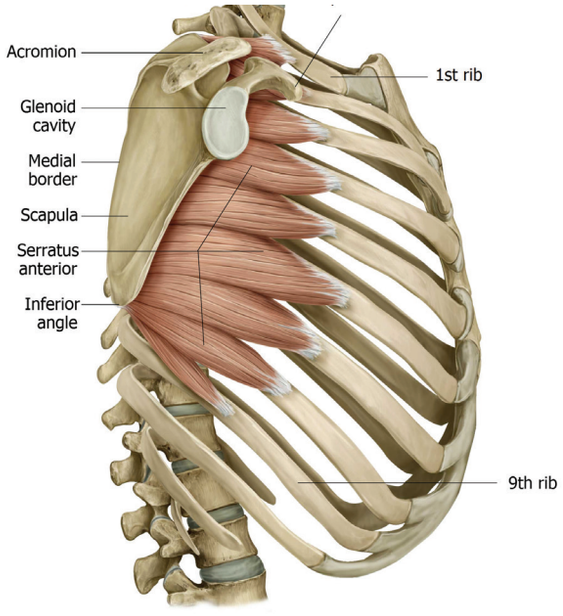
2. SERRATUS ANTERIOR

Origin: Lateral surface of upper 8-9 ribs
Insertion: Medial border of scapula
Action: Protract scapula, stabilize scapula
Poses:



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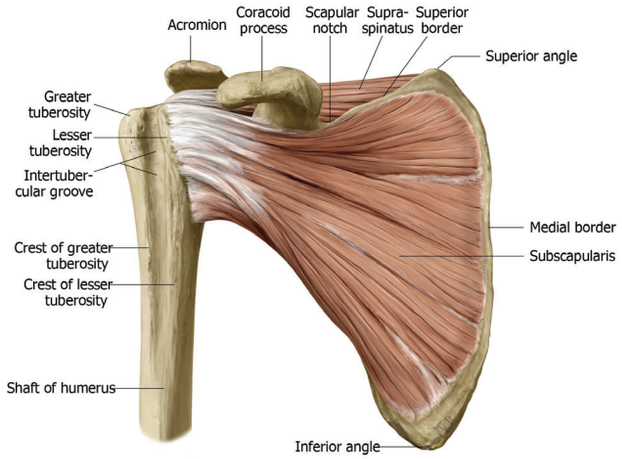
2.4 Muscles of the Shoulder: Humeral Stablizers

3. ROTATOR CUFF

(Subscapularis, Supraspinatus, Infraspinatus, Teres minor)

3A. SUBSCAPULARIS

Origin: Subscapular fossa (anterior scapula)
Insertion: Lesser tubercle of humerus
Action: Internally rotate humerus, stabilize humeral head
Poses:

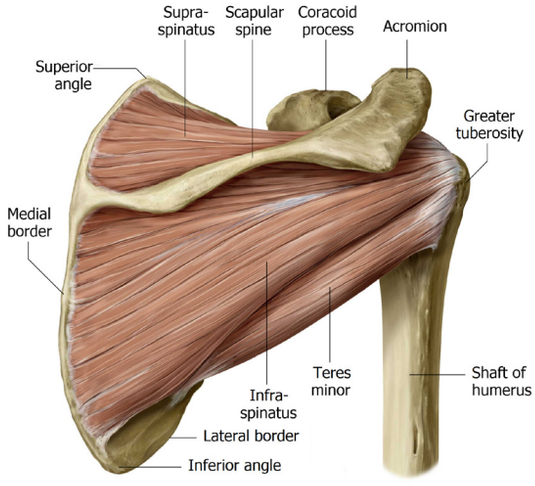


3B. SUPRASPINATUS

Origin: Supraspinous fossa on scapula
Insertion: Greater tubercle of humerus
Action: Abduction of humerus, stabilize humeral head
Poses:

3C. INFRASPINATUS

Origin: Infraspinous fossa on scapula
Insertion: Posterior greater tubercle of humerus
Action: External rotation of humerus, stabilize humeral head
Poses:



3D. TERES MINOR

Origin: Lateral border of scapula
Insertion: Posterior greater tubercle of humerus
Action: External rotation of humerus, stabilize humeral head
Poses:

2.5 Experiential: Shoulder Plapation and Myofascial Release (Part 1)

2.6 Experiential: Shoulder Plapation and Myofascial Release (Part 2)

2.7 Asana: Focus on the Shoulders

2.8 Recap the Shoulder

NOTES

SECTION 3
THE HIP

3.1 Introduction to the Hip

MOVEMENTS OF HIP:

- Flexion
- Extension
- Abduction
- Adduction
- External rotation
- Internal rotation

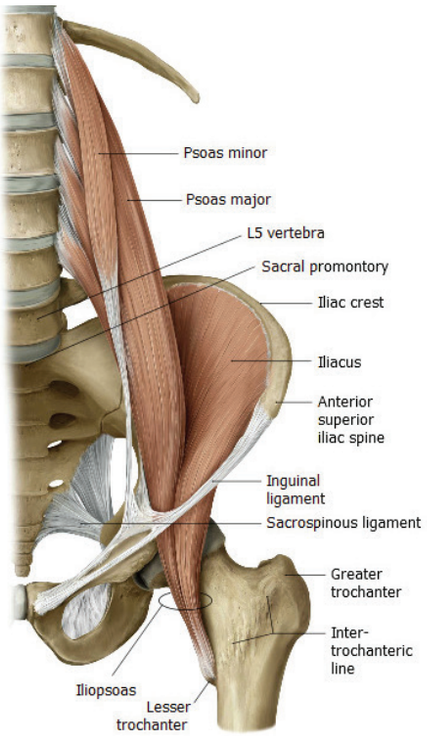
KNOW

- Pay attention to the balance of stability and mobility.
- Hip joint has a natural inclination toward stability.

3.2 Muscles of the Hip: Psoas and Gluteus Maximus

1. ILIOPSOAS

Origin: Transverse process, body and discs of T12-sacrum
Insertion: Lesser trochanter
Action: Hip flexion, lumbar extension/lordosis
Poses:



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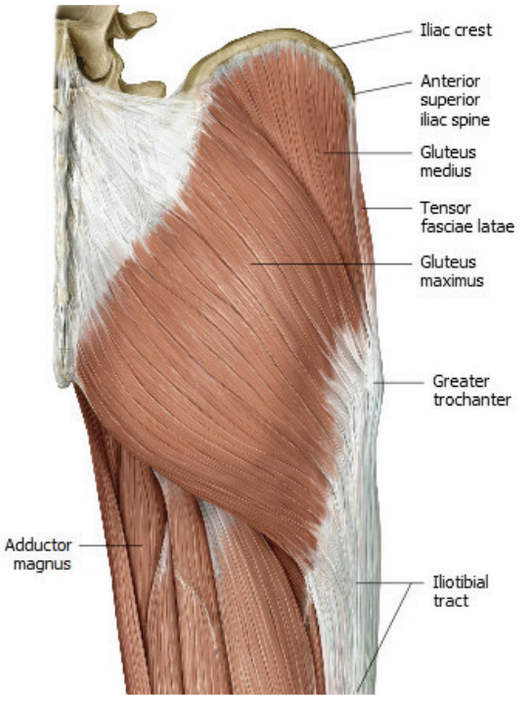
2. GLUTEUS MAXIMUS

Origin: Lateral border of sacrum
Insertion: Gluteal tuberosity and iliotibial band
Action: Hip extension, hip external rotation
Poses:

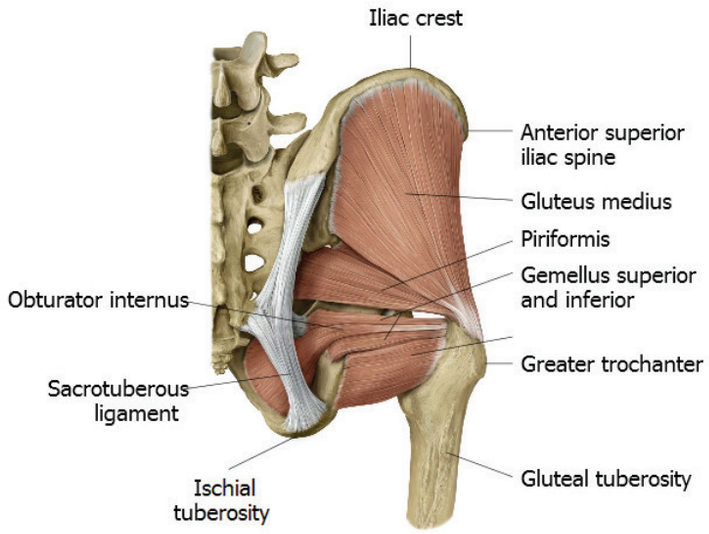


, Fig. 31.14 A, Illustrator: Wesker/Voll,

3.3 Muscles of the Hip: Gluteus Medius and Tensor Fascia Latae (TFL)

3. GLUTEUS MEDIUS

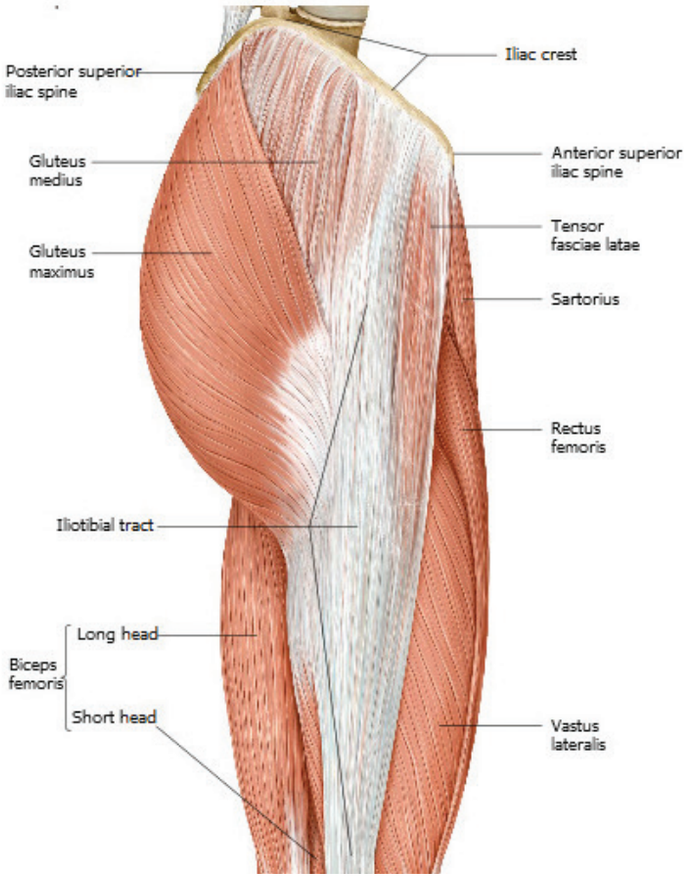
Origin: Under iliac crest
Insertion: Greater trochanter
Action: Hip abduction, stabilize pelvis on one leg
Poses:



Atlas of Anatomy, 2nd ed., Fig. 26.20 A, Illustrator: Karl Wesker,

4. TENSOR FASCIAE LATAE

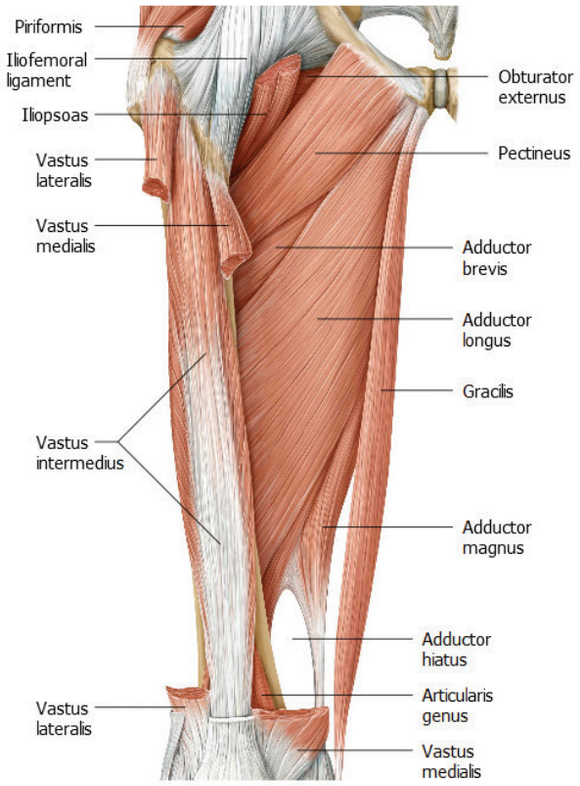
Origin: ASIS
Insertion: Iliotibial band
Action: Hip flexion, abduction, and internal rotation
Poses:



, Fig. 16.28, Illustrator: Karl Wesker, Markus Voll,

5. ADDUCTORS

Origin: Pubic bone and ischial tuberosity
Insertion: Linea aspera of femur
Action: Adduction of the hip
Poses:

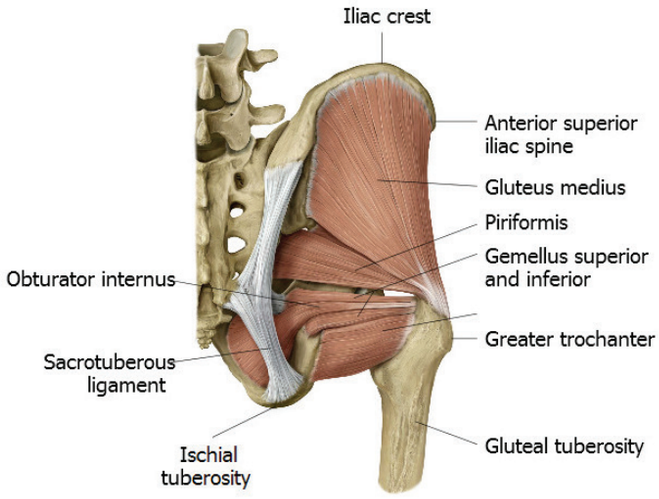


, Fig. 16.25 B, Illustrator: Karl Wesker, Markus Voll,

6. PIRIFORMIS AND GOGOQ MUSCLES:

GOGOQ muscles = Gemellus Superior, Gemellus Inferior, Obturator internus, Obturator externus, Quadratus femoris.

Origin: Lateral border of sacrum
Insertion: Greater trochanter
Action: External rotator
Poses:



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3.7 Let's Recap the Hips

NOTES

SECTION 4
THE TRUNK

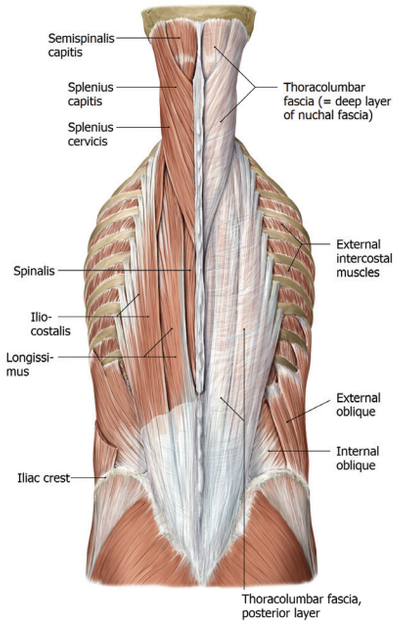
4.1 Muscles of the Back: Erector Spinae and Quadratus Lumborum

1. ERECTOR SPINAE (iliocostalis, longisimus, and spinalis)

Origin & Insertion: Large ropey muscles that run along sides of spine from sacrum to occiput, attaching to ribs and vertebrae along the way (iliocostalis: most lateral; longisimus and spinalis: most medial)

Action: Extend vertebral column

Poses:



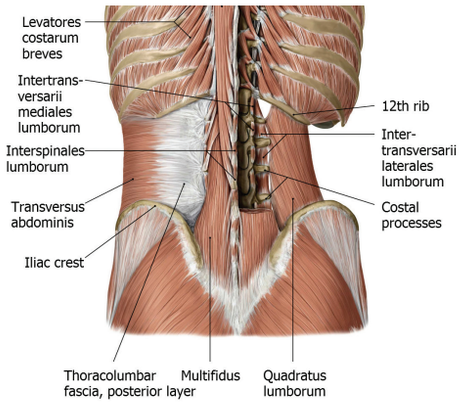
2. QUADRATUS LUMBORUM

Origin: Iliac crest

Insertion: last rib and transverse process of lumbar vertebrae

Action: One side = lateral flexion of vertebral column both sides = extension of spine

Poses:



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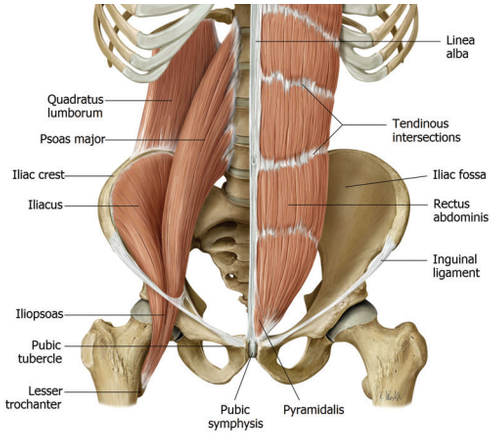

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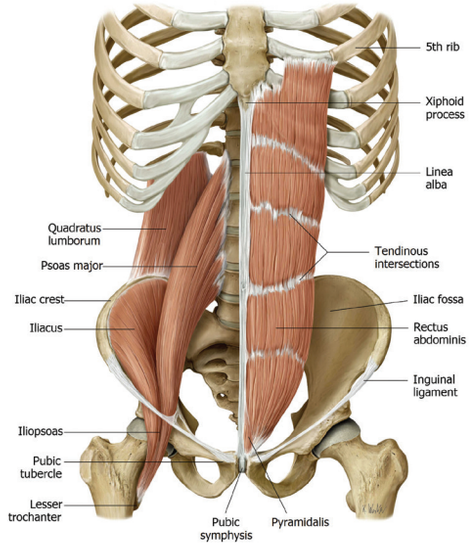
4.2 Muscles of the Core: Rectus Abdominis and Obliques

1. RECTUS ABDOMINIS

Origin: Pubic bone
Insertion: Xiphoid process of sternum and costal cartilage of ribs 5-7
Action: Flexion of lumbar spine
Poses:



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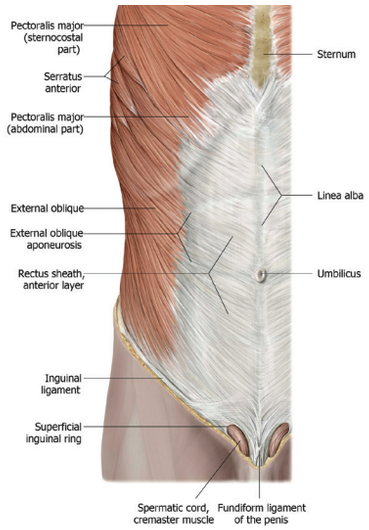
2. OBLIQUES

Origin & Insertion: Together create X shape across abdomen around sides of waist
Action: Rotation, lateral flexion, flexion of lower spine
Poses:



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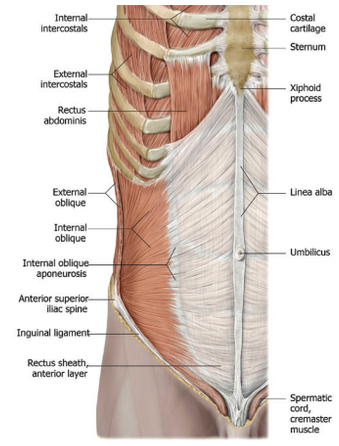

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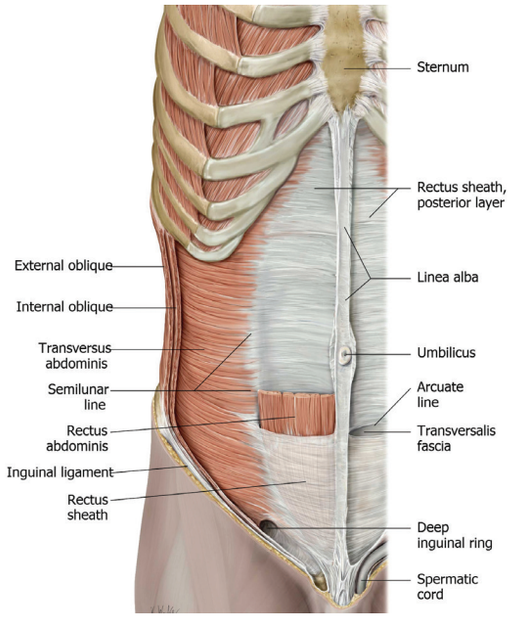
4.3 Muscles of the Core: Transverse Abdominis and Diaphragm

3. TRANSVERSUS ABDOMINIS

Origin & Insertion: Runs between pelvis and rib cage to wrap around waist to back
Action: Compress abdominal contents, draw in around waist to support abdominal organs and lumbar spine and to create axial extension
Poses:



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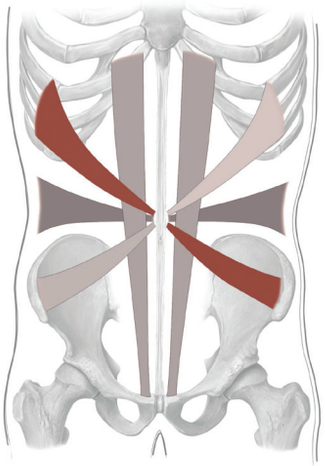
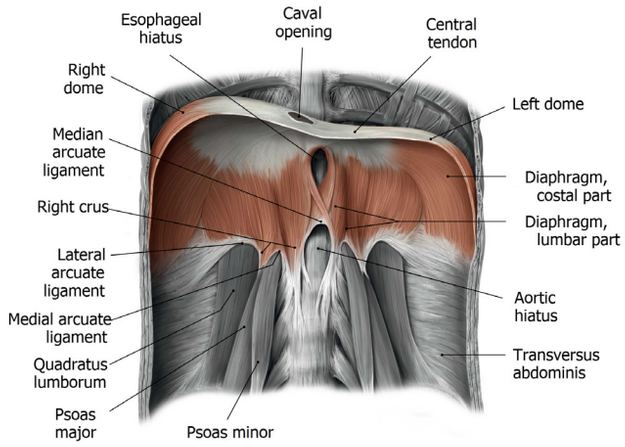


Schuenke, Atlas of Anatomy Vol. 1, 2nd Ed., Fig. 10.157 Cb, Illustrator: Karl Wesker, ©2017 Thieme Medical Publishers, Inc. All Rights Reserved.

4. DIAPHGRAGM

Origin: Lower ribs and T12-L2
Insertion: Central tendon
Action: Relaxed breathing



SECTION 5

THE LIMBS

5.1 Muscles of the Legs: Quadriceps

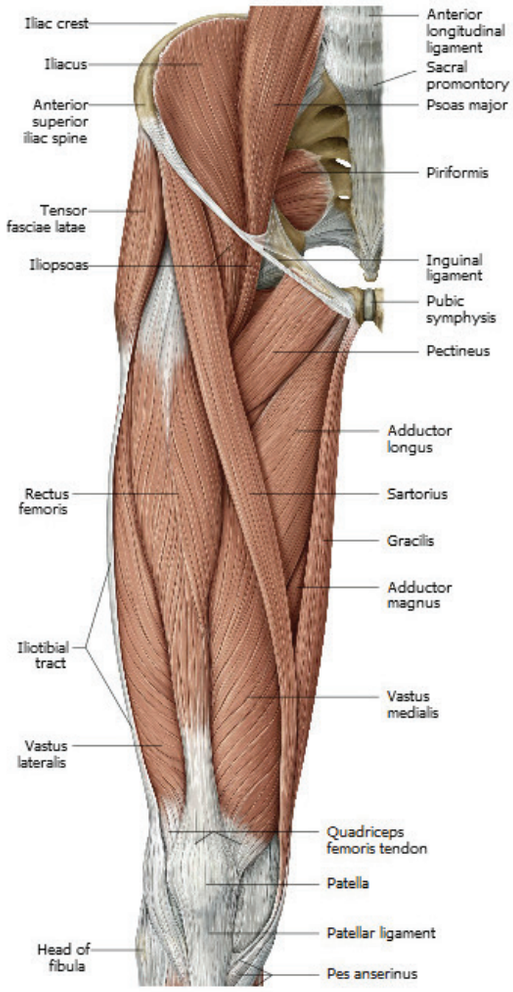
1. QUADRICEPS (Vastus lateralis, medialis, intermedius, and rectus femoris)

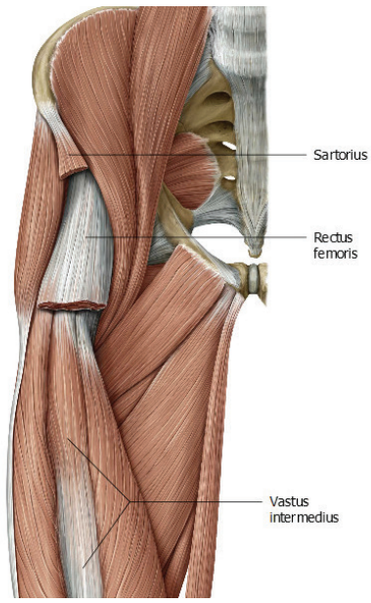
1A. VASTUS LATERALIS, MEDIALIS, INTERMEDIUS

Origin: Femur
Insertion: Tibial tuberosity via patellar tendon
Action: Extend knee
Poses:

1B. RECTUS FEMORIS

Origin: AIIS
Insertion: Tibial tuberosity via patellar tendon (with rest of quadriceps)
Action: Knee extension, hip flexion
Poses:



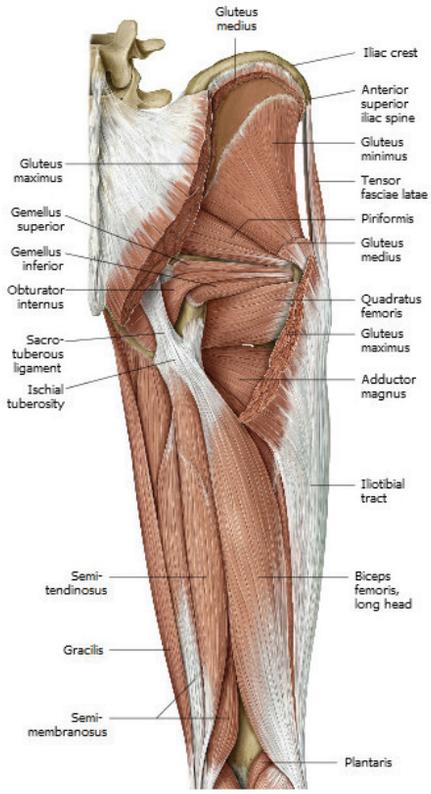


5.2 Muscles of the Legs: Hamstrings and Lower Leg

2. HAMSTRINGS (Semimembranosus, semitendinosus, biceps femoris longus and brevis)

2A. SEMIMEMBRANOSUS & SEMITENDINOSUS

Origin: Ischial tuberosity
Insertion: Medial condyle of tibia
Action: Extension of hip, flexion of knee
Poses:



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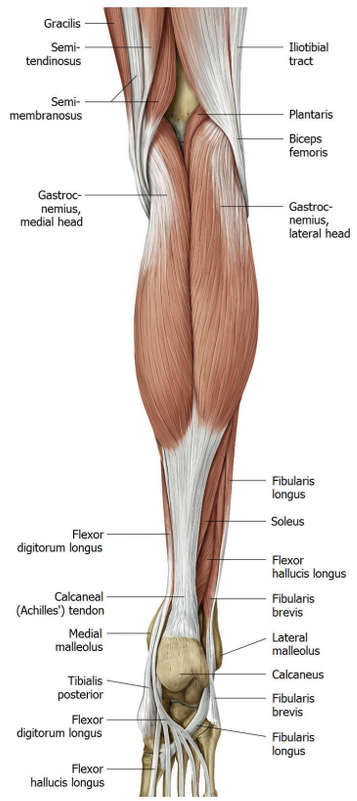
2B. BICEPS FEMORIS LONGUS & BREVIS

Origin: Ischial tuberosity and femur
Insertion: Head of fibula
Action: Extension of hip, flexion of knee
Poses:

3. GASTROCNEMIUS

Origin: Superior to lateral and medial femoral condyles
Insertion: Achilles tendon to calcaneus
Action: Plantar flex foot, flex knee
Poses:



Gilroy, Atlas of Anatomy, 2nd ed., Fig. 27.21 A, Illustrator: Karl Wesker, ©2016 Thieme Medical Publishers, Inc. All Rights Reserved.

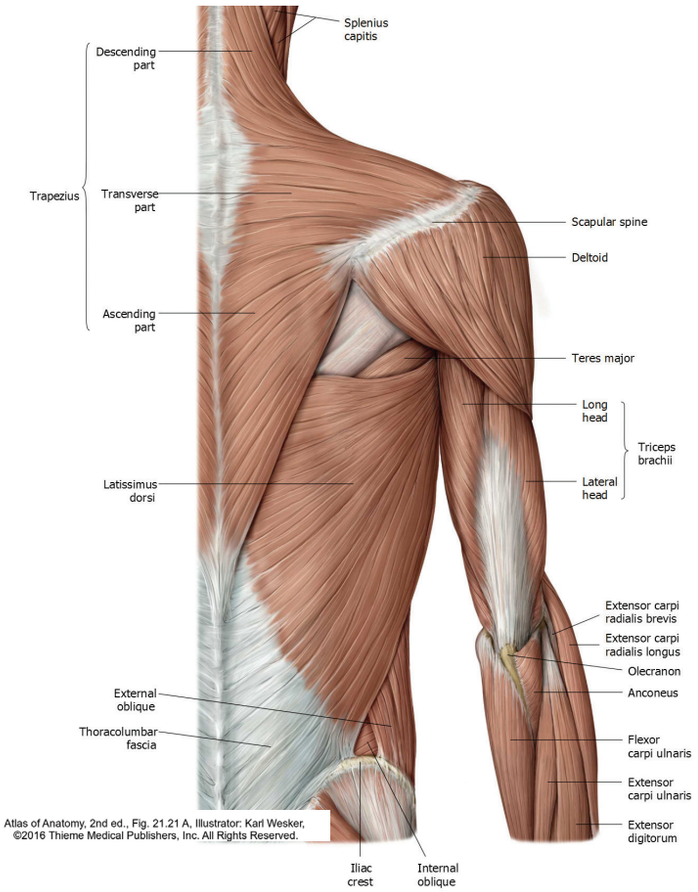
5.3 Muscles of the Arms and Shoulders: Latissimmus Dorsi and Pectorals

1. LATISSIMUS DORSI

Origin: Spinous process of the T7-L5, thoracolumbar fascia iliac crest, inferior 3-4 ribs, inferior angle of scapula

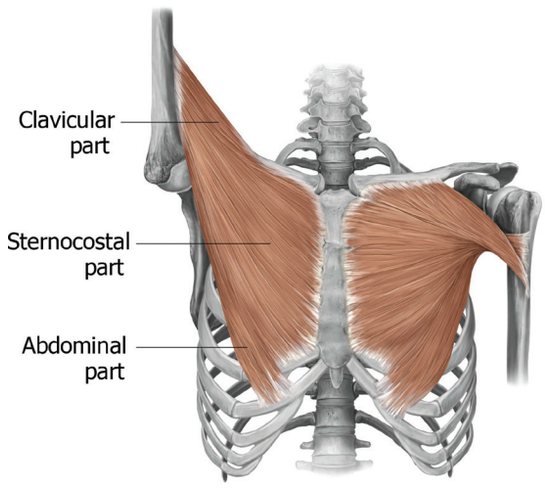
Insertion: Medial to bicipital groove
Action: Adduct, extend, and interally rotate the arm, rotation of the trunk

Poses:



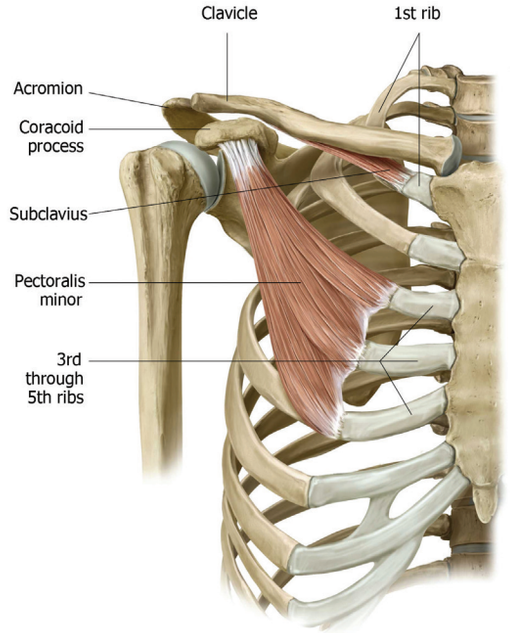
2. PECTORALIS MAJOR

Origin: Medial 2/3rd of clavicle, sternum, costal cartilage (upper 6), aponeaurosis of external obliques
Insertion: Lateral edge of bicipital groove
Action: Adduction, flexion, and medial rotation of humerus
Poses:



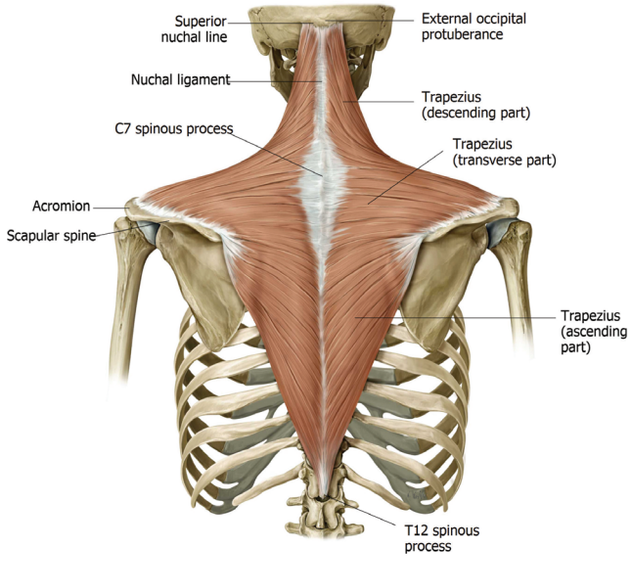
3. PECTORALIS MINOR

Origin: Ribs 3-5
Insertion: Coracoid process
Action: Anterior stability for scapula, lift ribs in respiration
Poses:



4. TRAPEZIUS

Origin: Spinous process of C1-T12
Insertion: Lateral spine of scapula, acromion process, and lateral 1/3rd of clavicle
Action: Upper: elevate scapula; middle: retract scapula; lower: depress scapula
Poses:



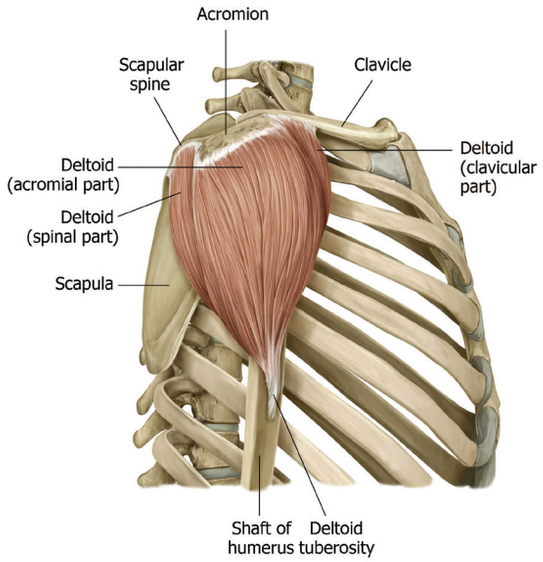
5. DELTOID

Origin: Lateral 1/3rd of clavical, acromion, and lateral spine of scapula

Insertion: Deltoid tuberosity on humerus

Action: Anterior: flexion of shoulder; middle: abduction; posterior: extension of shoulder

Poses:



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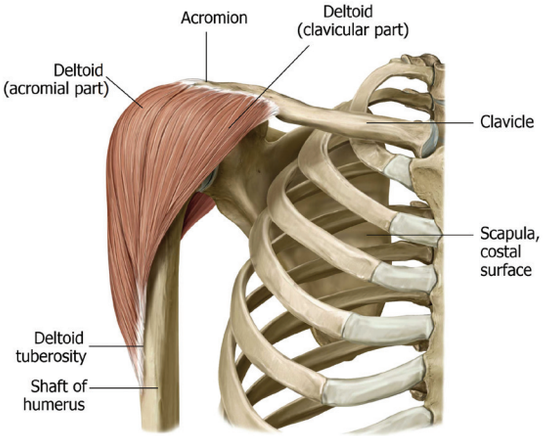

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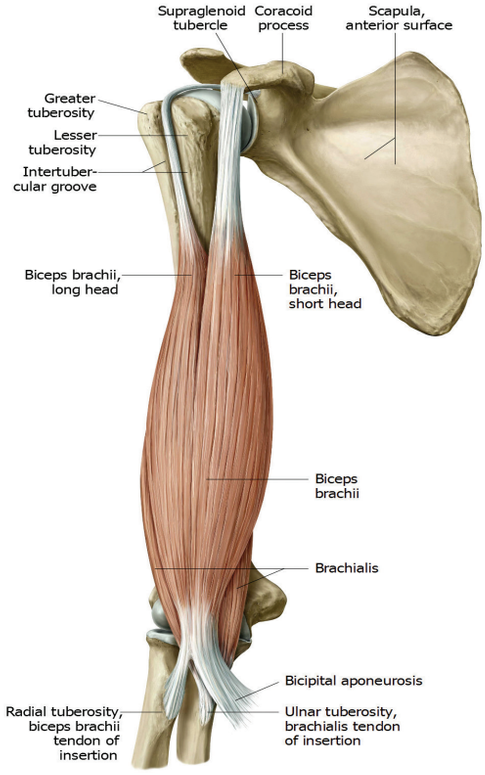
5.4 Muscles of the Upper and Lower Arm: Biceps and Triceps

1. BICEPS

Origin: Short head: coracoid process
Long head: supraglenoid tubercle
Insertion: Radial tuberosity and bicipital aponeurosis
Action: Flex elbow, flex shoulder, supinate forearm
Poses:



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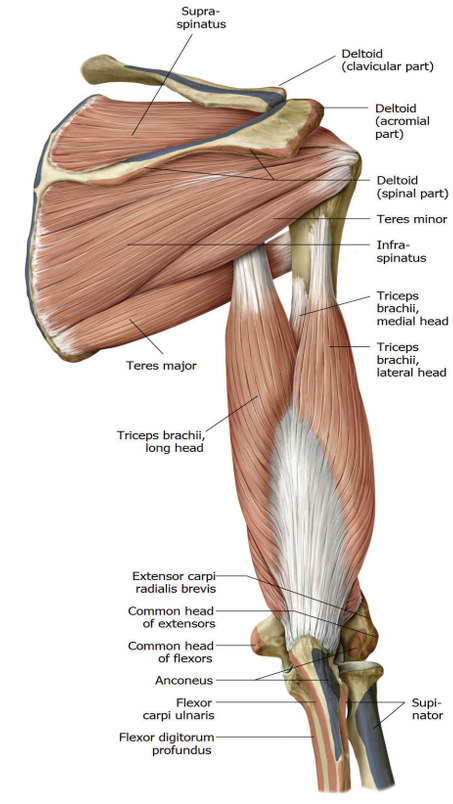
2. TRICEPS

Origin: Long head: infraglenoid tubercle
Lateral and medial heads: humerus
Insertion: Olecranon process of ulna
Action: Extend forearm, long head; also extends shoulder
Poses:



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