Kids Yoga

Anatomy of Movement for Yoga Teachers

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Introduction

As a yoga teacher, it's important to have an understanding of how yoga asanas affect specific muscles, so you can plan a well-rounded class that aims to strengthen and stretch the muscles within each major muscle group. Although this guide was written with adult students in mind, the same anatomy of movement principles can be applied to kids. The following guide gives the names and illustrates the location of specific muscles, as well as describing their actions and ways to strengthen and stretch the muscle. Specific yoga poses that strengthen or stretch the muscle can be found in paratheses in the "to strengthen" and "to stretch" columns of the charts.

Note: This section of the yoga teacher's guide does not provide a complete cataloging of the relation of anatomy of movement to yoga. That would have taken an entire book. But, this section will provide you with general information about the actions of major skeletal muscles and the relationship between those muscles and specific yoga poses. The more you understand how yoga movements affect muscles, the easier it becomes to plan a well-rounded and safe class.

To learn more about the anatomy of movement in hatha yoga, please consider reading the reference materials listed at the end.

Anatomical Terminology

There are a common set of terms used to describe the spatial positions and relationships in the human body when speaking of anatomy or movement. They are all related to anatomical position, which is standing erect with the palms of the hands forward, as seen in most anatomy charts.

Terms Used to Describe Muscle Location and Movement

In this section, anatomical terms are used to describe location and movement. If you are unfamiliar with these terms, please see the charts below.

Planes

In order to describe where anatomical structures are located three-dimensionally, the body is divided into three planes:

1) Saggital Plane: The vertical plane dividing the body into left and right halves

2) Frontal Plane: The vertical plane dividing the body into front and back halves.

3) Transverse Plane: The horizontal plane dividing the body into upper and lower parts.

Location Terms

Term	Description of Location
Anterior	Towards the front of the body (abdomen/chest are in anterior and back is in posterior position)
Posterior	Towards the back of the body (back is in posterior position and abdomen/chest is in anterior position)
Ventral	Towards the front of the torso (towards front of belly/abdomen)
Dorsal	Towards the back of the torso (back)
Medial	Towards the center or midline of the body
Lateral	Away from the midline of the body (to the side)
Inferior	Below – in relation to another structure (feet are inferior to knees)
Superior	Above – in relation to another structure (knees are superior to feet)
Proximal	Nearest the trunk or point of origin of the limb (shoulders are proximal to elbows)
Distal	Situated away from the center or midline of the body or away from the point of origin, closer to the end of the limbs
Contralateral	Pertaining or relating to the opposite side.
Ipsilateral	On the same side
Transverse	Horizontally across the body

Movements Terms - Terms used for specific movements.

Movement	Description	Examples
Flexion	Decreasing the inner angle of the joint	Bending the elbow Dropping the chin to the chest Folding forward (flexion of spine)
Extension	Increasing the inner angle of the joint	Back bend Kicking leg back (hip extension)
Abduction	Moving away from the midline of the body	Lifting leg to the side Lifting arms up from sides into T position
Adduction	Moving towards the midline of the body	Crossing one leg in front of the other Crossing arm in front of torso or behind back
Lateral Flexion	Sidebending (neck/torso)	Dropping ear towards shoulder Crescent Stretch (dropping one hand down same side of body)
Rotation	Rotating or pivoting around a long axis	Twisting along spinal column (seated twist) Turning palms up and down
Circumduction	Circular movement	Arm circles
Dorsiflexion	Flexing the ankle with foot moving upwards	Lifting toes up towards body
Plantarflexion	Flexing the ankle with foot moving downward	Pointing toes
Pronation	Rotating the forearm with the palm turning inward	Lifting arm then turning arm (like emptying a can of soda)
Supination	Rotating the forearm with the palm turning outward	Lifting arm then turning arm back (turning palms towards ceiling)
Inversion	Turning sole of foot medially (inward)	Turning feet in, turning toes towards each other
Eversion	Turing sole of foot laterally outward	Turning feet out, bringing backs of heels towards each other.
Horizontal Abduction	Move arm in horizontal plane away from the body	Bring arms to shoulder height and pull arms back (opening through chest)
Horizontal Adduction	Moving arm in horizontal plane inwards across body	Crossing arms in front of the chest
Protraction	Draw forward (shoulder)	Round shoulders forward “spreading” back
Retraction	Draw back (shoulders)	Squeezing shoulder blades together

Bones, Joints and Ligaments

Bones form the frameword for the body. They also serve as levers that are acted upon by muscles. Bones come in varied shapes and sizes. Long bones are found in the limbs, where they act as levers for support and locomotion. Short bones function for strength and compactness. Flat bones have a protective function (skull) or provide broad surfaces for muscular attachment (shoulder blades).

Joints are areas where bones are linked together. Some joints, such as the sacroiliac joint, are very inflexible and capable of little or no movement. Other joints move freely, permitting bones to form levers that hinge or pivot with one another. These joints are called synovial joints because they contain synovial fluid which lubricates the opposing surfaces, allowing them to glide or move against each other. The different kind of synovial joints include: hinge joints, ball and socket joints (multi-axial, and bi-axial), gliding joints, pivot joints, and saddle joints.

Examples of different types of joints include:

- Hinge (ginglymus): Elbow, knee. This type of joint permits a wide range of movement in only one plane.
- Multi-Axial Ball and Socket (enarthrodial): Hip, shoulder joint. This type of joint allows movement in all planes – wide range of rotation and movement.
- Bi-Axial Ball and Socket (condyloidal): Fingers, jaw, wrist (between the radius and proximal row of the carpal bones). This is a type of joint that allows movement in two planes without rotation.
- Gliding (arthrodial): Spine, carpal bones of the wrists. This type of joint permits limited gliding movement in which bones glide past each other. It is characterized by two flat bony surfaces that butt against each other.
- Pivot (trochoidal): Top of the neck, rotation of the radius at the radioulnar joint. This type of joint permits rotational movement around a long axis (bones can spin or twist around other bones).
- Saddle (sellar): Thumb. This type of joint permits ball and socket movement (back and forth, side to side), but with very limited rotation.

Bones do not actually touch against each other where they articulate. The articulating surfaces are covered by cartilage that helps protect the bone and allow movement at the joint. It also absorbs the fluids that lubricate the joint, helping to keep the fluid from dissapating.

Joints are bound together by ligaments. All primary joints are firmly bound together by ligaments that connect bone to bone. Torn ligaments result from undue stress on joints, with knee and ankle injuries being the most common. Muscles are attached to bones and cartilage by tendons. By contracting, muscles produce movement. So bones function as levers, and muscles as motors that move the levers. Fascia are tendinous fibers that connect the skin and underlying structures to the muscles. The words “origin” and “insertion” indicate where muscles are attached to bones in relation to the most common movement at a joint. The origin of a muscle is on the bone that is usually relatively stationary, and the insertion of the is on the bone that is most often moved. For example, in flexion of the elbow, it is the forearm (not the upper arm) that

is usually most moved. So, the biceps brachii and the triceps brachii take origin from the upper arm and shoulder, and insert on the forearm.

Muscle Forms

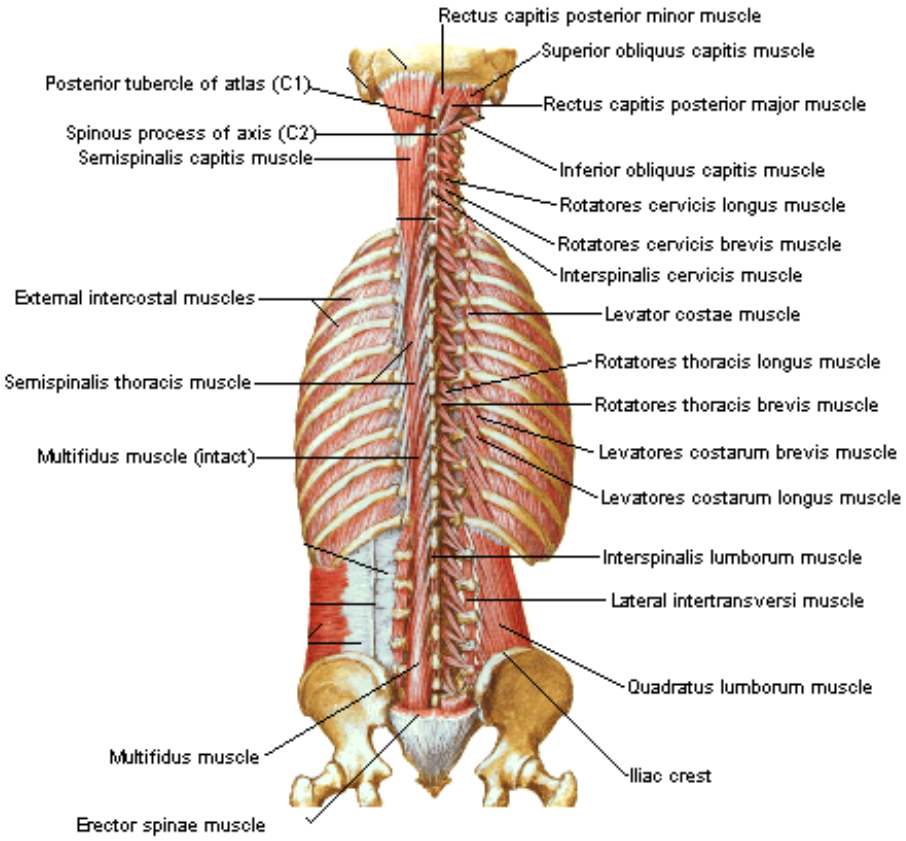
Muscles have different forms and fiber arrangements, depending on their function. Muscles in the limbs tend to be long. Because of this, they can contract more and are capable of producing greater movement. Muscles in the trunk tend to be broader and to form sheets that wrap around the body. Muscles that stabilize parts of the body tend to be short and squat, like those found in the hip.

Muscles are composed of bundles of fibers held together by very thin membranes. Within these fibers are thousands of tiny filaments, which slide along each other when the muscle is stimulated by a nerve. This causes the muscle to shorten or contract. Muscles that produce a specific movement are called agonists, while the muscles that produce the opposite movement are called antagonists. When a muscle shortens in length while contracting, it is called isotonic contraction. When a muscle contracts but can not shorten due to the resistance of weight or immovable objects, it is called isometric contraction.

Muscles can contract in different ways. In concentric shortening, the entire muscle reacts by contracting and shortening. An example is when the biceps brachii muscle in the forearm contracts to lift a book off a table and bring it in close to you to read. However, when you slowly extend your elbow to put the book back on a table, we are lengthening the muscle (biceps brachii) while keeping some of its muscle fibers in a state of contraction. Whenever this happens (increasing muscle length against resistance or gravity), the movement is called eccentric lengthening.

The next sections will examine the location and actions of different muscles, and the exercises we can do to stretch and strengthen specific muscles.

Deep Spinal Muscles (Neck/Back) – Posterior View



The cervical spinal muscles (nape of the neck) include:

- Rectus capitis posterior minor
- Rectus capitis posterior major
- Obliquus capitis (superior)
- Obliquus capitis (inferior)

These muscles extend and rotate the head. They are stretched by flexing the head, bringing the chin towards the chest (neck stretches).

Deep spinal muscles along the vertebral column include:

- Interpinalis cervicis
- Spinalis thoracis
- Rotator brevis
- Multifidis
- Semispinalis capitis
- Semispinalis cervicis
- Semispinalis thoracis
- Erector Spinae

Erector Spinae Muscles
The erector spinae are the long muscles that run parallel to the spine. The erector spinae are composed of the following muscles:

Muscles	Action	To Strengthen	To Stretch
Iliocostalis (lumbar, thoracic, cervicis)	Extension and lateral flexion (side-bend) of spine	Back extension in prone position (locust, bow, cobra), moving against gravity.	Flexion of the spine (forward fold), side bend (crescent stretch opposite side, gate), neck stretches
Longissimus (thoracis, cervicis, capitis)	Extension and lateral flexion of spine and rotate head	Back extension in prone position (locust, bow), moving against gravity.	Flexion of the spine (seated forward fold), side bend (crescent stretch opposite side), neck stretches.
Splenius (cervicis, capitis)	Extend and rotate head	Head extension – head back (sun worshipper, neck stretches-turn head)	Head flexion (drop chin to chest) and turn head side to side

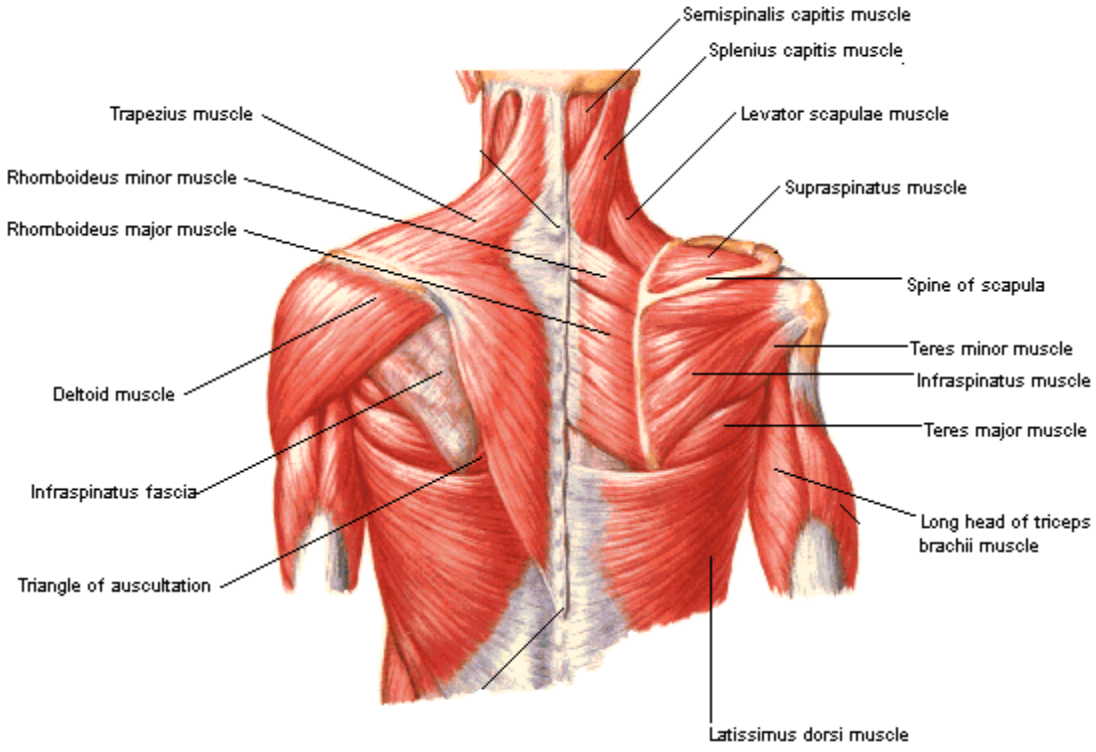
These muscles are responsible for intevertebral movements, including extension, sidebending and rotation

Yoga movements to strengthen these muscles:
- Standing Backbend
- Camel
- Sun Worshipper
- Crescent Stretch
- Locust
- Bow
- Cobra
- Seated Twist

Yoga movements to stretch these muscles:
- Neck Stretches (chin to chest)
- Seated Forward Fold
- Child's Pose
- Seated Twist (stretches opposite side of twist)
- Plow
- Rabbit
- Crescent Stretch (opposite side)

Note – In standing forward fold, if you bend from the waist, you will contract only abdominal muscles as you fold forward. If you bend from the hips, you will contract (use/strengthen) both your adominal muscles and your erector spinae muscles.

Torso/Shoulder Muscles – Posterior View



Torso/Shoulder – Anterior View

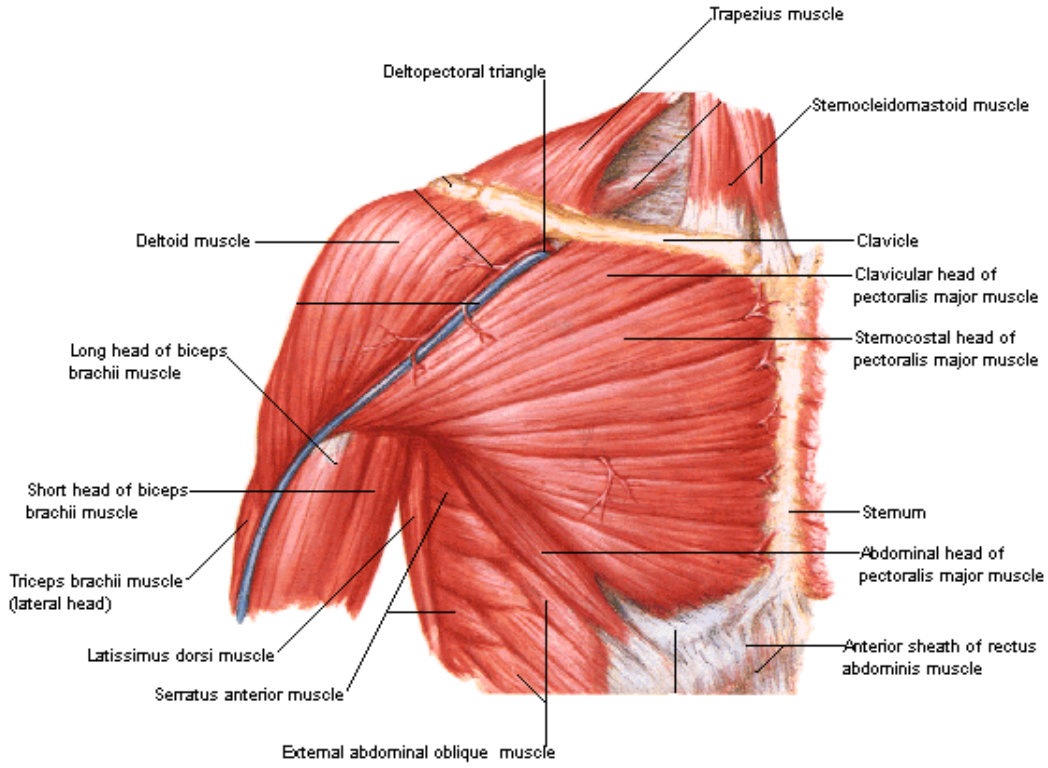


Chart of Muscles of Torso/ Chest (Anterior)

Muscles	Action	To Strengthen	To Stretch
Sternocleido-mastoid	Flex and rotate head, raise ribs	Flex head (bring chin to chest), rotate head	Extend head (drop head back), rotate head
Obliques (external, internal, transverse)	Rotate, flex and side bend trunk	Rotate trunk while flexing hips, knees flexed (leg pumps - (bring elbow to opposite leg, lunge with twist, chair with twist)	Laterally flex the opposite side while rotating lumbar region (triangle, gate, supine twist)
Rectus Abdominus	Flex trunk (forward bend)	Flex hip with knees flexed (leg pumps, plank - with knee to chest, knee to chest standing balance, boat, marichyasana)	Extend lumbar and thoracic spine, and extend hips to accentuate the anterior rotation of the pelvis (bow, upward bow, standing backbend, camel)

Chart of Muscles of Shoulder Girdle (Posterior)

Muscle	Action	To Strengthen	To Stretch
Shoulder Blade			
Levator Scapula	Elevates (raises) scapula, rotates and side bends head	Rotate neck, keep head raised against gravity (dropping ear to shoulder, triangle look to raised hand), Elevating scapula against gravity (standing backbend - with arms overhead)	Rotate head to and flex cervical spine (neck stretch – bringing chin towards armpit or drop ear to shoulder, child's pose, rabbit)
Rhomboid (major and minor)	Adduction of scapula, draw scapula down	Abduct shoulder, squeeze shoulder blades (camel, locust, chest expander)	Protract scapula while keeping shoulders down (child's pose, rabbit, plow, thread the needle)
Trapezeus (upper, lower, middle)	Elevation and adduction of scapula. Upper fibers extend head	Abduct arm and shoulder, squeeze shoulder blades together (camel,locust chest expander)	Flex neck, protract scapula (thread the needle, rabbit, shoulder stretch)
Serratus Anterior	Protraction and upward rotation of scapula	Push ups (yoga push ups, eagle)	Retract scapula (serpent stretch, fish, frog)
Pectoralis Minor	Protraction and downward rotation of scapula	Depress and rotate scapula down (chaturanga, spider)	From supine position, retract scapula (fish, reclining hero)

Shoulder Joint	**Action**	**To Strengthen**	**To Stretch**
Deltoid (anterior, lateral, posterior)	Abduct arm, anterior also draws arm forward, posterior also draws arm back	Abducting arms to shoulder height – arms in T position (warrior 2, blade, chair)	Adduction - crossing arm across torso (thread the needle, shoulder stretches) or extension (chest expander)
Teres Major	Extension, internal rotation and adduction of shoulder joint	Internal rotation against resistance (eagle, swaying palm tree)	External rotation of shoulder in 90 degree abducted position (tree pose with arms out to sides and palms turned up)
Latissimus Dorsi	Adduction, extension, internal rotation and horizontal abduction of shoulder joint	Exercises in which arms are pulled down (swimming dolphin)	External rotation of shoulder in 90 degree abducted position (tree pose with arms out to sides and palms turned up)
Pectoralis Major	Internal rotation of arm, horizontal adduction, and adduction	Push ups (chaturanga, yoga push up)	Externally rotating shoulder with arm adducted behind back (chest expander), horizontal abduction of shoulder (prone twist)
Rotator Cuff Muscles	**Action**	**To Strengthen**	**To Stretch**
Supraspinatus	Abduction, Stabilization	Internally rotate shoulder and abduct arm (like pouring a can of soda) (serpent stretch)	Adduct arm behind back with shoulder extended (binds – as in extended angle and seated twist)
Infraspinatus	External rotation, horizontal abduction and extension of shoulder	Exercises in which arms are pulled down (swimming dolphin)	Internal rotation and horizontal adduction (shoulder stretch)
Teres Minor	External rotation, horizontal abduction and extension of shoulder	Exercises in which arms are pulled down (swimming dolphin)	Internal rotation and horizontal adduction (shoulder stretch)
Subscapularis	Internal rotation, adduction and extension of shoulder	Internal rotation with arms beside the body against resistance (rabbit)	External rotation and horizontal adduction (eagle)

Lower Arm – Anterior View

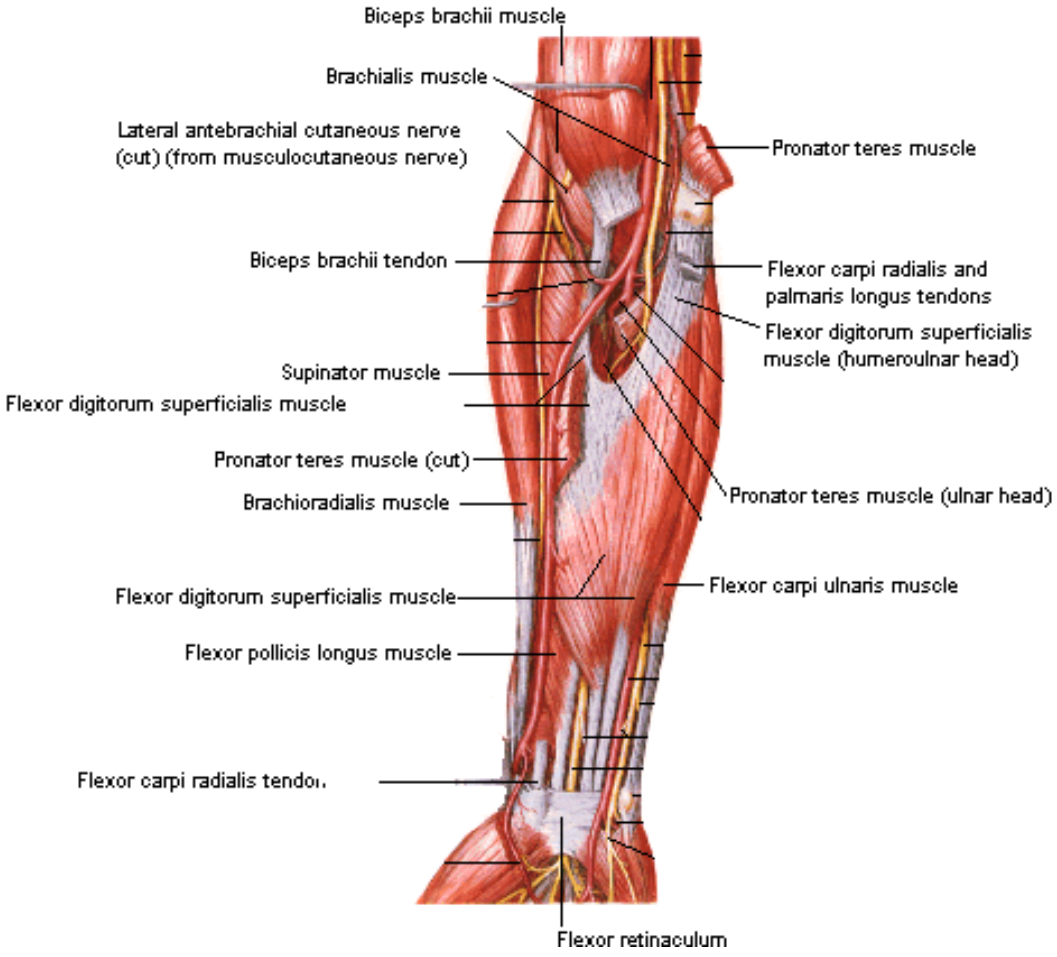
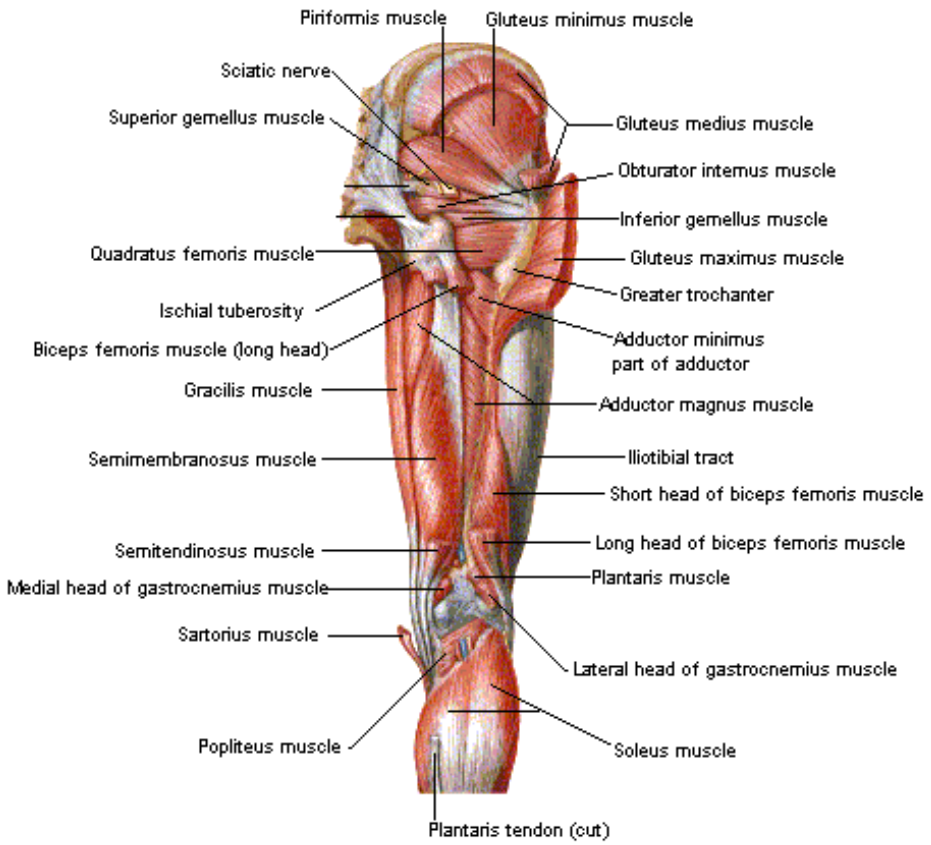


Chart of Major Muscle Arms/Elbow Joint

Muscle	Action	To Strengthen	To Stretch
Biceps Brachii	Flex elbow and supinate forearm	Flexion of elbow against resistance (yoga push up, dolphin, swimming dolphin)	Extend elbow and horizontally abduct arm (Prone twist)
Triceps Brachii	Extension of elbow, adduction of shoulder joint	Extend elbow with arms in close to ribs (Chaturanga, Cobra)	Flex shoulder and elbow (Cow's Face)
Brachialis	Flexion of the elbow	Flex the elbow against resistance (dolphin, swimming dolphin, serpent stretch)	Extend elbow and relax and flex shoulder (fish with arms overhead, arms stretched overhead in supine position – lying on back)

Brachioradialis	Flexion of elbow, pronation from supinated position or supination from pronated position	Flex the elbow against resistance (yoga push up, swimming dolphin, serpent stretch)	Extend elbow with shoulder in flexion (arms overhead) and forearm in pronation or supination (swaying palm tree, crescent stretch)
Anconeus	Extension of the elbow	Extend elbow against resistance	Flex elbow (cow's face – upper arm)
Pronator Teres Pronator Quadratus	Pronation of the forearm	Pronate and flex elbow against resistance (serpent stretch)	Extend elbow and supinate forearm (lie on back and place arms overhead with palms on floor)
Supinator	Supination of the forearm	Hold forearms in supinated position (tree with arms out to sides and palms turned up)	Pronate forearm (swaying palm tree)

Hip and Thigh – Posterior View



Hip/Thigh – Anterior View

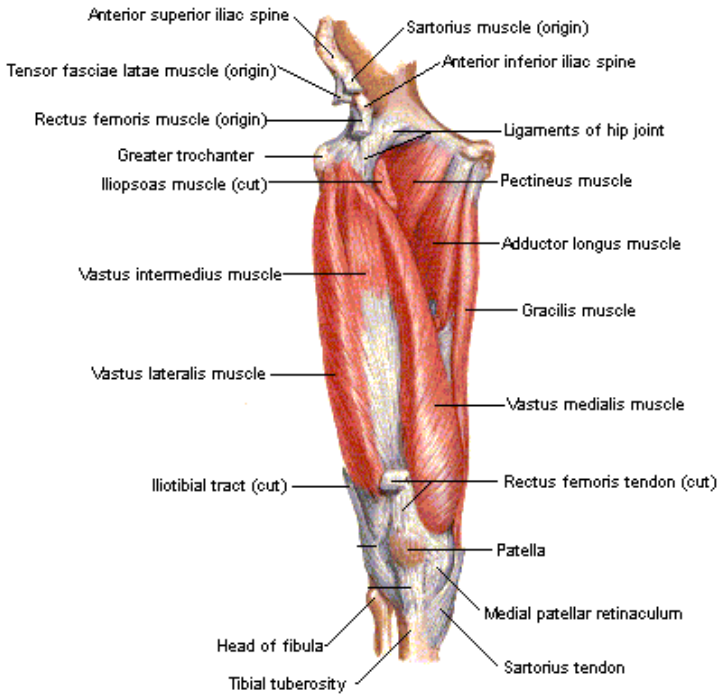
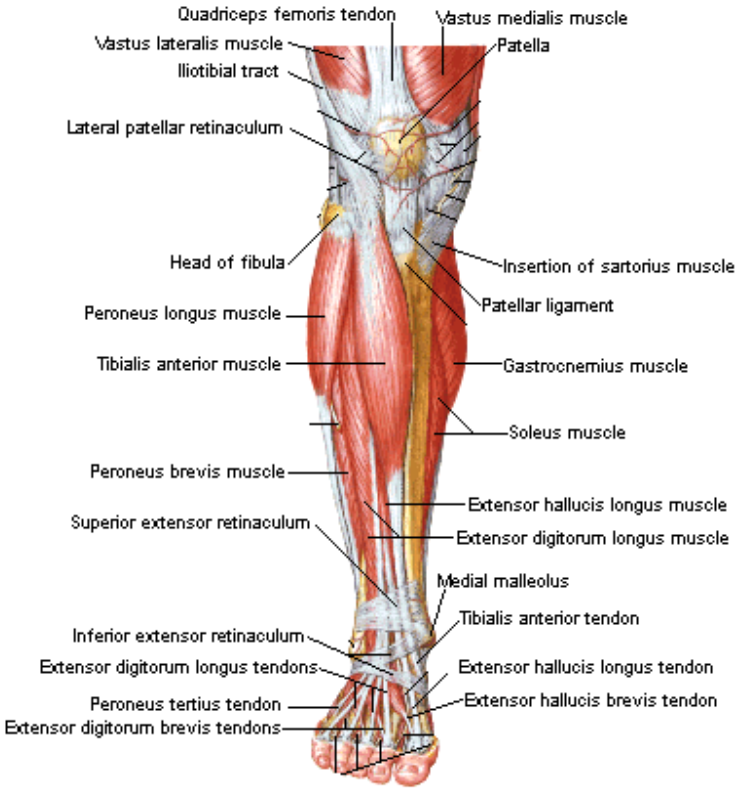


Chart of Muscles of Hip and Thigh (Hip and Knee Joint)

Muscle	**Actions**	**To Strengthen**	**To Stretch**
Posterior Muscles			
Gluteus Maximus	Extend, outwardly rotate hip	Hip extension exercises from forward bending or prone position (one leg forward fold, bow, locust)	Exercises in supine position with full hip flexion (reclined hip opener, dead bug)
Gluteus Medius, Gluteus Minimus	Abduction of Hip, Internal rotation (minimus), External rotation (medius)	Hip abduction (side lying leg raises, plank – holding foot, warrior 2)	Hip adduction in front of the opposite extremity (supine twist, seated twist)
Piriformis, Obturator internus, Gemellis superior and inferior, Obturator externus, Quadratus femoris (deep rotator muscles)	Outwardly rotate and abduct hip	Externally rotate femur or stand on one leg and turn body away from leg (moon god, warrior 2)	Flex and rotate hip in supine or seated position (seated twist - pressing down through both sitting bones, reclined twist, pigeon)
Hamstrings (Biceps femoris, Semimembranosus, Semitendinosus)	Knee flexion, rotation of knee when flexed, hip extension	Knee flexion against resistance (warrior 1, warrior 2, chair, crescent lunge)	Extend knee while flexing hip (lunge flow, one leg seated forward fold, seated forward fold, pryamid)
Anterior Muscles	**Action**	**To Strengthen**	**To Stretch**
Adductor Muscles (Brevis, Longus, Magnus)	Adduction of hip and slight external rotation	Adduct leg (bring it in) against resistance (side plank, lift lower leg)	Abduct legs and may add hip flexion (seated straddle, standing straddle fold)
Quadriceps (Rectus Femoris, Vastus Lateralis, Vastus Intermedius, Vastus Medialis)	Knee extension, rectus femoris also provides hip flexion	Knee extension against resistance (sun flower – when coming up, standing hand to foot, warrior 3, triangle)	Pulling the knee into maximum flexion (king dancer – keeping foot to buttocks, sun worshipper – from sitting on heels position)
Popliteus	Flexion and internal rotation of the knee	Flexion of knee against resistance or against gravity	Extend knee fully without flexing hip or external rotation of knee with knee flexed 20-30 degrees (reclined hip opener – pressing knee away)

Lower Leg – Anterior View



Lower Leg – Posterior View

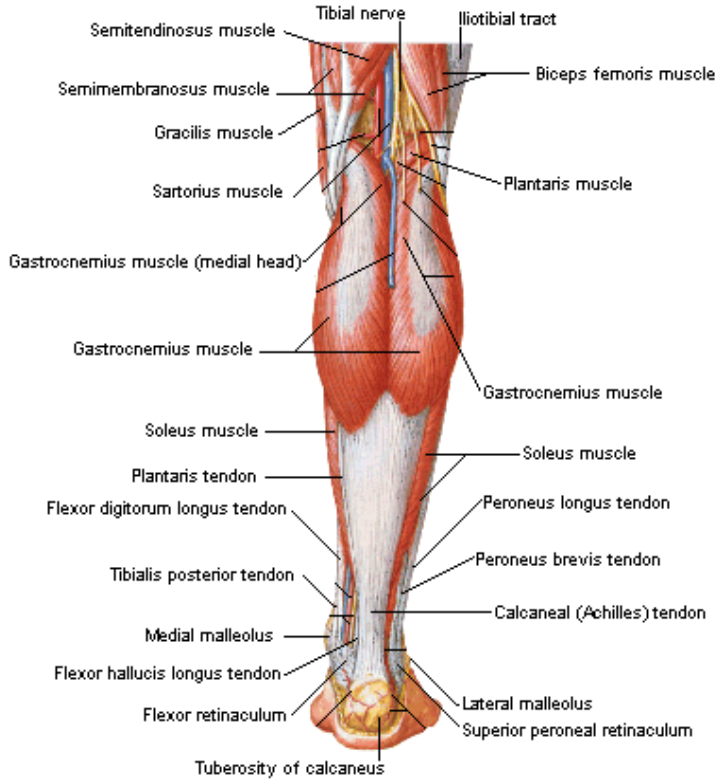


Chart of Leg Muscles (Ankle Joint) – Plantar Flexion Group

Muscle	Action
Gastrocnemius	Plantar flexion of ankle, knee flexion
Soleus	Plantar flexion of ankle
Peroneus (longus, brevis)	Plantar flexion of ankle, eversion of foot
Tibialis Posterior	Plantar flexion of ankle and inversion of the foot
Flexor Digitorum Longus	Plantar flexion of ankle, flexion of four lessor toes
Flexor Hallucis Longus	Plantar Flexion of Ankle

To Strengthen the Plantar Flexion Group of Muscles practice heel raising exercises such as:

- Chair (come onto toes in chair position)
- Toppling Tree (when balancing on toes in squatting position)

To Stretch the Plantar Flexion Group of Muscles practice the following:

- Lean forward while pressing back through heel (down dog, dolphin)
- Take foot into dorsi flexion while knee is flexed (dead bug, prayer squat)

Chart of Leg Muscles (Ankle Joint) – Dorsi Flexion Group

Muscle	Action	To Strengthen	To Stretch
Peroneus tertius	Eversion of the foot and dorsi flexion of ankle	Pulling foot towards shin (dandasana, janu sirsasana)	Take foot into plantar flexion (lunge – top of back foot on floor, rolling over toes from up dog to down dog)
Extensor Digitorum Longus	Dorsi flexion of the ankle, eversion of the foot, extension of the four lesser toes	Dorsi flex ankle and extend toes - pulling foot and toes towards shin (dandasana, paschimottanasana)	Take foot into plantar flexion and flex toes (lunge – top of back foot on floor, rolling over toes from up dog to down dog)
Extensor Hallucis Longus	Dorsi flexion of the ankle, eversion of foot and extension of big toe	Dorsi flex ankle and extend toes (pulling foot and toes towards shin) (dandasana)	Take foot into plantar flexion and flex toes (lunge – top of back foot on floor, rolling over toes from up dog to down dog)
Tibialis Anterior	Dorsi flexion of ankle and inversion of foot	Pull foot and toes towards shin (dandasana)	Point foot/toes (lunge – top of back foot on floor)

To Strengthen the Dorsi Flexion Muscles flex ankle against resistance, pulling toes towards shin:

- Straight leg seated position - Dandasana (legs extended in front of you with toes flexed – bringing toes towards shins)
- Janu Sirsasana
- Reclined hand to foot – with foot flexed

To Stretch the Dorsi Flexion Muscles take foot into plantar flexion and point toes (toes and foot pointing away from shins):

- Lunge (dorsi flexion muscles of back leg are stretched)
- From up dog to down dog – as in Sun Salutation A (rolling over the toes stretches the dorsi flexion muscles)
- Sitting back on heels from kneeling position

Developing a Well-Rounded Yoga Practice

When developing a yoga practice, it's important to include exercises and postures that strengthen and stretch muscles within all the major body parts, including:

- Neck
- Shoulders/Upper Back/Thoracic Spine
- Chest
- Lower Back/Lumbar Spine
- Torso/Abdomen
- Arms/Wrists
- Hips/Thighs
- Lower Legs/Feet/Ankles

Design a warm-up routine that would warm up the major muscles of the body parts listed above.

Design a yoga class that includes yoga postures and exercises that strengthen and stretch the major muscles in the body parts listed above.

Review Questions

1. What does the term “contralateral” mean? What does the term “ipsilateral” mean?

2. Explain how the arm is moving in “horizontal abduction.”

3. Explain how the forearm is moving in “pronation.”

4. Explain what the term “dorsal” means in terms of location in the body.

5. List the muscles that make up the erector spinae muscles. Explain the action of each and yoga postures you could do to stretch or strengthen these muscles.

6. Explain the action of the trapezius (upper, lower and middle) muscles and a yoga pose you could use to strengthen the trapezius, as well as a pose you could use to stretch the trapezius.

7. List the rotator cuff muscles and the actions of each.

8. Name the hamstring muscles. Explain the actions of the hamstring muscles. Name a yoga pose you could practice to strengthen the hamstrings and a yoga pose to stretch the hamstrings.

9. Explain the actions of the Triceps Brachii. Name some yoga postures that can strengthen and stretch the triceps brachii.

For Further Reading

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