



Yoga Teacher Training

Anatomy of Movement for Yoga Teachers

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Table of Contents

Introduction.....	2
Anatomical Terminology.....	2
Anatomical Location Terms.....	3
Movement Terms.....	5
Bones, Joints and Ligaments.....	6
Muscle Forms.....	9
The Spine and Pelvic Girdle.....	10
Biomechanics of Movement.....	11
Neck and Spine.....	13
Deep Spinal Muscles.....	14
Erector Spinae Muscles.....	15
Torso and Shoulder Muscles.....	16
Lower Arm Muscles.....	22
Hip and Thigh Muscles.....	24
Lower Leg/Ankle Muscles.....	27
Major Muscles of the Body.....	30
Developing a Well-Rounded Yoga Practice.....	31
Review Questions.....	34
Further Resources.....	35

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. And, because the physical practice of yoga often focuses on the spine, we will pay special attention to that area of the body. 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 parentheses 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.

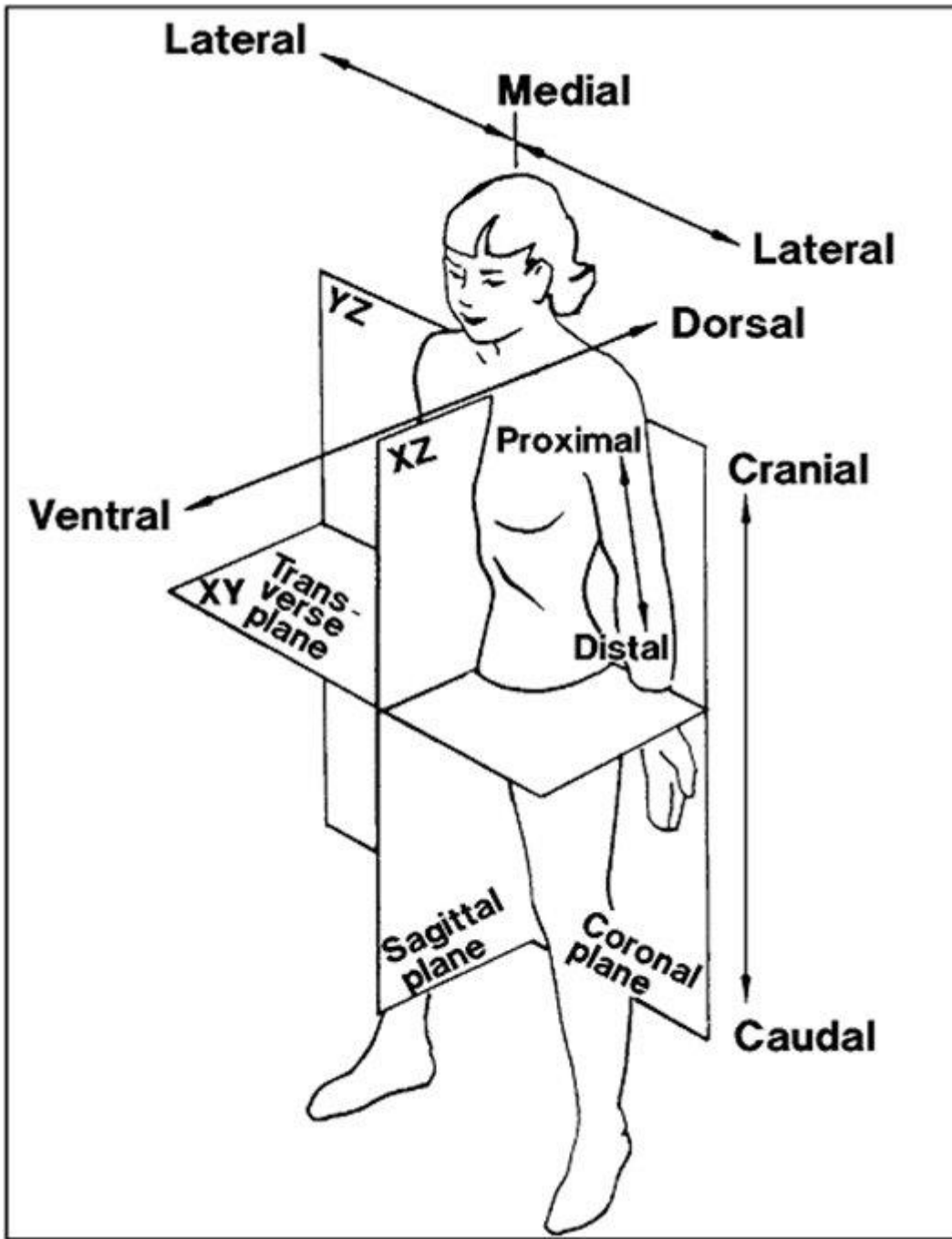
Planes

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 (Coronal 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 anterior to the back)
Posterior	Towards the back of the body (back is posterior to the abdomen/chest)
Ventral	Towards the front of the torso (on the front of the body)
Dorsal	Towards the back of the torso (on the back of the body)
Medial	Towards the center or midline of the body (the sternum is medial to the shoulder).
Lateral	Away from the midline of the body – to the side (the shoulder is lateral to the sternum).
Inferior (Caudal)	Below – in relation to another structure (feet are inferior to knees)
Superior (Cranial)	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 (the hand is distal).
Contralateral	Pertaining or relating to the opposite side.
Ipsilateral	On the same side
Transverse	Horizontally across the body



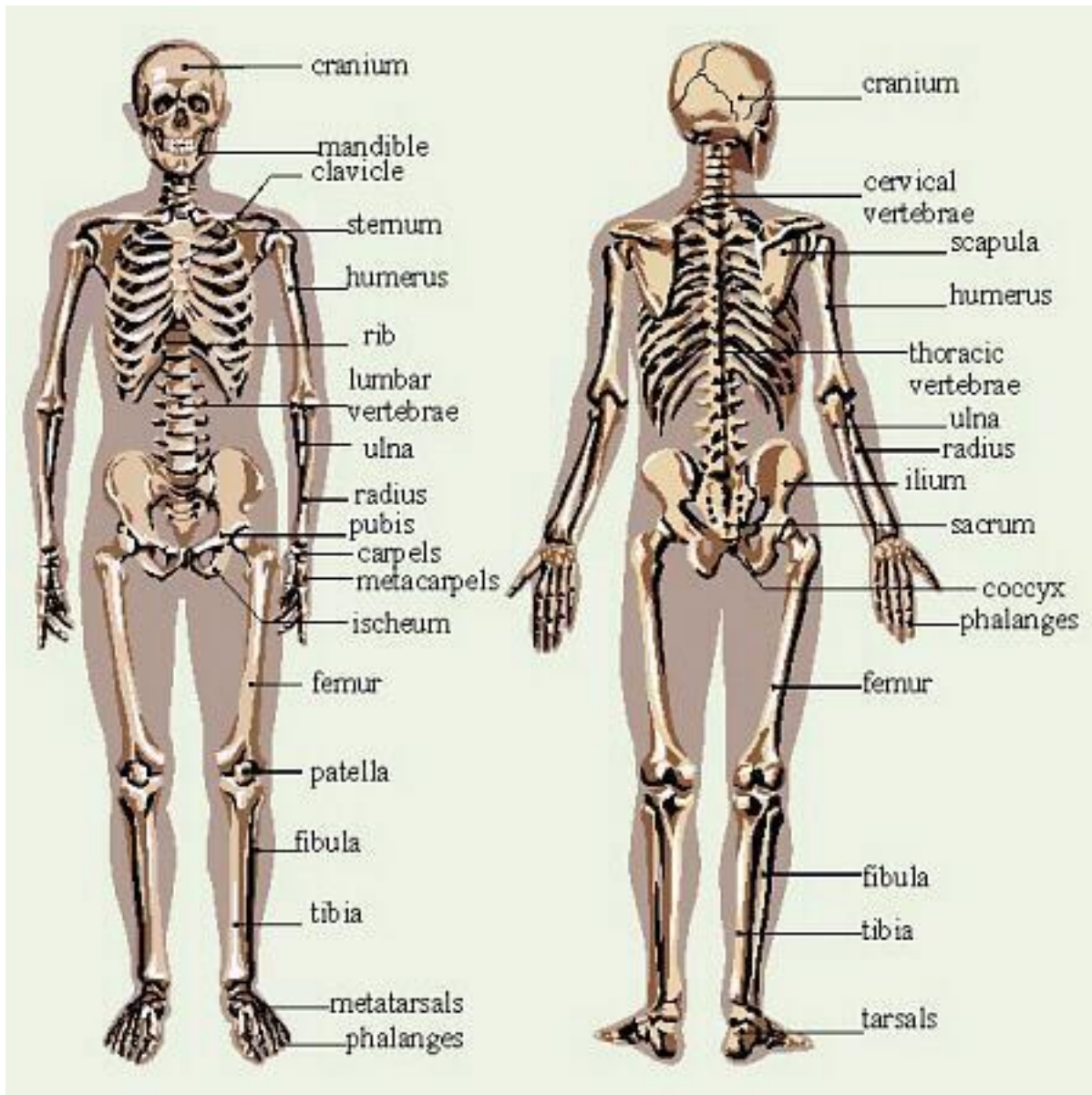
Movements Terms - Terms used for specific movements.

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	Turning 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 structural framework for the body. They are comprised of calcium salts, connective tissue, cells and blood vessels. Bones also serve as levers that are acted upon by muscles, and come in varied shapes and sizes. The shape of a bone reflects its function. 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). Regular yoga practice strengthens your bones because it provides weight bearing exercise in a variety of directions.

Major Bones in the Body

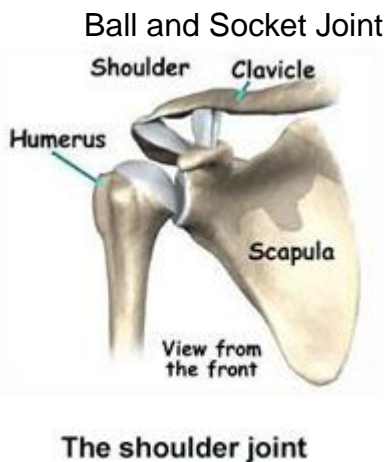


Joints

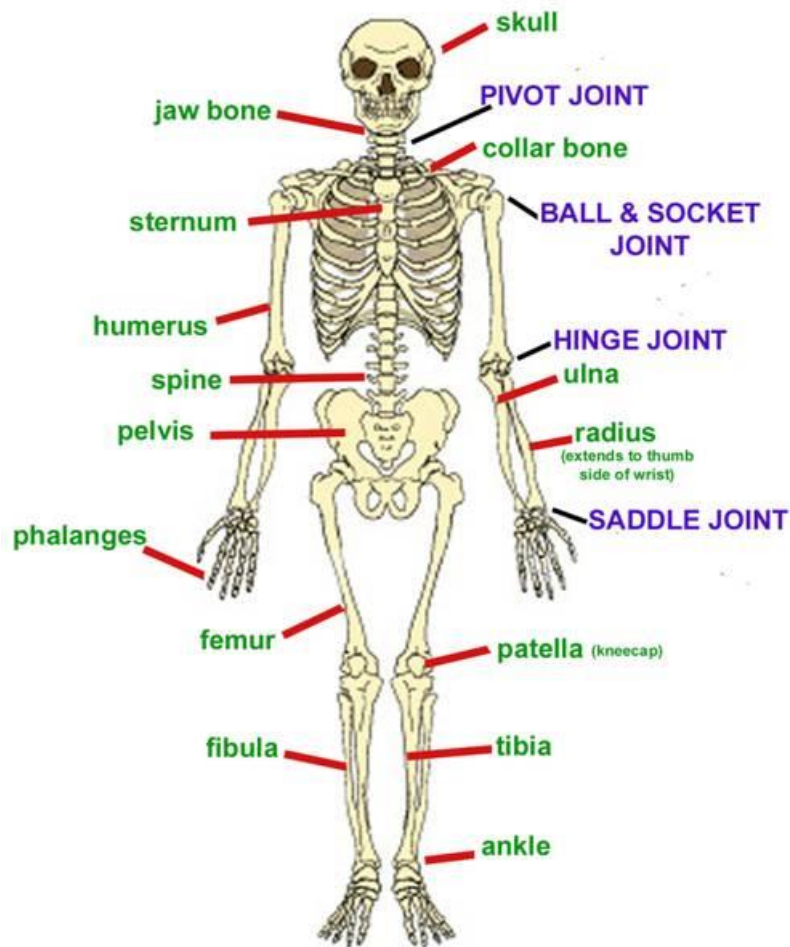
Joints are areas where bones are linked together. Some joints, such as the sacroiliac joint, are very inflexible and capable of little or no movement. Other joints move freely, permitting bones to form levers that hinge or pivot with one another. These joints are called synovial joints because they contain 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 dissipating.



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 muscle 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 also defined by the number of joints they cross; from their origin to their insertion. Monoarticular muscles cross only one joint, while polyarticular cross more than one joint (for example hamstrings).

Types of Muscle Contractions

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 we think of a muscle contracting, we tend to think of the muscle shortening as it generates force. While this is one way that muscles contract, there are also other forms of muscle contraction.

Concentric Contractions

In this form of contraction, a muscle shortens in length while contracting. 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, or when you perform a bicep curl with a free weight.

Eccentric Contractions

When you slowly extend your elbow to put a book you were reading back on a table, you are lengthening the muscle (biceps brachii) while keeping some of its muscle fibers in a state of contraction. Whenever this happens, we call this movement eccentric lengthening; increasing muscle length against resistance or gravity.

Isometric Contraction

In isometric contraction, muscles are active while held at a fixed length. The muscle is neither lengthened or shortened, but is held at a constant length. An example of isometric contraction would be carrying an object in front of you. The weight of the object would be pulling down, but your hands and arms would be opposing the motion with equal force going upwards. Since your arms are neither raising or lowering, your biceps will be isometrically contracting.

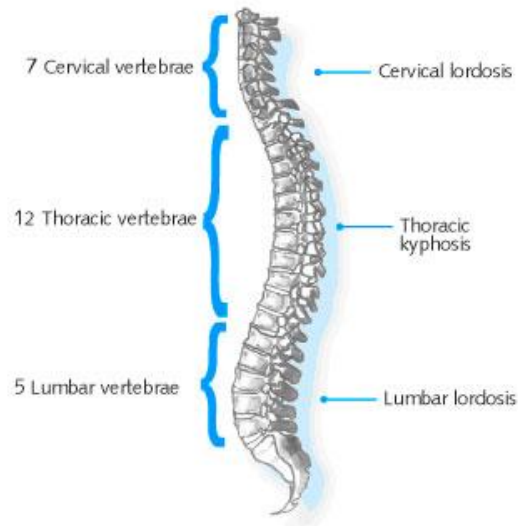
The next sections will examine the location and actions of different muscles, and the exercises we can do to stretch and strengthen specific muscles.

Muscular Force in Yoga

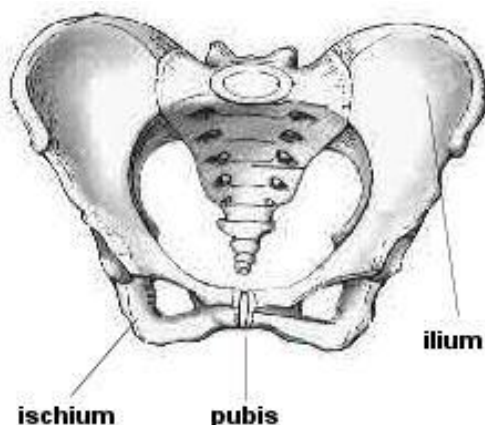
When we align the long axis of the bones with the direction of gravity, we decrease the necessary muscular force to maintain a posture. This makes the posture feel more effortless. For example, when sitting in a cross leg position, gravity is aligned with the long axis of the spine. If we sit up tall, stacking the head over the spine, our muscles are less strained, than by rounding our backs and dropping our heads.

The Spine and Pelvic Girdle

The spine has four distinct segments, consisting of the cervical, the thoracic, the lumbar, and the sacral. Each spinal segment contains a given number of vertebrae. The cervical spine has seven vertebrae, the thoracic (mid back) has twelve vertebrae, and the lumbar (low back) has five vertebrae. The vertebrae are separated by the intervertebral discs. These discs absorb shock, permit some compression, and allow movement. There are no discs in the sacrum or coccyx where the vertebrae are fused together. The cervical spine is curved in an extended position (cervical lordosis). The thoracic spine is curved in a flexed position (thoracic kyphosis). And the lumbar spine is curved in an extended position (lumbar lordosis). When there is too much rounding in the thoracic spine (like a hump back), it is called kyphosis. When there is too much arching in the low back (lumbar region), it is called lordosis. When the spine is curved from right to left (rather than straight), it is called scoliosis.



The sacrum is the foundation platform on which the spinal column is balanced. It is attached to the two hip bones at the sacroiliac joint. The rib cage consists of the twelve ribs that attach to the thoracic spine.



The appendicular skeleton (including shoulders, arms, pelvic girdle, legs) joins the axial skeleton (spinal column) at the shoulders and hips. The collar bone (clavicle) and the shoulder blade (scapula) form the shoulder. Each hip consists of three fused bones: the ilium, ischium, and pubis. This forms the pelvic girdle, which is shaped like a bowl.

Biomechanics of Movement

Forward bends

Forward bends stretch and strengthen the back portion of the spine, pelvic girdle, shoulders and legs. They also strengthen the abdominal muscles, which contract as we bend forward, and gently compress abdominal organs, which stimulates their function.

Proper Technique in Bending Forward

When folding forward, it's best to maintain a "flat" back, neither arched nor rounded, with the neck in line with the rest of the spine. So, as you bend forward you maintain the normal curvature of the spine. It's important to press the hips back and hinge from the hips, instead of rounding the back, when folding forward. If hamstrings are tight, it is best to bend the knees, so the back can remain flat. Rounding the back due to tight hamstrings can lead to a backwards rotation of the pelvis and a collapsing of the chest over the belly. This can result in intervertebral disc compression in the anterior (front) of the spine.

Low back pain is often a result of poor mechanical relationship between the lumbar spine and the pelvis. Although many chronic back conditions can occur due to improper forward bending, forward bending done properly can also help us strengthen and stabilize our back and body.

Obstacles to forward bends result from tightness in the hamstrings, spinal muscles and gluteals.

Back Bends

Backward bending helps to stretch the front portion of the torso, shoulders, pelvic girdle and legs. In addition, they stretch the abdominal organs, relieving compression. Backbends also help develop more strength in the muscles in the back, which must contract during back bends.

Proper Technique in Bending Backwards

It's important in backbends to control the proportional relation between lengthening the thoracic curve and deepening the lumbar curve. You don't want too much arch in the lumbar spine without any movement in the thoracic spine. Bending that way can cause compression and strain in the lumbar region. Like the lumbar region, the cervical region should not arch excessively in relation to the movement of the thoracic region. One way to maintain a balance between the movement of the thoracic region and the lumbar region is to first expand and lift the chest on inhale (which lengthens the thoracic spine), and then keep the abdominal muscles slightly contracted as you exhale and bend backwards. Keeping the abdominal muscles slightly contracted helps prevent excessive arch in the lumbar region and helps to bring more of the arch into the thoracic region, which keeps the backbend in balance. Students should also be encouraged to keep the legs straight (or slightly internally rotated) to keep the sacroiliac joints stable.

Twists

Twisting creates a rotation between the vertebrae, which builds strength and flexibility in the deep and superficial muscles of the spine and abdomen. Twisting alternating stretches and strengthens each side of the torso, including the intestines, which may help improve digestion.

Proper Technique in Twisting:

It's important in twisting to control the spinal rotation, rather than simply force it through the use of leverage. The key to spinal rotation is to start the twist as you exhale and contract the abdominal muscles. As with forward bends, there can be a tendency to slump forward in the thoracic region of the spine. This can be avoided by lengthening between the chest and belly on inhalation. Lengthening the spine helps create more space between each vertebrae in which to twist. In standing twisting postures (revolved triangle), the pelvis is stabilized to emphasize the rotation of the spine and shoulders. Because the shoulder girdle has more range of motion than the spine, it is best to start a twist without using the arms as leverage, and add the arms at the end.

Lateral Bends

Lateral bends alternately stretch and compress the deep spinal muscles, intervertebral discs, and intercostal muscles of the ribs. They stretch and strengthen the muscles of the spine, rib cage, shoulders, and pelvis. They also help restore balance to asymmetries of the spine. The capacity for lateral flexion of the spine is limited, so it is often not done during daily activities. Because of this, it is an important movement to add to a yoga practice.

Proper Technique in lateral bends

When practicing a lateral bend, people often turn their hips and rotate their chest towards the side they are bending. For example, in Triangle posture, as students slide their hand down their right leg, their chest often turns towards the floor and their hip moves to the right. This causes them to lose the lateral stretch, as it moves towards a forward bending position. In Triangle, as with other postures requiring lateral flexion, the shoulders should stack one on top of the other and the chest should remain open facing forward. One way to make sure that the shoulders remain stacked is to practice Triangle posture with your back next to the wall, keeping both shoulder blades pressed into the wall. To help with lateral bending, again lengthen the spine on the inhale, and then move into the lateral bend on the exhale, keeping the abdominal muscles contracted.

Obstacles to lateral bends include tightness in the shoulder joints or latissimus dorsi.

Proper Sitting, Standing and Squatting

In yoga, as in every day movements, people will often find themselves sitting, standing, or squatting. Since these positions are performed frequently, it's important that people learn how to position themselves correctly, so there is less strain on the body, and less chance of injury.

Sitting

When sitting in a crossed legged position, it's important to sit up tall, lifting up through the crown of the head, while drawing the shoulders back and down. Place one heel in front of the other, and allow the knees to drop towards the floor. Many students will find that their knees don't touch the floor, and many may find this position uncomfortable in their low back. This will be especially true if a student's knees don't touch the floor when sitting on the floor with their knees bent. If a student's knees can't reach the floor, it is often due to less hip flexibility. To compensate for the lack of hip flexibility, the back will usually begin to round, which can cause the low back strain. To address this problem, have students sit on a blanket (or a bolster or block) with their thighs and knees dangling off. Increase the height of the blanket until the student's knees reach the floor. By bringing the knees lower than the hips, it takes the pressure off the low back, and allows students to sit comfortably with a straight spine.

Sitting back on the heels can also be uncomfortable for some students. In this position, it's important to sit up tall, lifting up through the crown of the head and slightly tuck the tailbone under to prevent any lordosis of the low back. To make this sitting position more comfortable, have students place a blanket either under their shins, or between their thighs and calves, to cushion the pressure on the knees and on the front of the ankle. Or students may like to place a block between their feet and sit on the block. The elevation of sitting on the block can take pressure off the legs and allow the spine to hang more easily in proper alignment.



Squatting

Whenever squatting, it's important to make sure that the knees are tracking in line with the feet. If the feet are hip width apart or closer, keep the feet facing forward, so the knees are in line with the feet, and sit back in the heels, while tucking your tailbone under. If your feet are wider than hip width apart, turn the feet out slightly, so the knees also turn out. This way, the knees will still be in line with your feet when you squat down.



Standing

A good standing posture is the foundation for an effective yoga practice. Have your students start by bringing their feet roughly hip width apart. Bring your feet parallel and then spread your toes wide and balance your weight evenly on all parts of your feet. Your knees should be in line with the middle of your feet and your hips should be about the same. Your knees should feel soft and not locked in place. Locking your knees can be hard on your joints and can restrict blood flow.

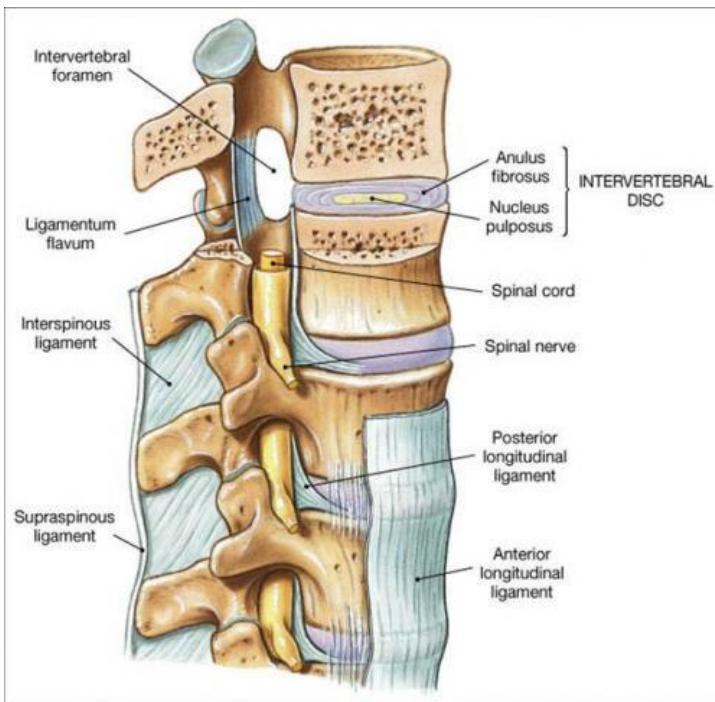
Lift up through the crown of your head, stacking your head directly over the rest of your spine. Draw the shoulders back and down, and check that the shoulders are level to each other (one is not higher than the other). Your chest should be slightly in front of your shoulders, so your hands will hang at the middle of each upper thigh (where you see the outside seam of a pant leg). Bring the chin parallel to the floor. Release the tailbone down, so the pelvic bowl remains in a neutral position (not tilted forward or back). No leaning forward or backwards either. That can overstrain your knees and back, while interfering with the S-curve of your spine.



Neck and Spine

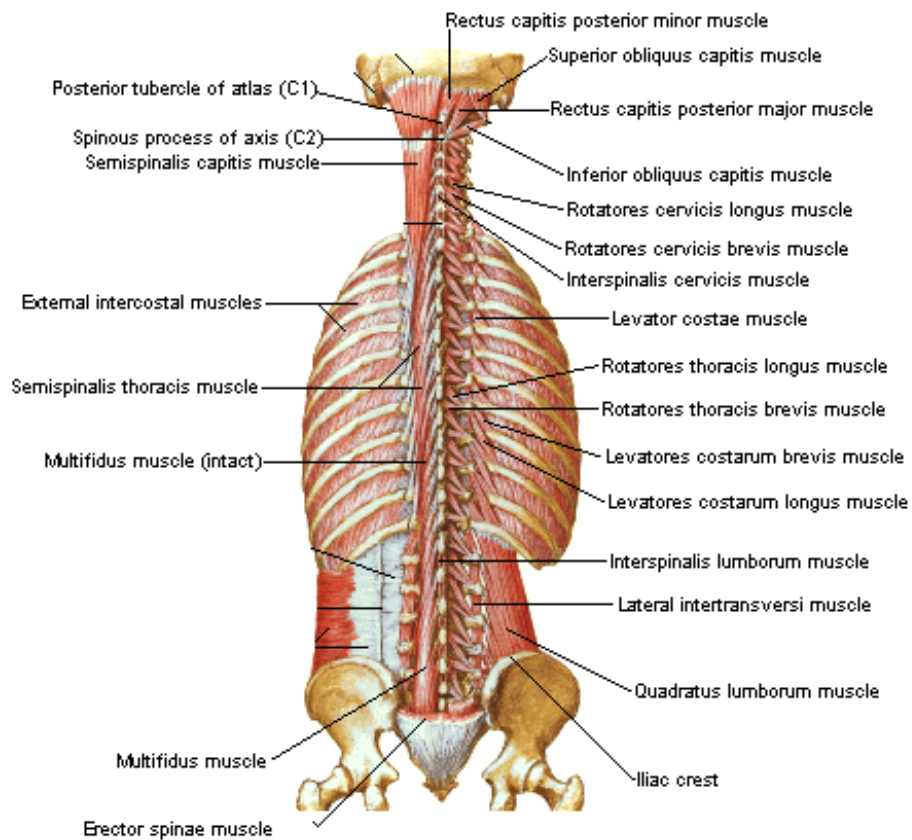
The portion of the spine contained within the neck is called the cervical spine. Unlike the rest of the spine, which is better protected from injury because it is enclosed by the torso, the cervical spine is more vulnerable to injury. This portion of the spine is enclosed in a small amount of muscles and ligaments, but is required to have extensive range of motion.

People often experience neck strain due to repetitive or prolonged neck extension or flexion, often caused by poor posture while sitting or standing. It can also be caused by common habits, such as cradling a phone between the shoulder and ear, or sleeping in an awkward position. By gently strengthening and stretching the neck muscles, strain is reduced. Remember to not roll the head when stretching the neck.



Deep Spinal Muscles (Neck/Back) – Posterior View

Below is a diagram of the deep muscles of the spine.



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 to the chest) or moving the head side to side. Moving the head against pressure (pressing the head against your hand, as your hand presses in the opposite direction) can help develop more strength.

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 intervertebral 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 abdominal muscles and your erector spinae muscles.

Muscles of Back/Shoulder – Posterior View (Back)

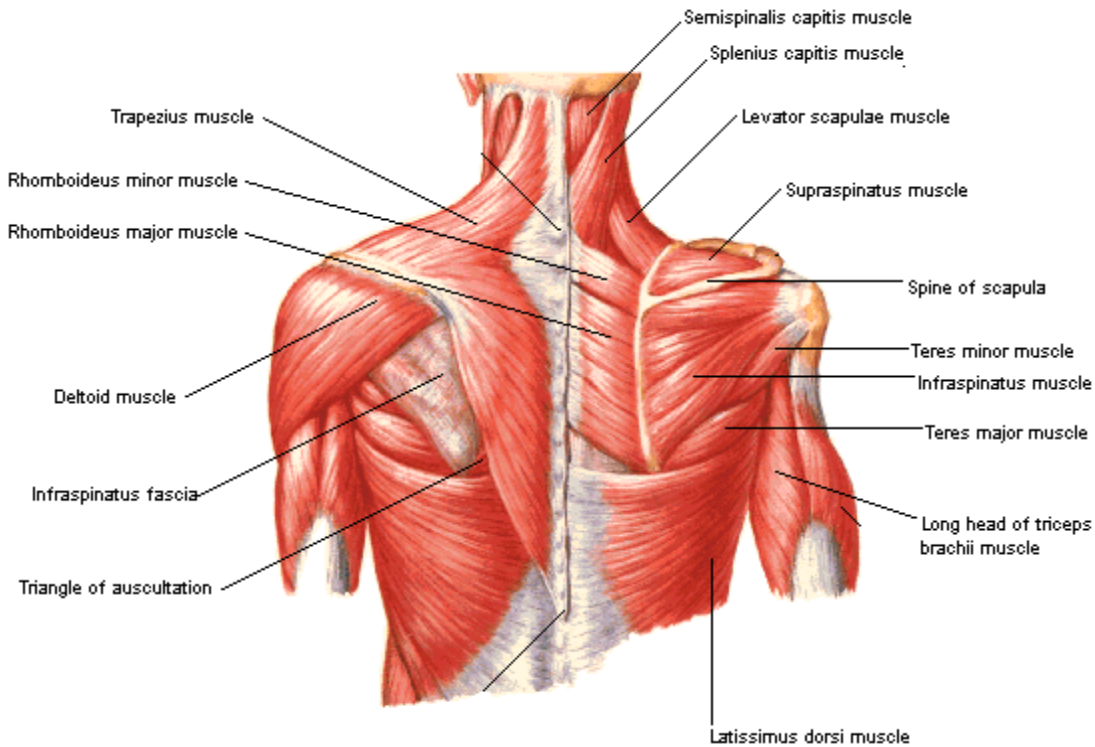
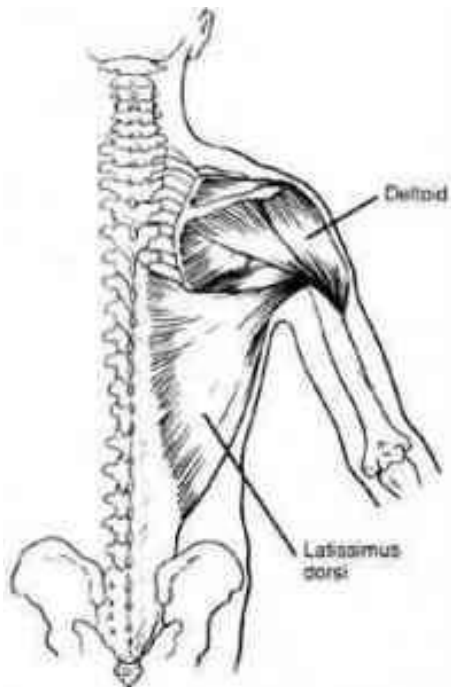


Chart of Muscles of Shoulder Girdle/ Scapular (Shoulder Blade) Stabilization (Posterior) – How to Strengthen/Stretch

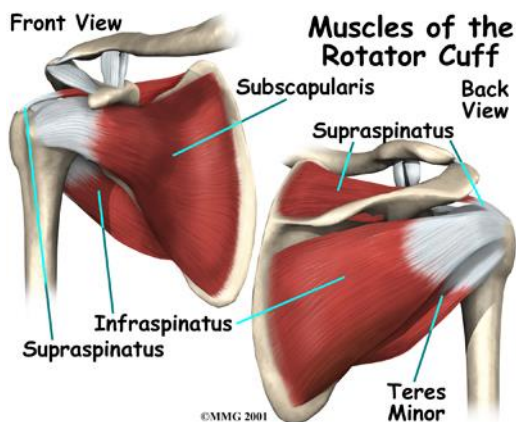
Muscle	Action	To Strengthen	To Stretch
Shoulder Blade			
Levator Scapula	Elevates (raises) scapula, rotates and side bends head	Rotate neck, keep head raised against gravity (dropping ear to shoulder, triangle look to raised hand), Elevating scapula against gravity (standing backbend – with arms overhead)	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)

Movers of the Shoulder Joint (Posterior)

Shoulder Mover Muscles	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, warrior 3, 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)



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)



Yoga Movements to Stretch and Strengthen Muscles of Upper Back/Shoulder Blade Stabilization

To Strengthen:

- Standing Backbend with arms overhead
- Camel
- Locust (especially with fingers interlaced behind back)
- Chest Expander
- Chaturanga (especially hovering low to floor)
- Fish

To Stretch:

- Rabbit
- Plow
- Thread the Needle
- Neck Stretches (chin to chest and looking to armpit)
- Cobbler's Pose

Yoga Movements to Stretch and Strengthen Posterior Muscles that Move the Shoulder Joint

To Strengthen:

- Warrior 2
- Warrior 3 (airplane wings)
- Swimming Dolphin

To Stretch:

- Chest Expander
- Thread the Needle
- Shoulder Stretches

Muscles of the Torso/Chest/Shoulder – Anterior View

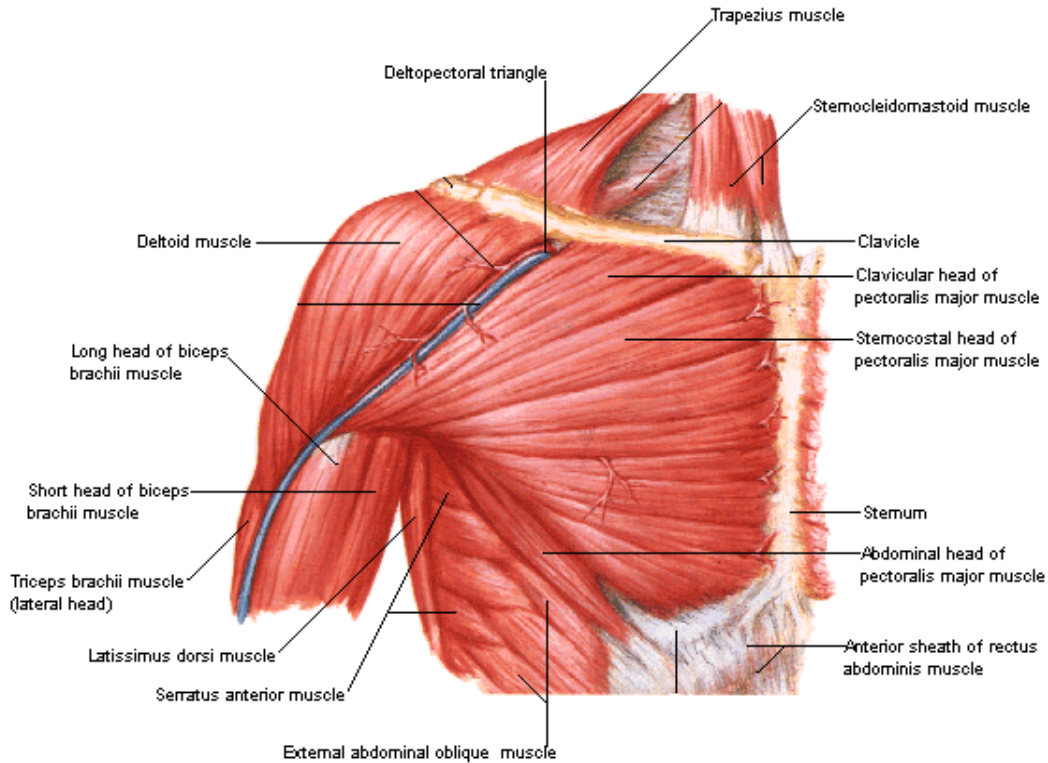


Chart of Muscles of Torso/ Chest (Anterior) – How to Strengthen/Stretch

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
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)
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 rotation of the pelvis (bow, upward bow, standing backbend, camel)

Yoga Movements to Stretch and Strengthen Muscles of the Chest and Front Torso

To Strengthen:

- Rotate head, bring chin to chest
- Lunge with twist
- Chair with twist
- Bringing opposite elbow to opposite knee
- Boat
- Plank with knee to chest

To Stretch:

- Triangle
- Supine (lying on back) twist
- Bow
- Upward Bow/Wheel
- Camel
- Chest Expander
- Prone Twist

Muscles of the Arm – Anterior View

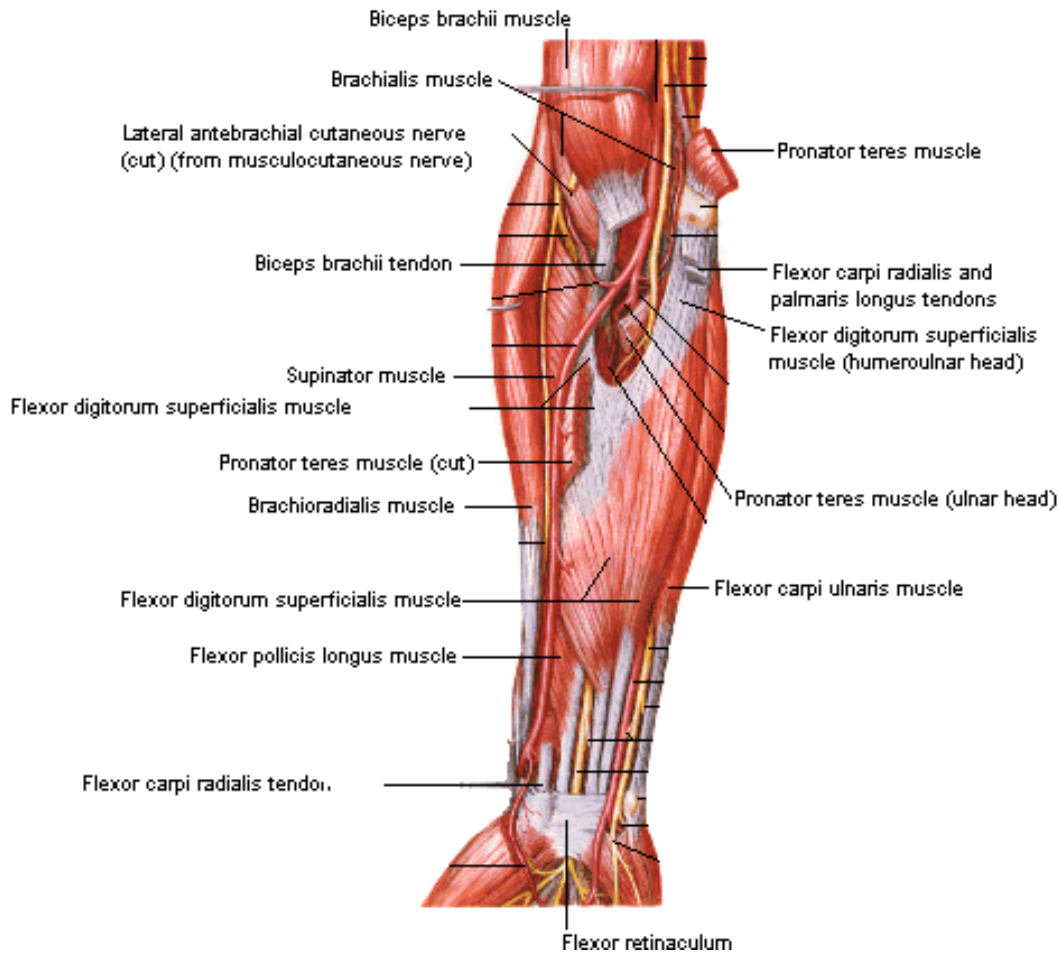


Chart of Major Muscle Arms/Elbow Joint – How to Strengthen/Stretch

Muscle	Action	To Strengthen	To Stretch
Biceps Brachii	Flex elbow and supinate forearm	Flexion of elbow against resistance (yoga push up, dolphin, swimming dolphin), crow	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)

Yoga Movements to Stretch and Strengthen Muscles of the Arms

To Strengthen:

- Chaturanga
- Dolphin/Swimming Dolphin
- Holding arms out at shoulder height with palms up (in tree or warrior 2)
- Arm balances (crow, side arm balance)

To Stretch:

- Cow's face
- Prone Twist
- Stretch arms overhead while lying on the floor

Hip and Thigh – Posterior View

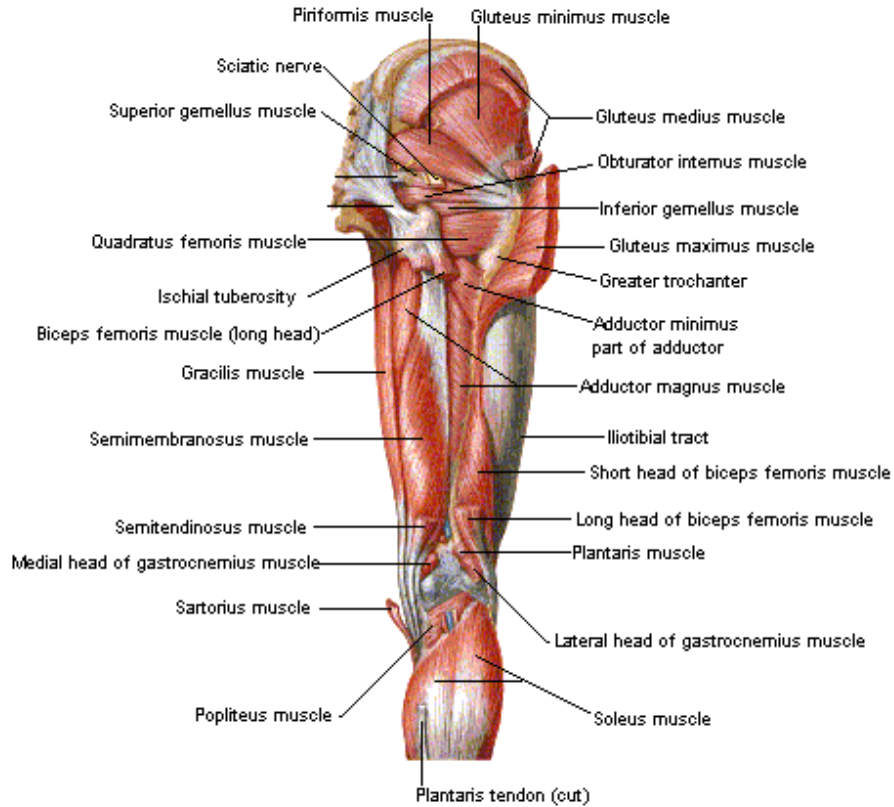
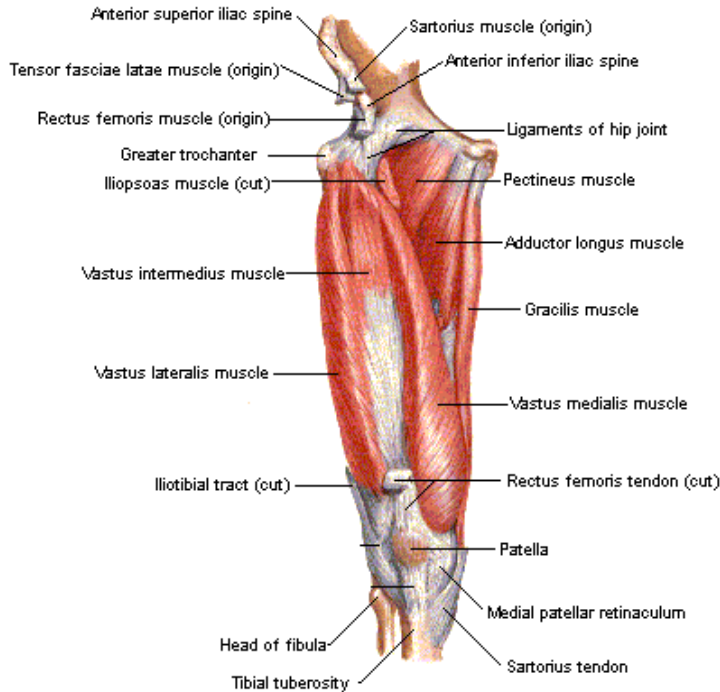


Chart of Muscles of Hip and Thigh (Hip and Knee Joint)

Muscle	Actions	To Strengthen	To Stretch
Posterior Muscles			
Gluteus Maximus	Extend, outwardly rotate hip	Hip extension 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	Hip abduction (side lying leg raises, plank – lift one leg, warrior 2)	Hip adduction in front of the opposite extremity (supine twist, seated twist)
Deep Rotator Muscles (Piriformis, Obturator internus/externus, Gemellis, Quadratus femoris)	Outwardly rotate and abduct hip	Externally rotate femur or stand on one leg and turn body away (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 (seated forward folds, seated forward fold, pyramid)

Hip/Thigh – Anterior View



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 (chair)	Extend knee fully without flexing hip or external rotation of knee with knee flexed 20-30 degrees (reclined hip opener – pressing knee away)

Yoga Movements to Stretch and Strengthen the Hip and Back of Thigh

To Strengthen:

- One leg standing forward fold (back of lifted leg)
- Half Moon
- Locust
- Bow
- Crescent Lunge (lunge with back knee bent, but off the floor)

To Stretch:

- Pigeon
- Reclined Twist
- Seated forward fold
- Pyramid
- Reclined hip opener
- Happy baby

Yoga Movements to Stretch and Strengthen the Front of Thigh

To Strengthen:

- Chair
- Warrior 3
- Triangle (front leg)
- Warrior 1 (front leg)
- Boat

To Stretch:

- Reclined Hero
- Windshield wipers
- Camel
- Pigeon (sitting up, bending back knee, holding back foot)
- Bow

Lower Leg/Ankle – Posterior View

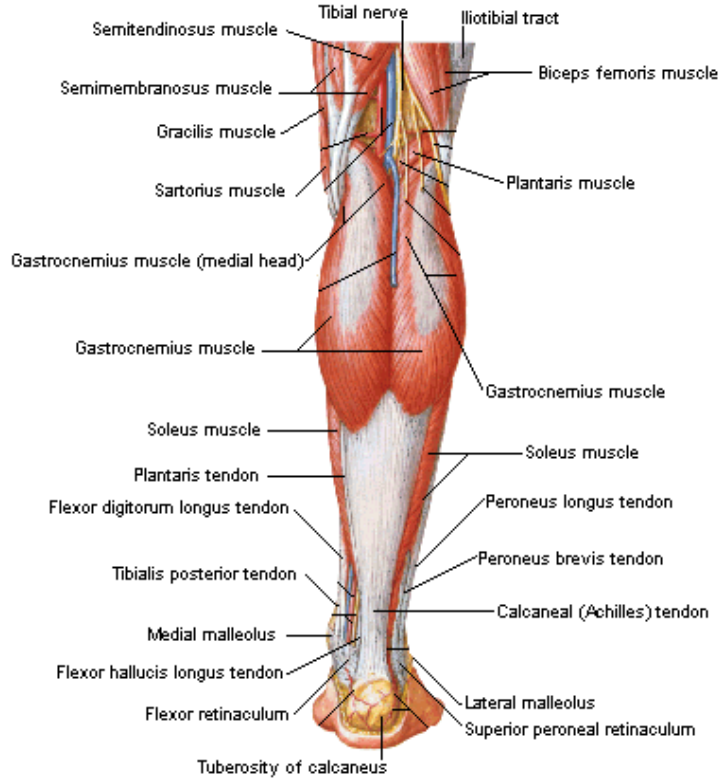


Chart of Leg Muscles (Ankle Joint) – Plantar Flexion Group

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 lesser 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 dorsiflexion while knee is flexed (dead bug, prayer squat)

Lower Leg/Ankle – Anterior View

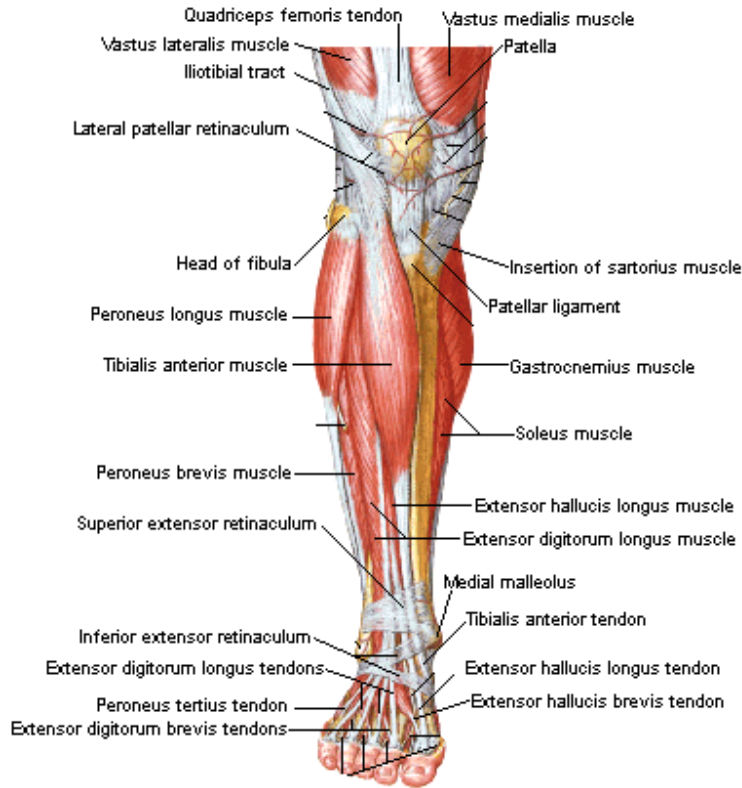


Chart of Leg Muscles (Ankle Joint) – Dorsi Flexion Group

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)

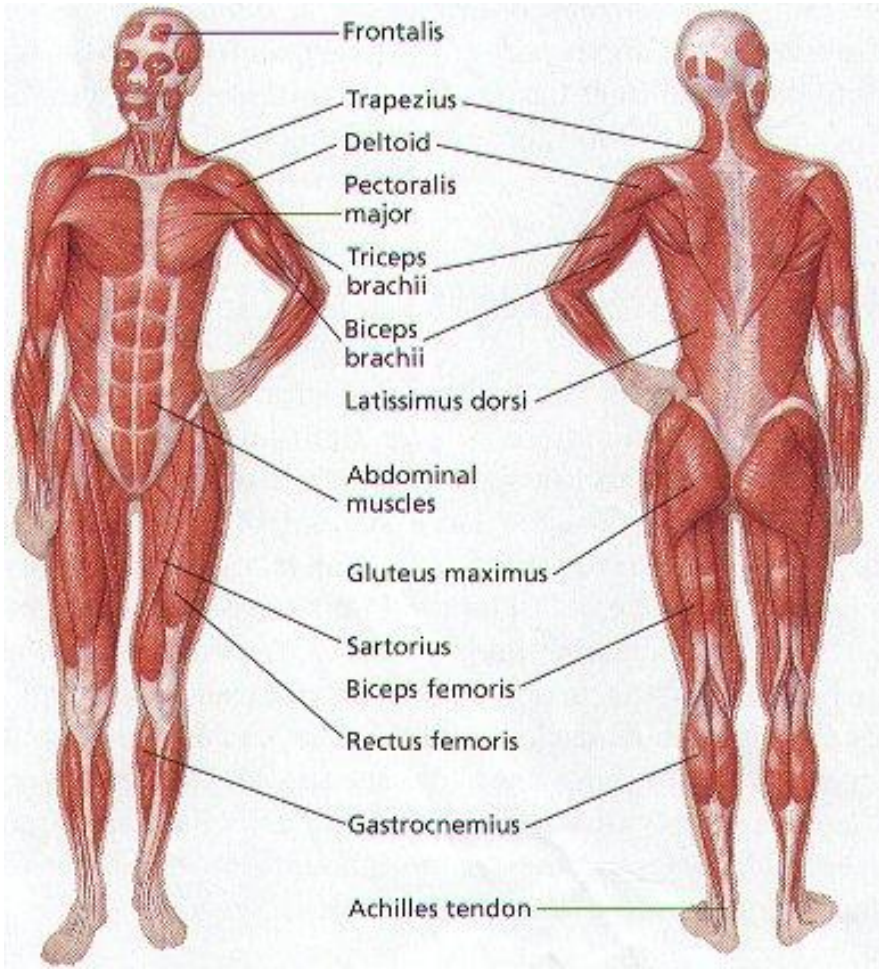
To Strengthen the Dorsi Flexion Muscles flex ankle against resistance, pulling toes towards shin:

- Straight leg seated position - Dandasana (legs extended in front of you with toes flexed – bringing toes towards shins)
- Paschimottanasana (straight leg seated forward fold)
- 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

Major Muscles of the Body



Below is an abbreviated list of some yoga postures and movements that stretch and strengthen each of the major muscle groups.

Body Part/Muscle Group	Posture or Movement to Strengthen	Posture or Movement to Stretch
Upper Back/ Shoulder Girdle / Back of Neck	Standing Backbend with arms overhead, Camel, Locust, Chest Expander, Chaturanga (especially hovering low to floor), Fish	Neck Stretches (chin to chest), Child's Pose, Plow, Standing forward fold (especially with fingers interlaced behind head), Rabbit.
Chest/Shoulders	Eagle, plow, chin to chest, rabbit, swimming dolphin, shoulder stand	Prone twist (front lying twist), bow, wheel, camel, cow's face, chest expander
Abdomen/Front Torso	Boat, arm balances, plank (one leg lifted), fire breath, reclined hamstring stretch lifting chest to thigh, chair with twist, seated twist	Supine twist (lying on back), bow, wheel, triangle, seated twist (opposite side)
Lower Back/Back Torso	Bow, standing backbend, camel, wheel, bridge,	Seated forward folds, plow, rabbit
Arms/Shoulders	Arm balances, chaturanga, down dog, side plank, headstand	Cow's face, Thread the needle, eagle
Front of Thighs	Chair, down dog, warrior 1, eagle	Lunge (back leg), bow, wheel, windshield wipers, reclined hero
Back of Thighs/ Back of Hips	Standing split (raised leg), warrior 3, half moon	Down dog, cobbler's pose, pigeon,
Inner Thighs / Hips	Eagle, boat (with legs together),	Warrior 2, Happy baby, knee to chest (lying on back), straddle forward fold, splits, butterfly
Lower Legs/Ankles / Feet	Dandasana, chair (especially staying on toes only – toe squat),	Squatting, down dog, sitting on heels

Spine	Posture or Movement
Flexion	Forward folds (standing or sitting), plow, child's pose
Extension	Back bends (locust, up dog, bow, wheel, standing backbend)
Lateral Flexion	Crescent stretch, triangle (any other side bending)
Rotation	Twists (seated or lying twists), lunge with a twist, thread the needle

Anatomy of Hatha Yoga

Anatomy of Specific Asanas

Posture	Joint Actions	Main muscles Working/ Contracting	Main Muscles Lengthening/Stretching
Forward Fold (Uttanasana)	Hip flexion and some spinal flexion.	Knee extensors (quadriceps – vastus lateralis, vastus intermedius).	Spinal muscles, hamstrings, posterior fibers of gluteus medius and maximus.
Warrior 2	Front leg: hip flexion, external rotation, abduction, knee flexion, ankle dorsiflexion. Back leg: hip extension, knee extension, abduction, dorsiflexion.	Back leg: gluteus medius, minimus and maximus (for internal rotation and abduction), hamstrings. Front leg: quadriceps, gracilis (inner thigh), adductors (eccentric).	Back leg: iliopsoas (front inner hip) Front leg: hamstrings, adductors
Side Angle	Slight lateral flexion of the spine, shoulder abduction, elbow extension. Front leg: hip flexion, external rotation and abduction, knee flexion. Back leg: hip extension, abduction.	Front leg: quadriceps, hamstrings (resisting weight of spine). Back leg: gluteus medius, maximus, hamstrings, quadriceps. Obliques, deltoids	Serratus anterior, triceps, obliques
Tree Pose (vrksasana)	From the lifted leg: hip flexion, external rotation, abduction, knee flexion, ankle dorsi flexion	Of the lifted leg: psoas major, external rotators and extensors (gluteus maximus, medius, minimus, piriformis). Of the standing leg: gluteus maximus, piriformis.	Adductor longus, gracillis. Gluteus medius, minimus.
Down Dog	Hip flexion, knee extension, ankle dorsiflexion, scapula upward rotation.	Obliques, psoas minor, quadriceps, adductors, deltoids, serratus anterior (abducts the scapula), triceps	Intercostals, diaphragm, hamstrings, gastrocnemius (calves), latissimus dorsi.

Create Your Own Chart of Anatomy of Specific Asanas

Posture	Joint Action	Main Muscles Working/ Contracting	Main Muscles Lengthening / Stretching

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
- Upper Back/ Shoulder Girdle (Scapular Stabilizing Muscles)
- Chest/Shoulder Joints (Anterior)
- Spine/Erector Spinae (including flexion, extension, lateral flexion and rotation)
- Arms/Wrists
- Hips/Back of Thighs
- Front of Thighs
- Lower Legs/Feet/Ankles

Design a warm-up routine that would warm up the major muscles of the body parts listed above. Use the chart on the next page to choose specific postures, and then organize them into a sequence that flows.

List two or three postures for each space in the chart below. List postures (not warm ups) that strengthen the muscles in each body part listed, and then list postures that stretch the muscles in each body part.

Body Part / Muscle Group	Posture or Movement to Strengthen	Posture or Movement to Stretch
Upper Back/ Shoulder Girdle / Back of Neck		
Chest/Shoulders		
Abdomen/Front Torso		
Lower Back/Back Torso		
Arms / Shoulders		
Front of Thighs		
Back of Thighs / Back of Hips		
Inner Thighs / Hips		
Lower Legs/Ankles		

Spine	Posture or Movement
Flexion	
Extension	
Lateral Flexion	
Rotation	

Create a Yoga Practice from the Postures Listed

Look at the postures you listed on the last page. Design a yoga class (not including warm-ups or sun salutations) that includes at least one posture from each box (along with its counter pose if needed). Re-order the postures you selected from the last page to create a practice sequence from those postures that flows. The sequence should have about 15 postures. * Note that some postures with represent more than one box (more than one muscle group).

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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Review

Complete the following chart

Yoga Posture	What muscles are strengthened?	What muscles are stretched?
Bow (dhanurasana)		
One leg seated forward fold (janu sirsasana)		
Tree (vrksasana)		
Triangle (trikonasana)		
Rabbit		