Anatomy for Yoga Tips and Techniques Book 1

A compilation from

"The Daily Bandha"

a yoga blog by Ray Long, MD

BandhaYoga

A compilation from

The DAILY BANDHA
Scientific Keys to Unlock the Practice of Yoga

A Yoga Blog by Ray Long, MD

Anatomy for Yoga Tips and Techniques Book 1

Introduction

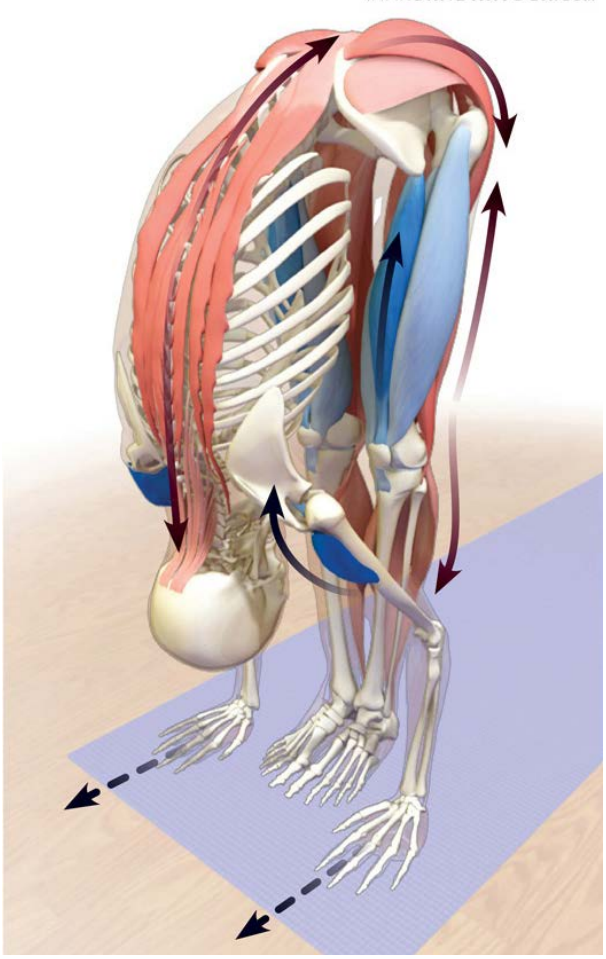
This first e-book is a compilation of posts from our blog, The Daily Bandha, from the date of its launch on January 11, 2011, through February 10, 2011.

In it we illustrate anatomical, biomechanical, and physiological techniques that you can use to improve and better understand your yoga postures. For example, the first three chapters reveal how to deepen Uttanasana (Intense Forward-Bending Pose). Then we discuss how to protect the knee joints in Padmasana (Lotus Pose), and finally we show a simple technique for bringing your knees closer to the floor in Baddha Konasana (Bound Angle Pose). We close the book with an enlightening reflection on the Mind—Body connection in yoga; don't miss the embedded video that demonstrates this concept!! Although we use simple poses to explain these principles, you can apply them to other asanas as well.

Remember to go slow and back off if you have pain, but above all, enjoy the process of integrating modern Western science into the ancient art of Hatha Yoga.

WEDNESDAY, JANUARY 12, 2011

Chapter 1
How to Use Your Shoulders to Deepen Uttanasana



Uttanasana illustrating the anterior deltoids and quadriceps contracting to stretch the posterior kinetic chain.

The deltoids are large muscles on the surface of the shoulders that produce many of the major movements about this joint. They are divided into three parts—the anterior, middle, and posterior thirds. The anterior portion originates from the front part of the clavicle (collarbone) and the acromion process and inserts onto the outside of the upper humerus. The main action of the anterior deltoids is to raise the arms in front of the body.

In Uttanasana, fix the hands onto the mat and attempt to drag them forward. This contracts the anterior deltoids and draws the upper body deeper into the pose. If you can't reach the floor, grasp the lower legs or backs of the knees and attempt to pull the hands forward. Activating the anterior deltoids with the hands fixed in place connects the upper appendicular skeleton (the arms and shoulder girdles) to the lower appendicular skeleton (the lower legs and hips). In a forward bend, engaging the anterior deltoids in this manner stretches the posterior kinetic chain, including the hamstrings.

At the same time you are contracting the anterior deltoids to draw the trunk forward, engage the quadriceps to straighten the knees. A cue for activating the quads is to lift the kneecaps towards the pelvis. In addition to straightening the knees, this signals the antagonist hamstring muscles to relax into the stretch through reciprocal inhibition. To better understand this physiological mechanism, try doing Uttanasana with and without firming the thighs. Note how the sensation of the stretch changes when you engage the quads.

One head of the quadriceps, the rectus femoris, originates from the front of the pelvis and crosses the hip joint. When we activate the quads to straighten the knees, the rectus femoris adds a forward tilt of the pelvis, further deepening the pose.

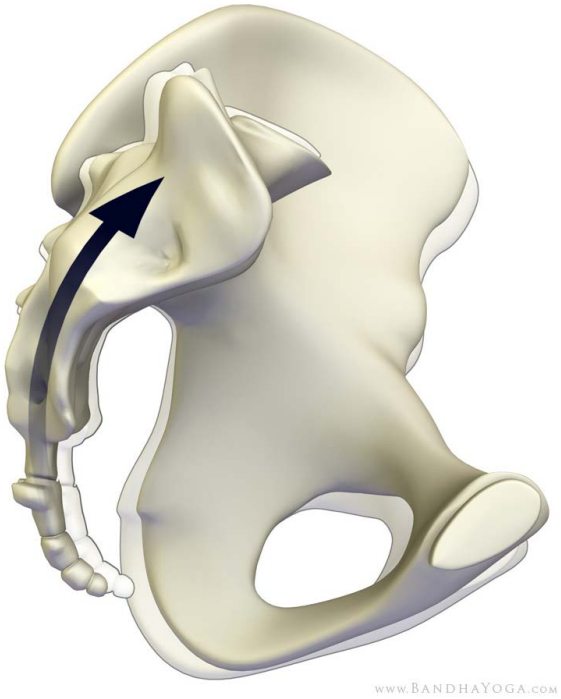
Once you get the hang of using the anterior deltoids to deepen Uttanasana, try this technique in Paschimottanasana. Do this by grasping the feet or lower legs to fix the hands and then try to lift upward. Once again, this activates the anterior deltoids and draws the trunk deeper into flexion.

The rectus femoris drawing the pelvis forward.

In Chapter 3, we discuss how to use the tensor fascia lata and gluteus medius muscles to further refine Uttanasana.

MONDAY, JANUARY 17, 2011

Chapter 2
How to Use Nutation to Refine Uttanasana—Part I

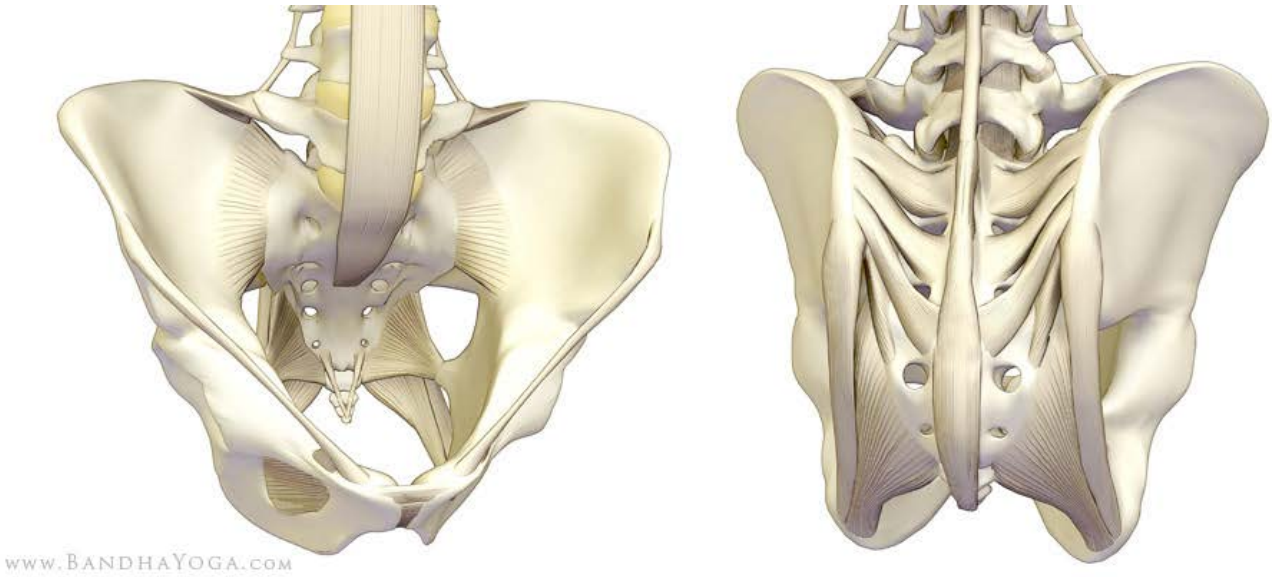


Sacral nutation - exaggerated for effect.

Many moons ago I had the privilege of spending an extended period studying yoga at the Ramamani Iyengar Memorial Yoga Institute in Pune, India. During my time there I made it a point to watch Yogacharya Iyengar practice whenever possible. I not only observed the form of his body but also the way he practiced, how he moved from one pose to another, and the way he worked in the individual asanas. I was fascinated by how he continued to refine his art. Bear in mind that B.K.S. Iyengar is the author of *Light on Yoga*, and he had been practicing for over 50 years at the time. Still, like a master artist, he polished his poses as if his body were a dynamic sculpture.

One day, as fate would have it, I was the only other person in the practice hall and Master Iyengar was going through his backbend sequence (picture the most advanced backbends from *Light on Yoga* to get an idea). I sat on the staircase and watched. He finished, and as he was getting dressed asked if I would like to go with him to visit some people around the city. The next thing I knew, I was in the back of a car speaking with Mr. Iyengar. I mentioned that he still worked to improve his poses, even though he was a master of the art. He gave me a somewhat surprised look, as if to say, “Of course I am!”

This is a characteristic of masters in any discipline. Even when they have achieved excellence, they still look for incremental improvement. One of the great things about yoga is that we can always work to improve our postures. In this e-book we use Uttanasana to illustrate this technique.



Anterior (front) and posterior (back) views of the sacroiliac joint with ligaments.

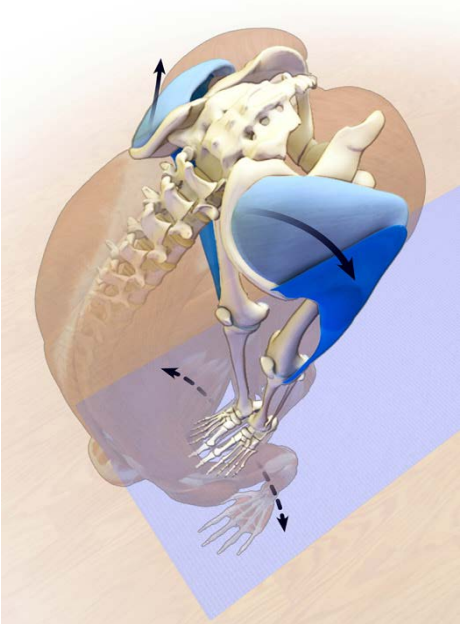
The sacroiliac joint is one of the most stable in the body due to the stout ligaments that surround it. It doesn't move much—some say it doesn't move at all. The movement that is available is called "nutation," which means *nodding* (as in nodding your head). In nutation the sacrum tilts forward just a little bit between the iliac crests. We can use this movement to deepen forward bends such as Uttanasana. This adds some incremental forward bending from within the pelvis, rather than the lumbar spine, and aids to protect the spine from hyperflexion.

Think about the sacroiliac joint and nutation. In Chapter 3 I'll show you a tip on how to use this movement to improve Uttanasana by engaging the tensor fascia lata and gluteus medius.

WEDNESDAY, JANUARY 19, 2011

Chapter 3
How to Use Nutation to Refine Uttanasana, Part II—The Tensor Fascia Lata and Gluteus Medius

In Chapter 2 I talked about how masters of various disciplines are continuously refining their art—even though they are masters. I followed the anecdote with some background information on sacral nutation. In this chapter I will give you a tip on how to use the tensor fascia lata and gluteus medius muscles to create some opening for nutation that will incrementally deepen your forward bends, especially Uttanasana.



Freeing the sacroiliac joint using the gluteus medius and tensor fascia lata.

The tensor fascia lata (TFL) and gluteus medius are muscles at the sides of the pelvis. The TFL originates from the front of the iliac crest and inserts onto the iliotibial band and from there onto the outside of the front of the tibia. The gluteus medius originates a bit farther back on the iliac crest and inserts onto the greater trochanter at the top of the femur (thigh bone). The main action of these muscles is abduction of the hip (taking the leg out to the side away from the midline). The TFL and the more anterior (front) fibers of the gluteus medius also internally rotate the femur. If the femurs are fixed in place (by constraining the feet to the mat), then activating these muscles pulls on their origins at the iliac crest, creating a degree of mobility at the sacroiliac joint. This is an example of “closed chain” contraction, wherein engaging a muscle moves the origin rather than the insertion (moving the insertion is considered “open chain” contraction).

In Uttanasana, firmly press the feet into the mat and then gently attempt to drag them apart (without actually allowing them to move). This is a cue to activate the TFL and gluteus medius. These muscles then pull on the iliac bones and free the sacroiliac joints, allowing that extra millimeter of forward bend from counter nutation.

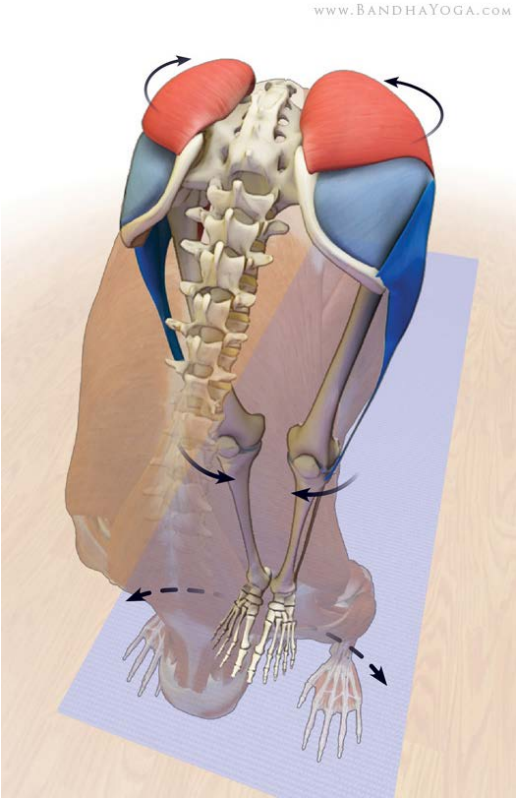
Remember to go slowly when applying these techniques. It is not necessary to use strong muscular contractions to experience the benefits. Start with gentle force and learn to moderate the contraction, “dialing” it in. Use similar care as you gradually release the action of the muscles. This applies when using the shoulders as well--gentle contraction and release.

In Chapter 4, we’ll illustrate a fringe benefit of engaging the tensor fascia lata and gluteus medius to counteract the kneecaps rolling outward in forward bends.

FRIDAY, JANUARY 21, 2011

Chapter 4
How to Use Nutation to Refine Uttanasana, Part III—A Fringe Benefit

In Chapter 3, we gave a trick for engaging the tensor fascia lata (TFL) and gluteus medius. Contracting these muscles allows us to access movement at the sacroiliac joint and aids to protect against hyperflexion of the lumbar spine.



Countering external rotation of the femurs with the gluteus medius and tensor fascia lata.

Now, when we do a forward bend from the hips, the gluteus maximus stretches. This produces a pull on the femurs that can externally rotate them and turn the kneecaps slightly outwards. Ideally we would like the kneecaps to face directly forward. An added benefit of engaging the TFL and gluteus medius is that it internally rotates the thighs. The gluteus minimus contributes to this action when the hips are flexing. This counteracts the pull of the stretching gluteus maximus and brings the kneecaps to face forward—the optimal form of the pose. Access this fringe benefit by fixing the feet on the mat and gently attempting to drag them apart. Feel how this internally rotates the thighs.

Then try activating the TFL and gluteus medius in seated forward bends. For example, in Upavistha Konasana, the cue for this is to press the heels into the floor and try to drag them apart. You can also press the outer edges of the feet or lower legs into the hands for a similar effect. Feel how these techniques deepen and refine your forward bends.

Remember to use gentle force with these cues. Train yourself to moderate engaging and releasing the muscles when sculpting the form of your poses.

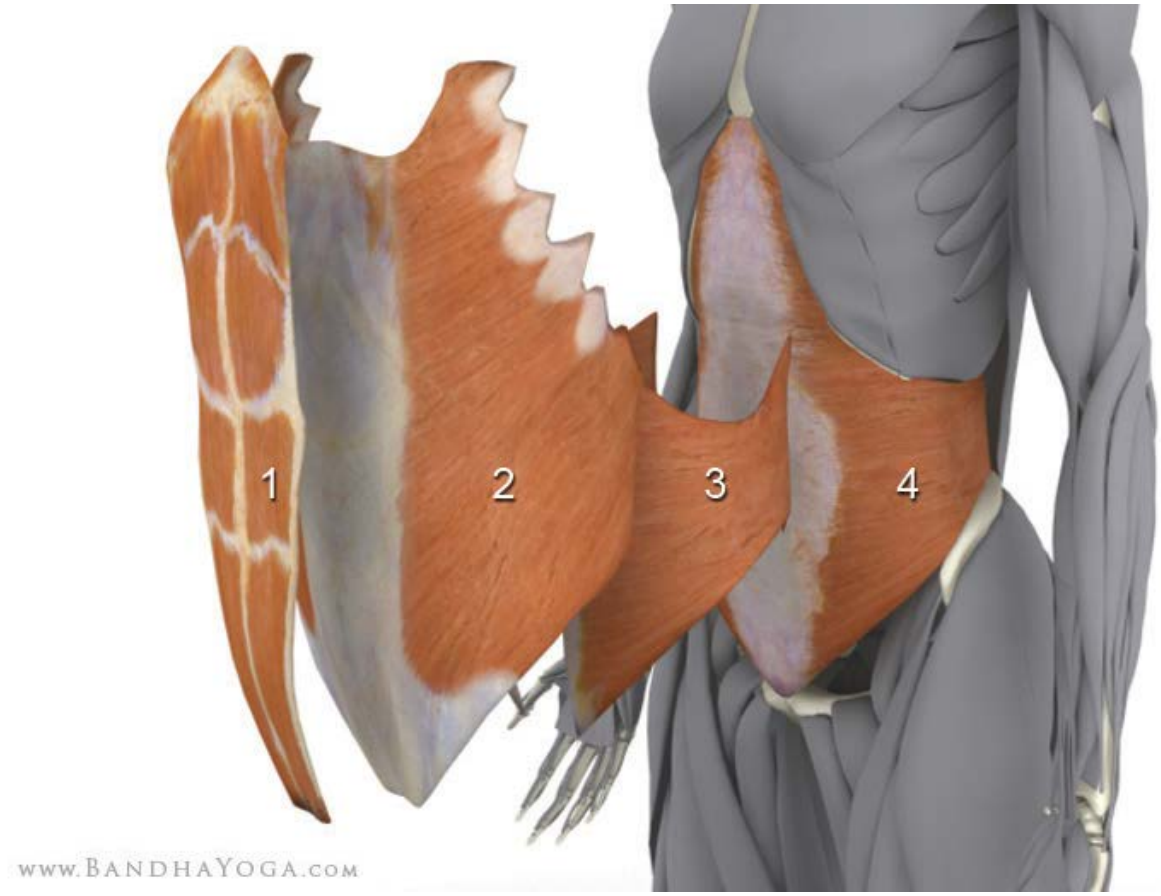
Refer to Chapter 5 for instructions on how to use the abdominals to release the muscles of the lower back in Uttanasana.

MONDAY, JANUARY 24, 2011

Chapter 5
How to Use the Abdominals to Release the Back in Uttanasana

I used to quote the writer, Emily Dickenson, as saying, “See the world in a grain of sand …” Then a friend of mine explained that, actually, the quote was by William Blake. So much for this surfer dude acting cultured.

Anyway, the point is that many of the things we learn in one pose can be applied to another. Similar muscles work in Paschimottanasana as in Uttanasana (with variations). Physiological principles, such as reciprocal inhibition between agonist and antagonist muscles, also apply across the board for other skeletal muscles. I find that when we approach learning in this way, it makes what appears to be a daunting subject like anatomy more manageable.

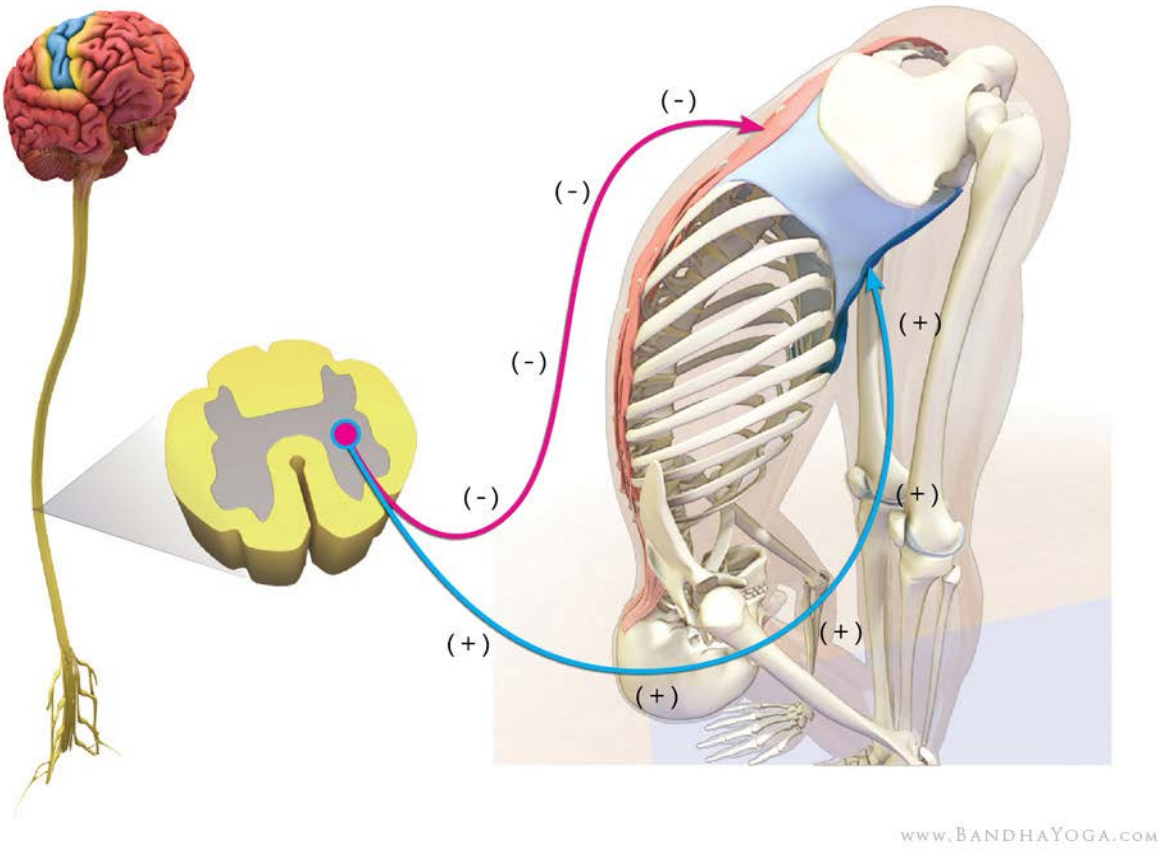


1-rectus abdominis, 2-external obliques, 3-internal obliques, 4-transversus abdominis.

For example, let’s look at using the abdominals in Uttanasana. The abs are composed of four muscles. Moving from the surface inward, we have the rectus abdominis in the front and the external obliques on each side. Deep to these are the internal obliques, with the deepest layer being the transversus abdominis. Contracting these muscles flexes the trunk forward and increases intra-abdominal pressure (by squeezing the abdominal organs). Bending forward from the trunk stretches the erector spinae of the posterior kinetic chain. The erector spinae comprise three columns of muscles that lie parallel to the spine. From medial to lateral, these are the spinalis, longissimus, and iliocostalis.

The erector spinae and abdominal muscles are an antagonist/agonist group, i.e., when one contracts the other stretches. As I explained for the quadriceps and hamstrings in Chapter 1, the nervous system signals the antagonist muscle to relax when the agonist contracts. This physiological Ying/Yang is called reciprocal inhibition.

Engaging the abs thus has two effects. It has the biomechanical effect of flexing the trunk and deepening the pose and the physiological effect of inhibiting the back muscles from contracting, relaxing them into the stretch.



Abdominal muscles contracting to produce reciprocal inhibition of the erector spinae.

Take a look at the image above. This illustrates an excitatory signal being sent to the abdominals, causing them to activate, and an inhibitory signal to the erector spinae, aiding them to release. When you consciously engage the abs, the reciprocal inhibition happens automatically (unconsciously).

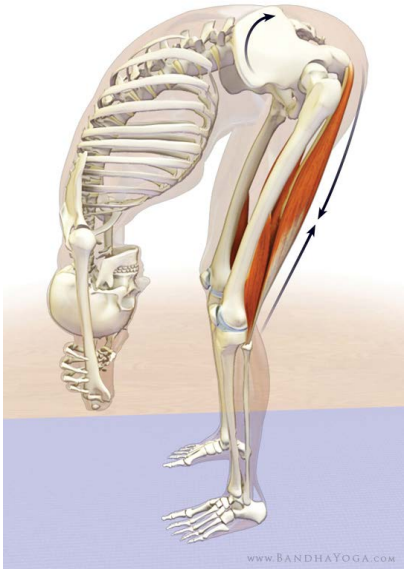
Gently contract the abdominals in forward bends like Uttanasana and feel the effect. A cue for isolating the transversus abdominis is to draw the navel towards the lumbar spine. Feel how this cue gives an added support to the low back. Combine these actions with firming the thighs to release the hamstrings, as described in Chapter 1.

In Chapter 6 we'll illustrate how tight hamstrings affect the lumbar spine and we'll offer you some tips on how to use physiology to release them.

WEDNESDAY, JANUARY 26, 2011

Chapter 6
How Tight Hamstrings Affect Your Lumbar Spine

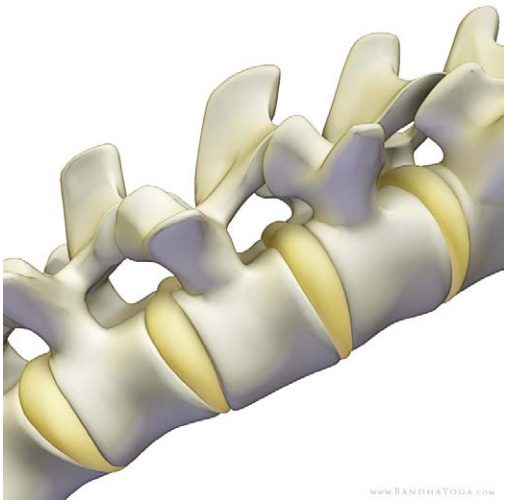
In Chapter 5, we illustrated how engaging the abdominals relaxes your back muscles and provides support for the lumbar region in Uttanasana. This can aid to prevent the feeling of muscular strain in the low back in forward bends. In this post we show how the hamstrings can affect the lower back. In Chapter 7 we illustrate how to use a key spinal cord reflex arc to gain length in these same muscles.



Uttanasana: tight hamstrings drawing pelvis into retroversion and coupled movement of spine into flexion.

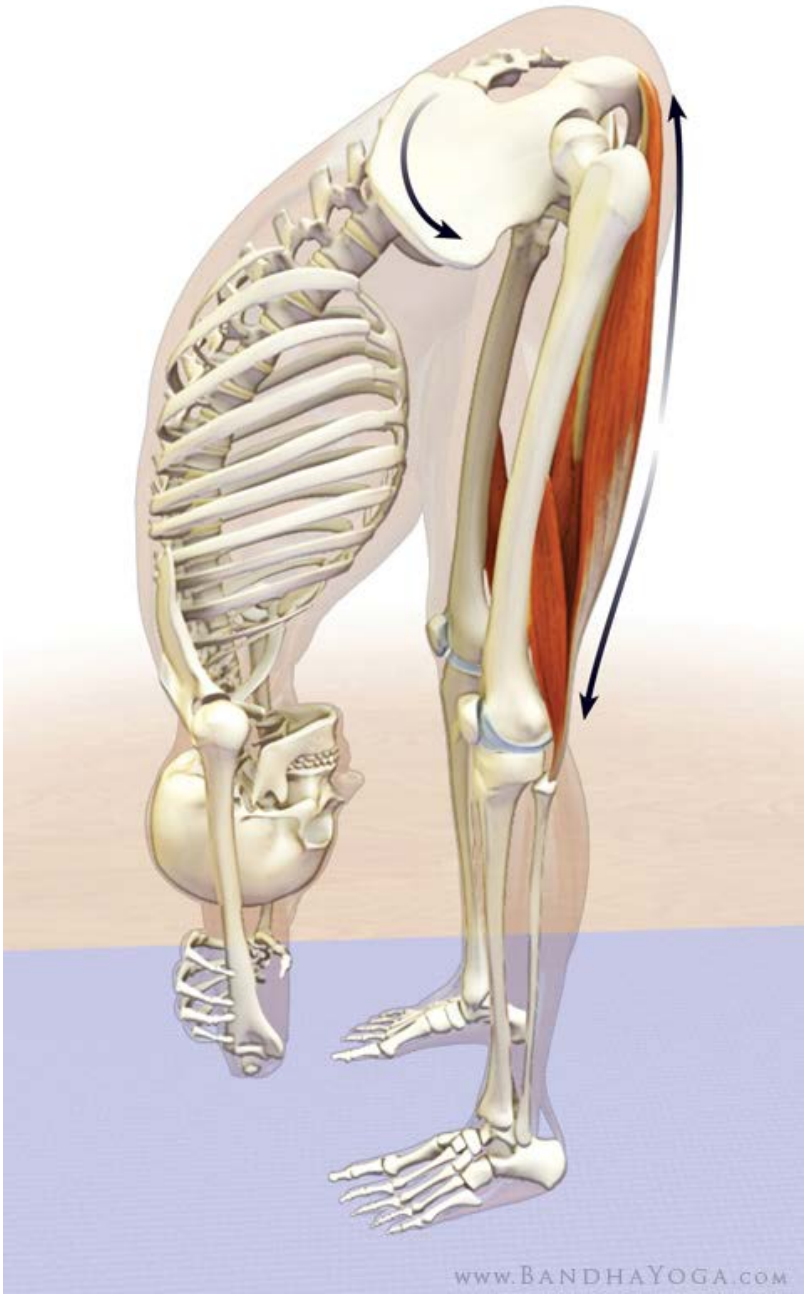
The hamstrings comprise three separate muscles—the semimembranosus, semitendinosis, and biceps femoris. The biceps has a long and short head. The semimembranosus, semitendinosis, and long head of the biceps originate from the ischial tuberosities (sitting bones). The short head of the biceps originates from the back of the femur (thigh bone). The semimembranosus and semitendinosus insert on the inside of the tibia (lower leg). The two heads of the biceps join into one tendon that inserts onto the head of the fibula at the outside of the knee. The main action of the hamstrings is to flex the knee. Secondary actions include rotating the knee and extending the hip.

Tight hamstrings can produce a pull on the ischial tuberosities. This draws the pelvis into retroversion, tilting it back. Now, adjacent joints move in what is known as a “coupled” fashion. When the pelvis tilts back, the lumbar vertebrae flex forward. What this means is that if the hamstrings are tight and we bend forward in Uttanasana, more of the flexion comes from the lumbar spine. This is not optimal, as it can strain the ligaments that surround the vertebral bodies and also exacerbate bulging of the intervertebral disks. Accordingly, lengthening the hamstrings can be key to safely practicing forward bends.



Lumbar spine in hyperflexion illustrating bulging discs.

Relaxed hamstrings allow the pelvis to tilt forward. The lumbar spine then couples with this movement by moving in the direction of extension. This aids to take the strain off of the ligaments and disks. Refer to the illustrations here to see this concept in action.



Uttanasana: hamstrings releasing pelvis to tilt forward with coupled movement of spine towards extension (flexing less).

In Chapter 7 we'll provide you with a simple method for using muscle physiology to gain length in the hamstrings in forward bends and potentially relieve strain on the lower back.

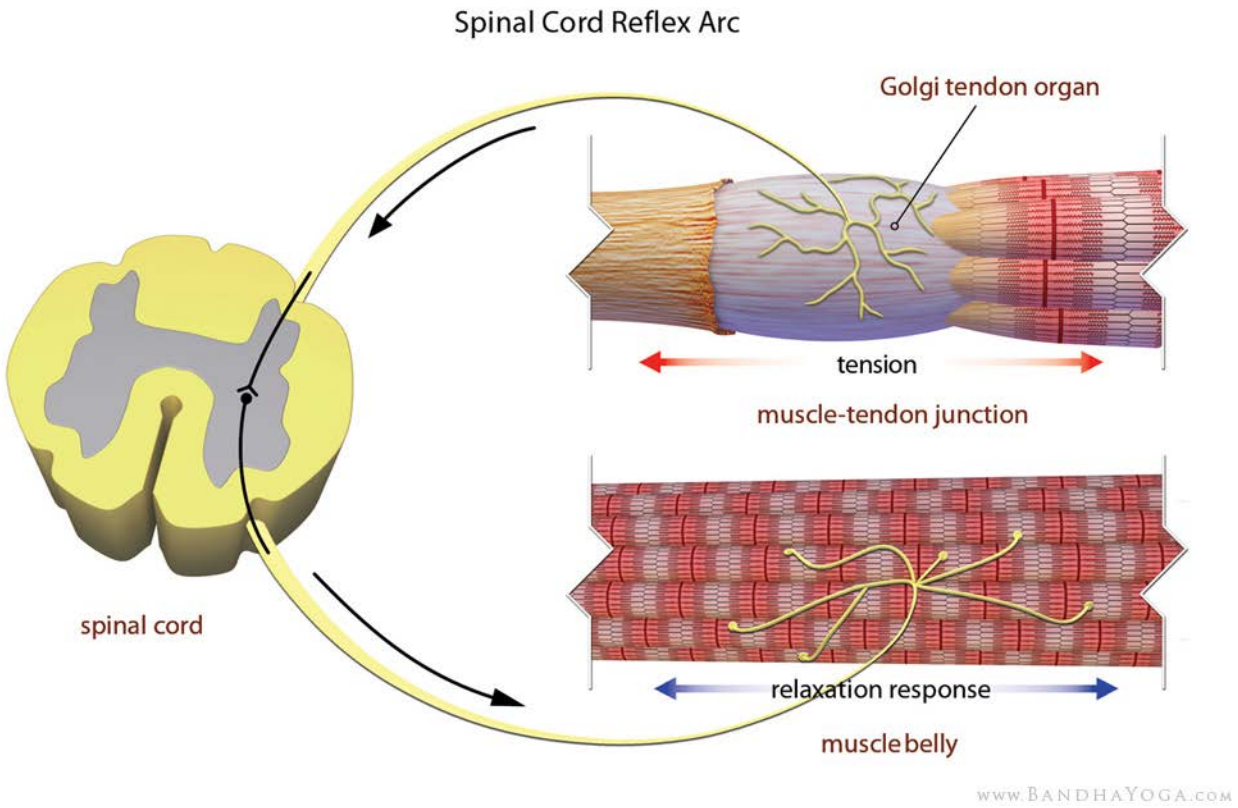
FRIDAY, JANUARY 28, 2011

Chapter 7
How to Lengthen the Hamstrings in Janu Sirsasana

In Chapter 6, we discussed how tight hamstrings can produce hyperflexion of the lumbar spine in forward bends such as Uttanasana. We also illustrated how releasing the hamstrings can aid to prevent this problem. Today we'll show you a simple, yet powerful technique for using a spinal cord reflex arc to create length in the hamstrings.

Spinal Cord Reflex Arcs

Spinal cord reflex arcs are composed of a sensory nerve receptor located at or near the muscle, its connection via a nerve to the spinal cord, an interneuron within the spinal cord, and an afferent nerve back to the muscle. The reflex arc we want to use to gain length involves the Golgi tendon organ. This receptor is located at the muscle-tendon junction and senses changes in muscle tension. The Golgi tendon organ signals the spinal cord when tension increases. The spinal cord then tells the muscle to relax. In essence, this reflex arc creates "slack" to relieve tension at the muscle-tendon junction and helps to prevent the tendon from tearing.



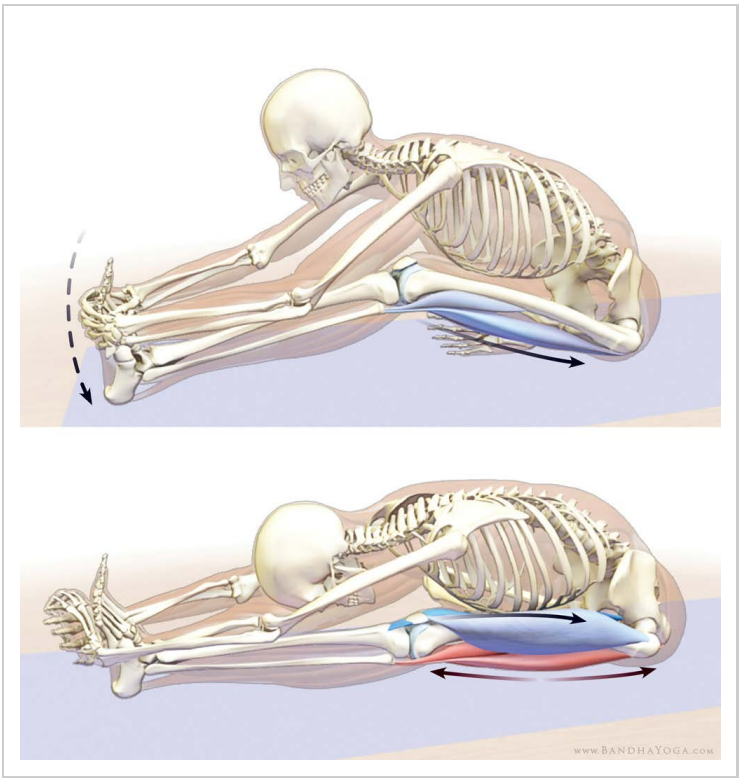
Proprioceptive Neuromuscular Facilitation (PNF)

Sports medicine experts long ago perceived that this particular reflex arc could be carefully manipulated to lengthen muscles. Using this knowledge, they invented a technique called proprioceptive neuromuscular facilitation (PNF), or facilitated stretching. It is the most powerful method for gaining length in muscles to improve flexibility. Yoga uses stretching, so why not use PNF in our practice to deepen the asanas?

It is important to remember that any powerful tool, including yoga itself, is a double-edged sword (like a surgeon's scalpel). If used carelessly, it can cause injury. This is also true of facilitated stretching. The key to using techniques like this is to apply them slowly and with care. They are like a tincture of medicine, so use less muscular force rather than more.

Facilitated stretching works as follows: after warming up, we take the target muscle into a moderate stretch. This establishes the muscle's "set length"—a measure in the brain of how far the muscle can lengthen. Stretching a muscle produces tension at the muscle-tendon junction and stimulates the Golgi tendon organs located there. The key to PNF is to then gently *contract* the same muscle that we are stretching. This combines the biomechanical event of positioning the body into a stretch and the physiological event of intentionally contracting the stretching muscle to amplifythe tension at the muscle-tendon junction. The Golgi tendon organs fire more intensively, producing a powerful relaxation response. We then stop contracting the target muscle and "take up the slack" by going deeper into the stretch. The net effect is a new set length.

Apply PNF in Janu Sirsasana



Here we use Janu Sirsasana to demonstrate specific guidelines for using PNF to lengthen the hamstrings. Warm up first with a few sun salutations to prepare your muscles. Then take Janu Sirsasana. Bend the trunk over your straight leg and engage the quadriceps to acclimate the hamstrings for the stretch. Next, bend the knee about 20 degrees. Although this takes some of the stretch out of the hamstrings, and thus some of the tension out of the muscle-tendon junction, bending the knee allows us to generate more force during the contractile phase of facilitated stretching

Then press the heel of the forward leg into the mat (as if you were trying to bend the knee). This cue causes the hamstrings to contract. Build the pressure gradually and top it off at no more than 20 percent of your maximum strength. Steadily engage the hamstrings for five even breaths, and then gradually release the contraction over a second or two. This will have produced the relaxation response. Now take up the slack by straightening the knee with the quadriceps and gently draw yourself deeper into the pose. Engaging the quadriceps not only straightens the knee, but also amplifies the relaxation response through reciprocal inhibition of the hamstrings. Repeat on the other side. Relax for a moment and then take Uttanasana, sequentially applying each of the cues illustrated in this book. Feel how your pose has changed.

Go slowly with facilitated stretching. Allow about 48 hours of recovery time before re-applying PNF to any given muscle group.

In Chapter 8 we go over joint reaction forces and how to use these techniques in a safe and controlled manor.

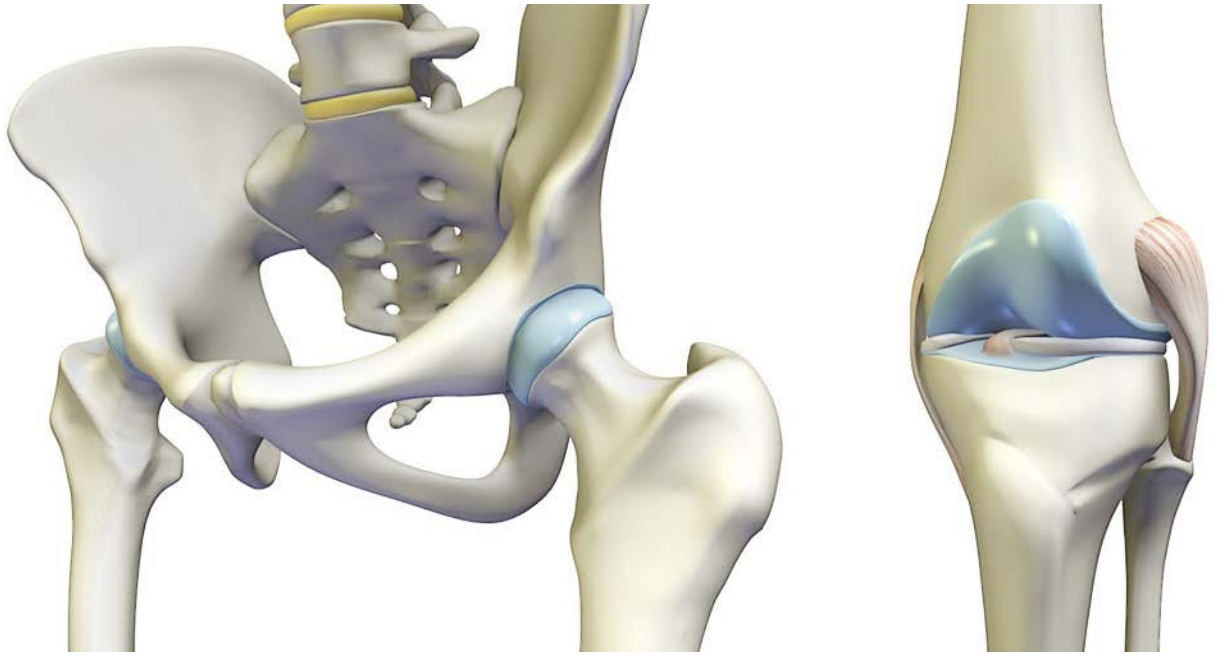
WEDNESDAY, FEBRUARY 2, 2011

Chapter 8
Joint Reaction Forces, Padmasana, and the Knees

First, thanks to Julia for the following question: “As a yoga teacher, I often see students in Uttanasana with hyperflexion in the lumbar spine. Aside from helping them work on hamstring flexibility over time, what do you suggest in the moment to help them take the flexion out of the lumbar spine?”

Refer to our website, www.BandhaYoga.com, for a simple technique on how to use the science behind the muscle spindle to address this common situation.

Now on to Padmasana (Lotus Pose) . . .
Yoga poses such as Padmasana can take your knees to the limit of their natural mobility. The idea is to do this without injuring yourself. Knowledge of anatomy and biomechanics can help. While it’s true that an injury can teach you a lot, I’ve been through that and those are hard lessons. For the rest of this incarnation, I’m opting for the easier lessons (at least with my yoga). We can learn a lot about how to avoid injuries in yoga from the vast fund of information available from sports science.



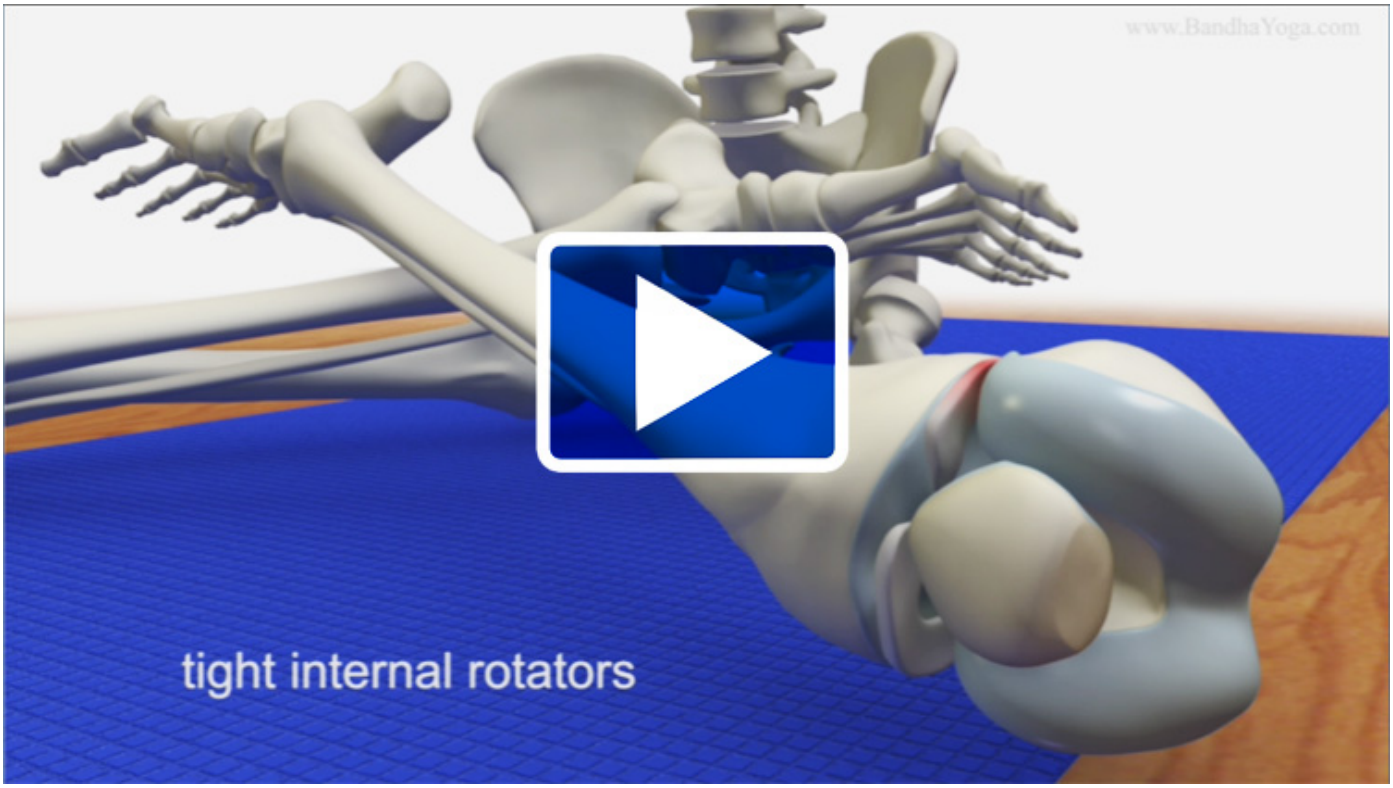
Hip joint and knee joint with meniscus and ligaments.

Joint Congruency
There is a concept in orthopedics known as *joint congruency*. This refers to joint surfaces maintaining their natural curvature when in contact with one another. A related concept is the *joint reaction force*. In essence, this is a combination of all of the factors that can produce pressure within a given articulation, such as the hip or knee. These elements include body weight, the contractile force of the muscles that surround the joint, or even someone “assisting” you to get into a pose. When the articulations are taken to extreme positions, the joint reaction forces tend to be concentrated over a much smaller area, creating the possibility of injury. To

understand this, imagine 1 pound spread over 10cm^2 of surface area versus 1 pound spread over 1cm^2. The force spread over the smaller region is more likely to cause injury. When practicing yoga, it is best to spread the joint reaction forces over a greater area by maintaining maximum congruency of the joint surfaces.

Padmasana (Lotus Pose)

Let's look at the form of the body in Padmasana: the hips flex, abduct, and externally rotate and the knees flex (and rotate a small amount). The hips are ball and socket joints, enabling them to move in all directions and, especially for this pose, rotate. The knee is a hinge joint with a limited capacity for rotation. Thus we want to protect the knees in Lotus by obtaining most of the rotation from the hips. If the hips are tight, there can be a temptation to force the knees to rotate more than they should, creating a torque at the joint that can injure the articular cartilage and/or ligaments. Maintaining joint congruency of the knee minimizes abnormally high joint reaction forces being concentrated over a small area within the joint and limits stress on the ligaments. You can see from this video that the hip only has to release a small amount to protect the knee.



Tight Internal Rotators

As discussed, Padmasana involves externally rotating the femurs. Look at today's video to see what happens when the muscles that internally rotate the hip are tight (the tensor fascia lata, gluteus medius, and gluteus minimus). This limits external rotation of the hip, which can compromise congruency of the knee joint. As a result, there can be increased pressure on the cartilage of the medial surface of the knee and abnormal stress on the lateral collateral ligament. Observe how releasing the internal rotators of the hip allows you to maintain the knee as a hinge. This removes the pressure on the inside of the knee and closes the opening on the outside.

Review facilitated stretching for Janu Sirsasana in Chapter 7. In Chapter 9 we'll illustrate how to use this technique for the tensor fascia lata and gluteus medius. This can help to relieve discomfort and prevent injuries in poses like Padmasana.

MONDAY, FEBRUARY 7, 2011

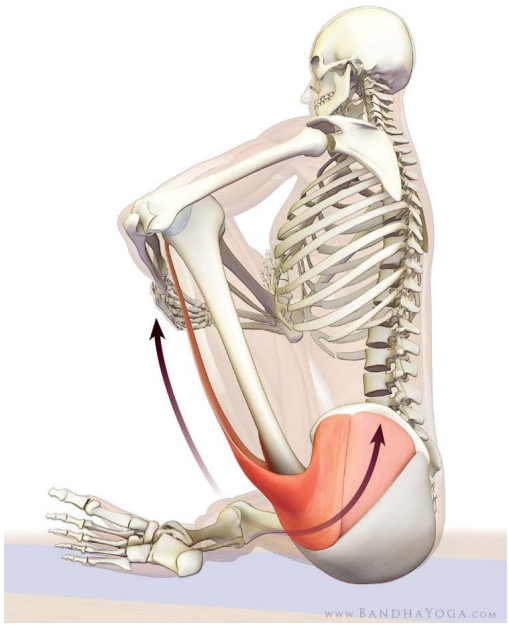
Chapter 9
How to Release the Hip Internal Rotators for Padmasana (Lotus Pose)

In *The Key Muscles of Yoga*, I point out that athletes experience improved performance and fewer injuries when they have a fundamental knowledge of their anatomy and biomechanics. For this reason, I recommend that you add our blog, The Daily Bandha, to your favorites and return every day or so to review one or two of the concepts presented here. This will allow you to integrate these tools into your yoga practice. After just a few sessions, you'll begin to apply the techniques unconsciously, improving your poses and aiding to prevent injuries.

In Chapter 8, we discuss the concepts of joint congruency and joint reaction forces as related to yoga. These are among the most important principles to understand for both practitioners and teachers, because many poses can take the articulations to the limits of their range of motion. Take a moment to review this post and look at the new video which shows these concepts in action in Padmasana (Lotus Pose).

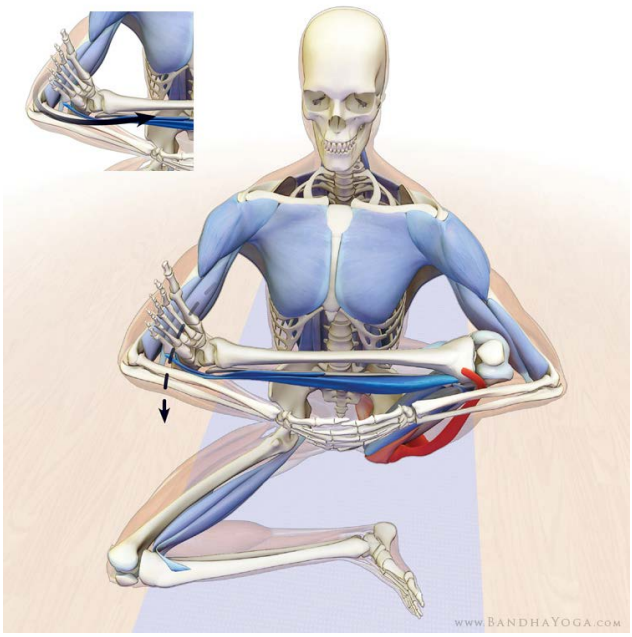
Now, on to releasing the internal rotators of the hip . . .

The main muscles that internally rotate the femur at the hip are the tensor fascia lata (TFL) and gluteus medius. The gluteus minimus contributes to this action when the hip is flexed. Conversely, when the internal rotators are tight, they can limit external rotation of the joint, a key component in poses like Lotus. Practicing this asana without releasing the TFL and gluteus medius can lead to excessive joint reaction forces in the knee. This is because the rotational component of the pose is directed into the knee joint. The key is to use the hip (which is a ball and socket) to do the rotation, while protecting the knee by maintaining it as a hinge.



Tensor fascia lata
and gluteus medius stretching.

To release the TFL and gluteus medius, I use a technique called the "cradle stretch." In it we lift the lower leg, as shown here. This action externally rotates the hip. Do not allow the knee to sag forward away from the body—this is important. Cradle it in the crook of the elbow so that the knee is maintained as a hinge. Place the outer edge of the foot into the crook of the other elbow and engage the peroneus longus and brevis muscles at the outside of the lower leg to evert the foot. Extending the toes also helps. This aids to maintain the congruency of the knee joint and helps to protect it from injury.



Cradle stretch with
inset of peronei contracting to evert foot.

Take the leg to a point where you feel a moderate stretch in the muscles at the outside of the hip—the TFL and gluteus medius. Hold this position by contracting the biceps, pectoralis major, and latissimus dorsi (shown in blue). Then gradually start to press the edge of the foot into the forearm, as if you were trying to bring it away from the body. This activates the stretching TFL and gluteus medius (shown in red). Build the contraction of these muscles slowly to about 20 percent of your maximum force (or less). Take four to five smooth deep breaths, and then stop pressing the foot into the forearm. At this point you will have elicited the relaxation response through stimulating the Golgi tendon organ at the muscle-tendon junction. Then “take up the slack” by gradually lifting the foot a little higher and drawing the knee a bit further across the body. Hold this new position for a few breaths. Continue to protect the knee as you take it out to the side, bend it, and place it on the floor. Feel the difference between the two hips. Repeat on the other side. Contracting and releasing the stretching muscles uses PNF to lengthen the hip internal rotators.

Alternative cradle for tight hips.

If you are unable to cradle the leg as shown, don’t despair, and don’t force it. Use the variation illustrated here with the mannequin. Protect the knee with one hand and press the edge of the foot into the other hand. Work like this for as many sessions as necessary until the TFL and gluteus medius have released enough to move into the full cradle. The lower back can tend to collapse into flexion when practicing this stretch. Engaging the erector spinae and quadratus lumborum muscles (extensors of the lumbar spine) will help to protect against this. Note how slightly extending the lumbar also accentuates the stretch of the TFL and gluteus medius.
Remember to go slowly with PNF. Allow about 48 hours for recovery before repeating the technique on any given muscle group. It takes a few sessions for the new length to be ingrained in the body, so don’t get discouraged if you feel a bit tight again when you come back to this position.

Refer to Chapter 10 to learn how to lower the knees closer to the floor in Baddha Konasana (Bound Angle Pose).

THURSDAY, FEBRUARY 10, 2011

Chapter 10
How to Draw the Knees to the Floor in Baddha Konasana

In *Yoga Mat Companion Book 2* (*Anatomy for Hip Openers and Forward Bends*), I mention an old Chinese proverb that says, "If you are unable to attain a goal, do not abandon the goal. Rather, change your strategy to reach it." A specific example of this would be working to bring the knees closer to the floor in Baddha Konasana (Bound Angle Pose). Say you have tried pressing on the knees, putting weights on them, etc., and you can't get the results you want. Perhaps it's time for a change of strategy . . .

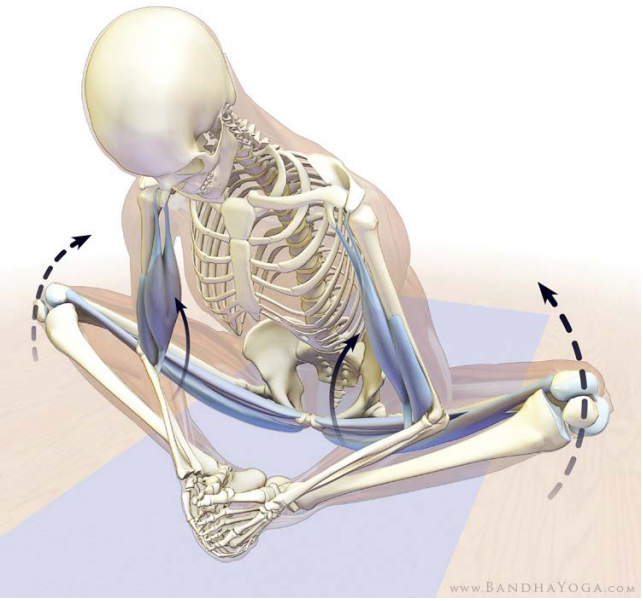
I teach the following technique in my workshops, both to illustrate how spinal cord reflex arcs function and to help practitioners bring their knees closer to the floor.

Analyze Your Pose

We'll use Baddha Konasana to illustrate the Bandha Yoga Codex, a simple process that you can apply to any pose to improve flexibility, strength, and precision—no matter what style of yoga you practice. Let's focus on the lower extremities in Bound Angle. Begin by looking at the general form of the pose. The hips flex, abduct, and externally rotate and the knees flex. Next, look at the muscles that engage to produce this position. The hip abductors (and their synergist, the sartorius) draw the knees apart and towards the floor. The external rotators turn the thighs out, and the hamstrings flex the knees. I usually start my work on a pose by gently engaging these muscles—I call them the synergists of the asana. This stimulates the brain centers associated with the muscles and joints and creates an imprint on the homunculus. It essentially says to the brain, "Baddha Konasana." This is an example of the mind—body connection in yoga. Next, determine which muscles are stretching. These will be the antagonists of the muscles that produce the form of the asana. To better understand agonist/antagonist relationships, read our Scientific Key on reciprocal inhibition. The muscles that stretch in a pose are the same ones that can limit openings. In the case of Baddha Konasana, tight adductors of the hip (muscles that act to draw the knees together) can restrict lowering the knees towards the floor.

Once you have identified the muscle group that is stretching, apply your knowledge of physiology to create length in those muscles. Below is the technique for using PNF to stretch the adductors in Baddha Konasana. This works nicely to bring the knees closer to the floor (some students say it's like magic).

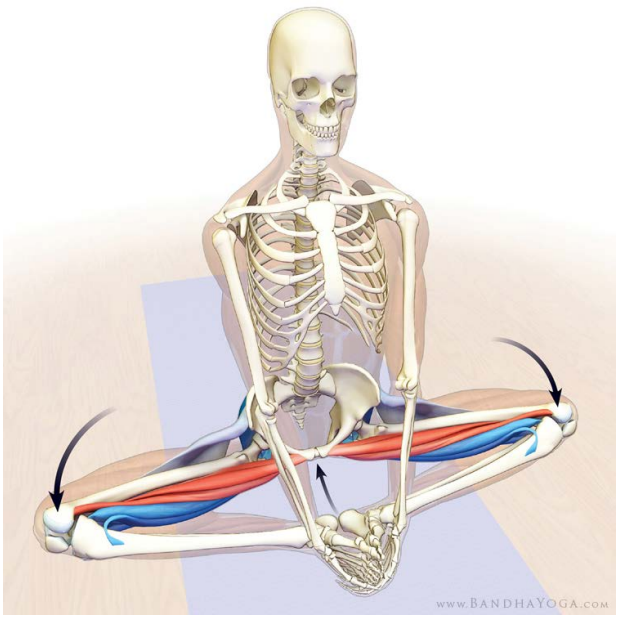
Apply Proprioceptive Neuromuscular Facilitation (PNF)



Engage the biceps to constrain the thighs.
Engage the adductors for PNF.

Take the general form of the pose. Grasp the feet with the hands and bend the elbows to place them in the crease between the lower legs and thighs. Activate the biceps and brachialis muscles to flex the elbows a bit further. This will bring the knees a little lower and stretch the adductors out to their "set length."

Keep the biceps and brachialis engaged and then contract the adductor group. The cue for this is to attempt to *lift* the knees and draw them towards the midline. The elbows will prevent the thighs from moving, but activating the adductors will stimulate the Golgi tendon organs at their muscle-tendon junction. Hold this contraction for five to six smooth deep breaths, using a maximum of about 20 percent of your force. Then relax the adductors and gently activate the tensor fascia lata and gluteus medius (muscles that abduct the knees towards the floor). A cue for this action is to press the soles of the feet together.



Engage the TFL and gluteus medius to abduct the hips and stretch the adductors.
Engage the hamstrings to flex the knees.

Lastly, engage the hamstrings by squeezing the lower legs into the thighs and bringing the heels closer to the pelvis. This helps to maintain the integrity of the knee joint.

Repeat this process once more before coming out of the pose.

Balance Opposites

Now take Dandasana. This balances the stretch of the adductors by engaging them to bring the legs together—just as Hatha Yoga balances the Sun and Moon. Don't worry if you can't get your knees down immediately. Rather, look for progress. Remember to allow 48 hours for muscle recovery and then go through this sequence again.

Drop by our Facebook page and our blog, The Daily Bandha, and let us know how this technique works for you. Learn more about the Bandha Yoga Codex and how to refine hip openers and forward bends in *Yoga Mat Companion Book 2*.

MONDAY, JANUARY 31, 2011

Chapter 11
The Mind—Body Connection in Yoga

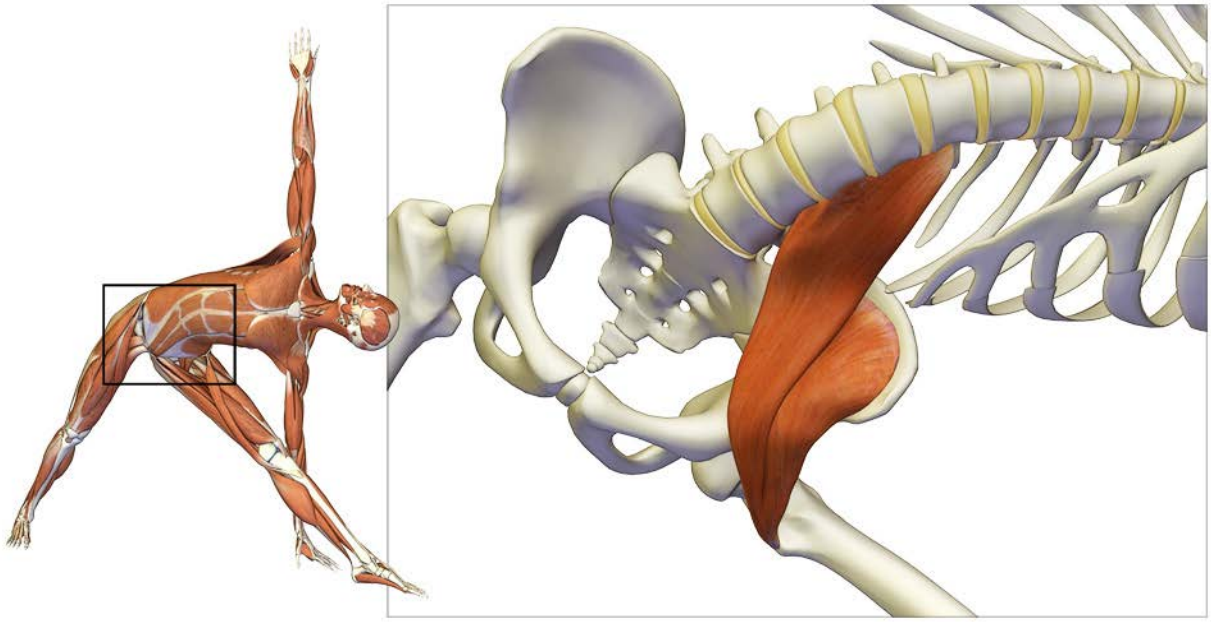
Many of the benefits of practicing yoga cannot be explained by modern Western science—especially the mystical aspects. Nevertheless, an advantage of approaching yoga scientifically is that we can often identify elements of the practice that produce a benefit and then use our knowledge of science to amplify the effect.

In this chapter we look at the neuroscience behind the way the brain “sees” the body. Our video illustrates the “motor homunculus.” This is a visual map of the proportionate representation of the body in the brain. It is derived from the work of Dr. Wilder Penfield, a renowned Canadian neurosurgeon. He developed this map by stimulating regions of the brain in epileptic patients during surgery and then documented what parts of the body were affected. Dr. Penfield’s work was a pioneering contribution to medical science. It was original, elegant in its simplicity, and has stood the test of time.

Regions of the body requiring greater tactile skills and sensory awareness, such as the hands and tongue, have a correspondingly larger representation on the homunculus. Areas that are responsible for less complex activities are smaller on the map. Look at the psoas muscle, for example. Its representation is far smaller than that of the tip of the little finger!

What does all of this have to do with yoga? Well, it has been shown that the brain exhibits a quality known as “plasticity.” This refers to the body's ability to alter the physical structure and circuitry within the brain through specific types of training. Practicing yoga can be a method for accessing this malleability within the brain. For example, The Psoas Awakening Series can be used to expand the circuitry associated with this muscle.

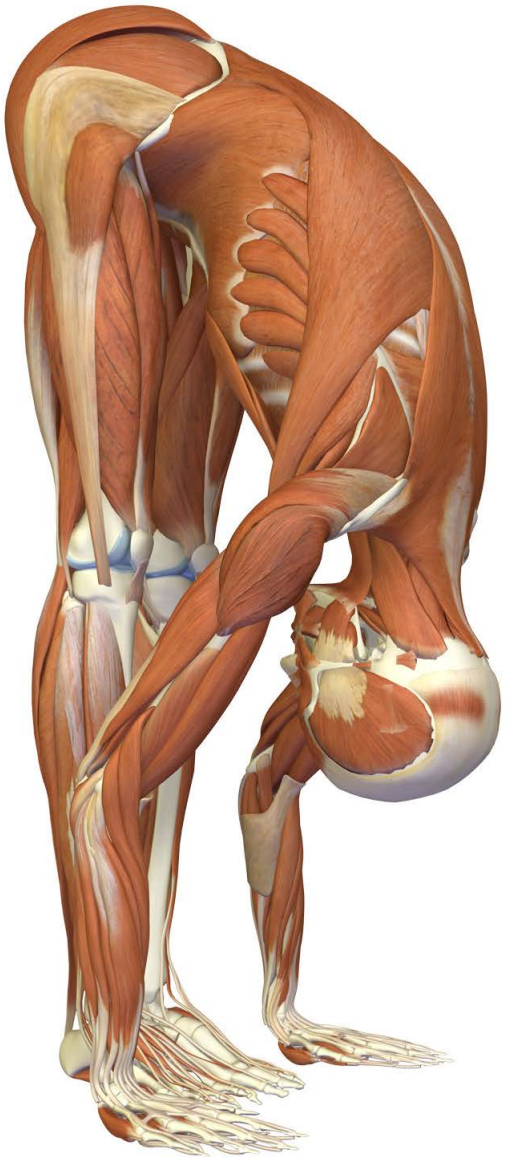
From the time we first sit up (at around eight months of age), we use the psoas. In fact, we use it so regularly that the brain relegates it to the unconscious so that we don't have to think about engaging it. Thinking takes energy, and the body is always looking for ways to conserve energy. Consequently, we "forget" how to activate this important postural muscle. For example, it's easy to contract the biceps (just "make a muscle"). Try doing the same with your psoas.



Why is the psoas important? Let's look at the origin and insertion of this muscle in Trikonasana. The psoas comprises two muscles—the psoas major and the iliacus. The psoas major originates from the T12 through L4 vertebral bodies, and the iliacus originates from the inside of the pelvis on the iliac fossa. Both muscles combine to form one tendon that inserts onto the lesser trochanter, a knob-like structure on the inside of the top of the femur (thigh bone). The psoas thus crosses multiple joints—it is polyarticular. This means that when it contracts, it can affect the lumbar spine, pelvis, or hip. Its action is to flex the hip or trunk. The psoas is particularly important to incorporate into yoga since it confers core stability of the lumbar, pelvis, and hip in the poses.

So we go through the various phases of life: pre-school, adolescence, we fall in love, fall out of love—you get the picture. All the while the psoas is there, helping us sit up, stand, and walk. Then we start doing yoga. This takes the body into new and unaccustomed positions. And although many of the asanas would benefit from intentionally activating the psoas, it is rare that people can do so without first bringing it back under conscious control. You can do this by isolating this muscle in yoga poses. Once the brain perceives that you are engaging the psoas regularly during your practice, it will again relegate it to the unconscious, but with a new function: improving your yoga.

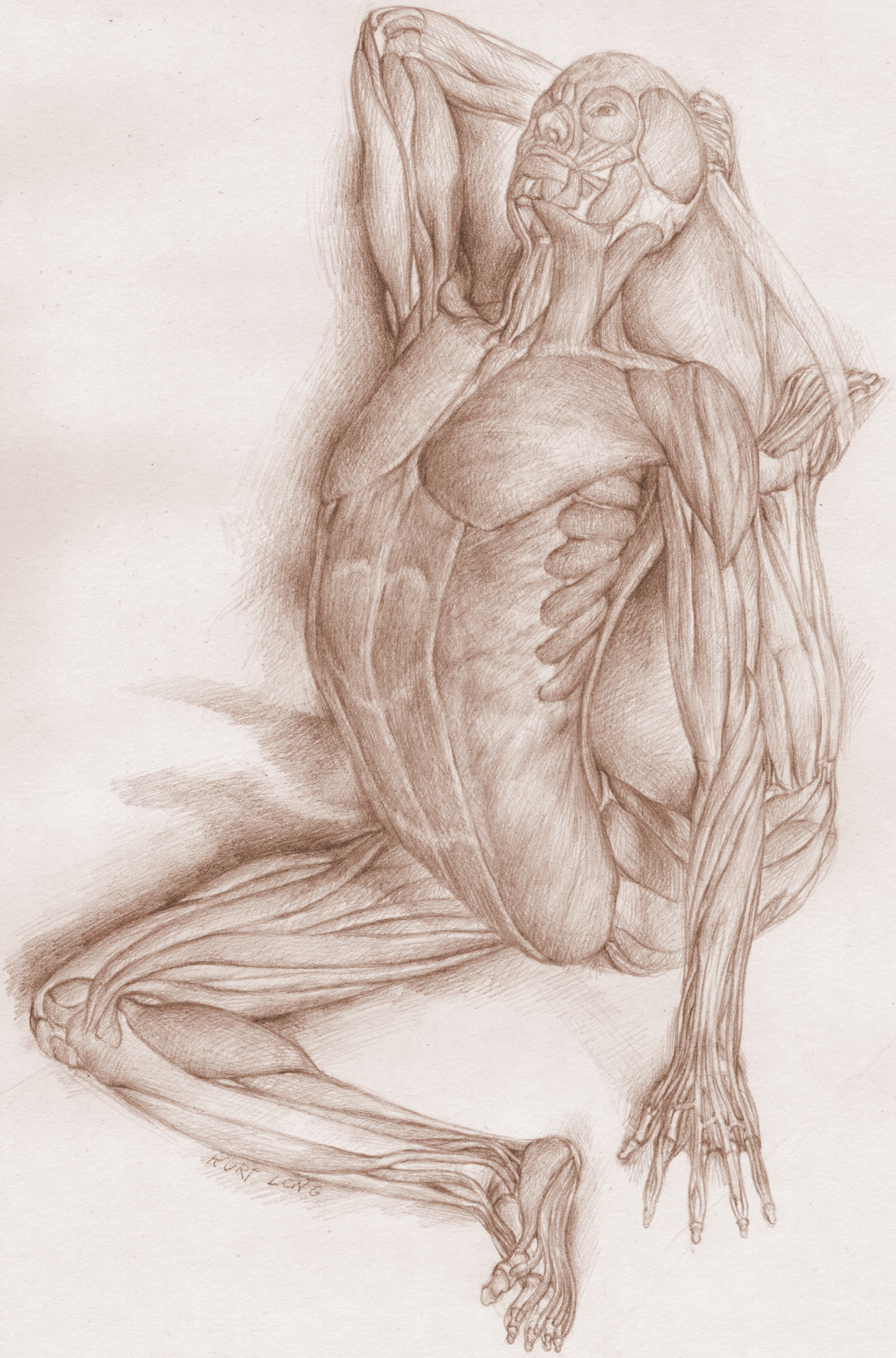
Be sure to click through to the The Psoas Awakening Series and try it out. Think about how your homunculus changes during this important practice.



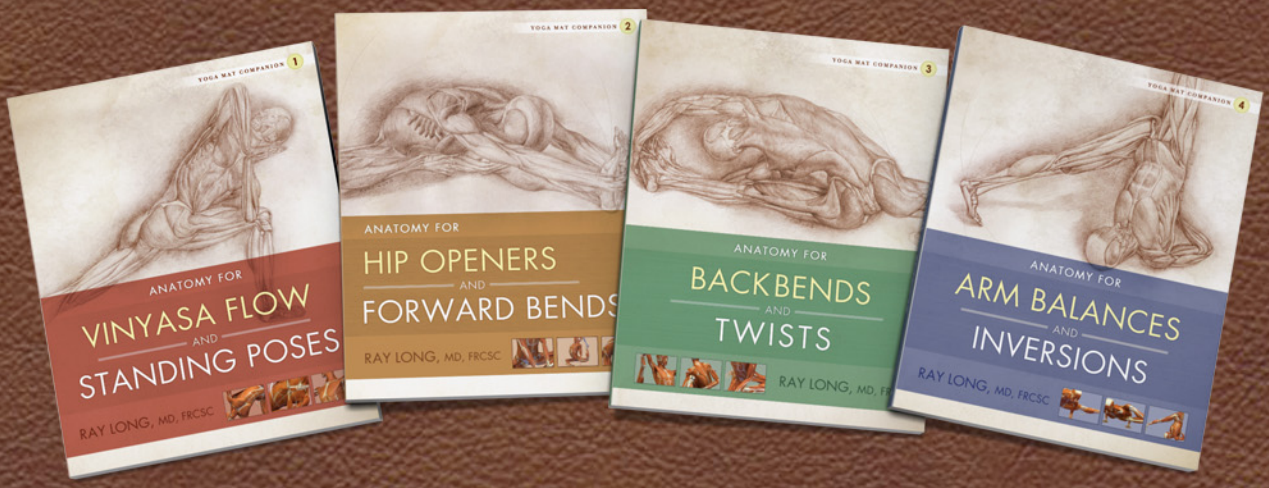
Conclusion

Go slowly when applying these techniques. Start with gentle force and learn to moderate activation of the muscle groups to help you safely deepen the asanas. Use similar care as you gradually release the pose.

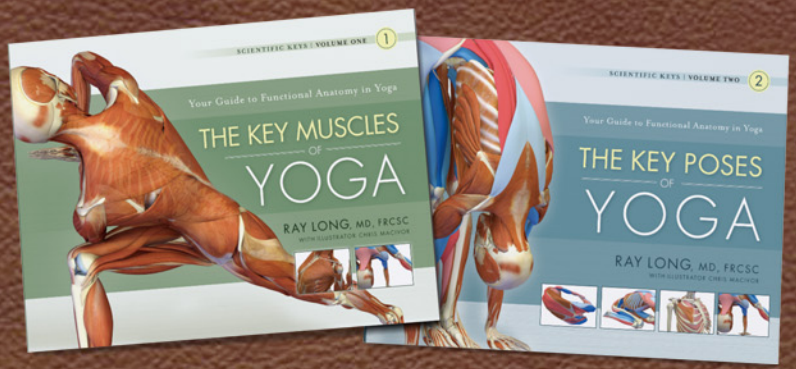
We hope you've enjoyed this first e-book compilation from The Daily Bandha blog. We appreciate everyone's feedback and thank all of you who have "liked" us on Facebook. Please feel free to share this e-book with friends, students, and colleagues. Also, click here for more information on how to obtain your free Chakra poster. Check The Daily Bandha often for new posts on combining modern Western science with ancient art of Hatha Yoga.



Also from Bandha Yoga



Click on a book to look inside!



www.BandhaYoga.com