Anatomy for Yoga Tips and Techniques Book 2

A compilation from

"The Daily Bandha"

a yoga blog by Ray Long, MD

BandhaYoga

A COMPILATION FROM

A YOGA BLOG BY RAY LONG, MD

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Introduction

"One who shows a high degree of right communication will not fail in his actions."
(T.K.V.Desikachar's translation of Yoga Sutra II.36)

Patanjali's *Yoga Sutras* have much practical wisdom that can be directly applied to life. In fact, evolution of a civilization (or its destruction) can usually be traced to *satya* (truthfulness) or *asatya* (untruthfulness). The same goes for an individual's personal evolution.

Satya and *asatya* also have practical benefits and consequences for sustainable design of the practice and teaching of yoga, because truth and theory go hand in hand. Base your teaching on sound theory (*satya*) and the benefits will automatically manifest in your practice. By the same token, if your theory is based on falsehoods (*asatya*), the benefits won't manifest. You can see examples of both *satya* and *asatya* in Chapter 3, "The Importance of Theory" and Chapter 5, "Strong Thighs Benefit People with Knee Osteoarthritis."

Satya is also said to be "that which has no distortion." Relating to yoga instruction, this means clarity of expression. Precise cues elicit a predictable response. Vague or distorted cues elicit confusion. And no matter what your personal style of communication, you can always benefit from knowing the biomechanical basis for what you're teaching.

In my experience, the closer your instructions are to activities that students routinely do or can easily access, the more likely they will understand the techniques and benefit from the session. An example would be a cue for expanding the thorax to deepen the breath. If clearly communicated, this technique will work for most of your students (even if you don't explain the science behind it). Understanding the anatomy and biomechanics, however, enables you to answer students' questions about how the body works with direct and credible terminology. Knowing the science behind your instructions builds self-confidence as well as students' confidence in you as a teacher.

Yoga works with the body and Western science has much wisdom about how the body works. Think of a combination lock in which a sequence of numbers is used to open the lock. The poses and breathing techniques work together in the same way. Combine them properly and the tumblers fall into place; this precipitates a cascade of beneficial physiological and biochemical changes, including an overall sense of well-being.

To quote Nicolai Bachman's translation of Sutra II.36: "*When established in truthfulness, one can be sure of the results of action*."

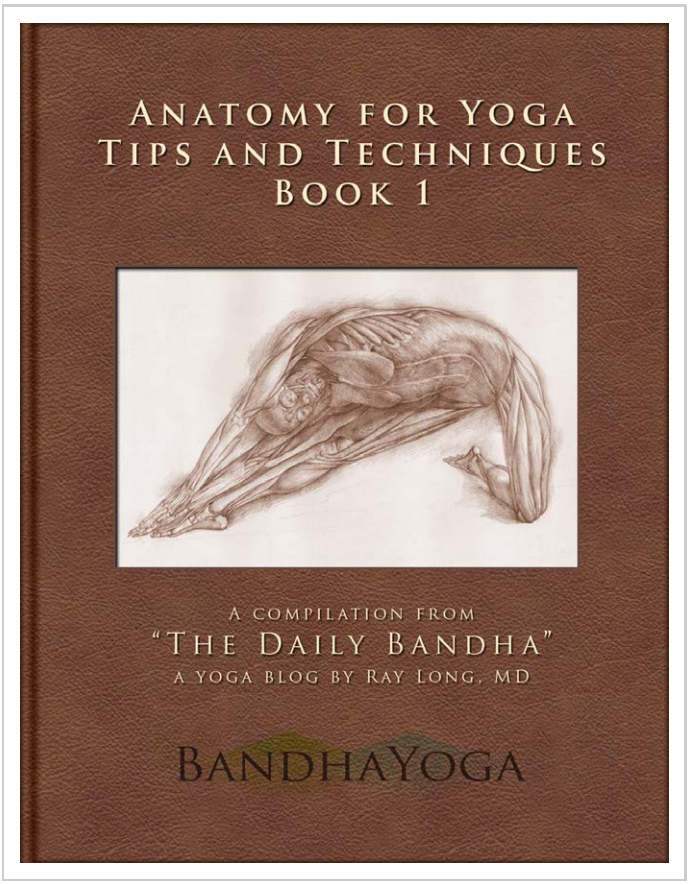
We hope you enjoy this interactive eBook; it describes a number of scientific techniques, which are based on sound biomechanical and physiological principles that yield predictable results.

Namasté,

Ray and Chris

FRIDAY, FEBRUARY 18, 2011

Chapter 1
A Cool Tip for Deeper Breathing in Yoga



First, heartfelt thanks for all of your "likes" and comments on our Facebook page. If you have not already done so, be sure to download the first volume of this eBook series *"Anatomy For Yoga, Tips and Techniques Book 1"*. We've heard from practitioners all over the world on how these techniques have enhanced their practice and teaching. This is music to our ears. To show my appreciation, I want to offer a tip that can help you dramatically expand the chest. This cue on engaging the accessory muscles of breathing can provide a quantum leap in the global effect of your yoga practice.

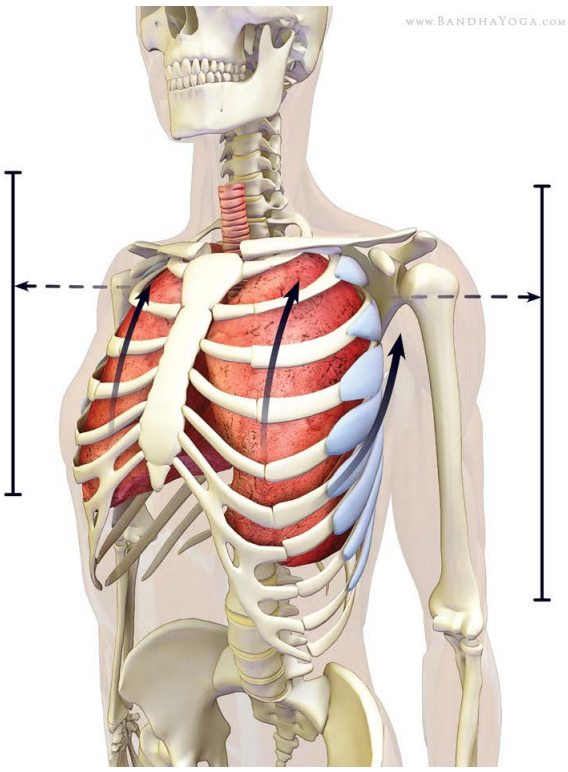
First, a little background . . .

As many of you know, I studied yoga for an extended period at the Ramamani Iyengar Memorial Yoga Institute in Pune, India. The Iyengars are true world experts in yogic breathing. During my time there, I was exposed to great teachings of pranayama from Yogacharya Iyengar, his daughter Geeta, and son Prashant. These classes were amazing; their effect would last for days.

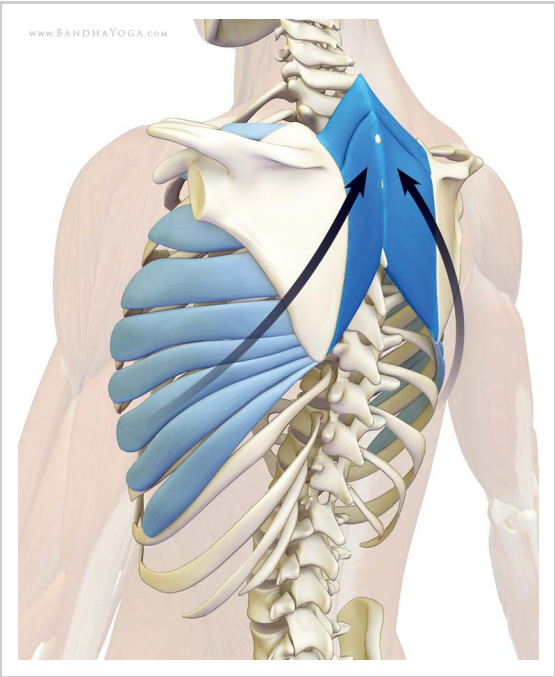
I continued to practice pranayama when I returned from India and gradually developed an understanding of the art. During this process, I used my medical training to analyze the breathing techniques. I found that I could use Western science to amplify the effects.

Now, part of pranayama involves breathing deeply. The body has a group of muscles that it recruits when we need to take deeper breaths, say after running a sprint. Recruiting these muscles expands the chest to a greater extent than when using the diaphragm alone. The result is increased inspiratory volume and improved lung ventilation (on the alveolar level). It occurred to me that intentionally engaging these breathing muscles would augment the volume of my inhalations during pranayama and asana practice. So I developed a series of cues to activate the various accessory muscles and incorporated them into my practice. The effect was immediate and amazing. After my practice was finished and through the day, my breathing felt effortless, leaving me energized. How cool is that?

So, here's a cue for activating one of my fave accessory muscles—the serratus anterior (SA) and his buddies, the rhomboids. Pause for a second. Rest your hands on your thighs. Now, exhale naturally and then gently draw the shoulders back to bring the scapulae (shoulder blades) towards the spine. As you inhale, imagine pressing the sides of your shoulders and upper arms against an imaginary wall, like a doorframe. Feel how this expands your chest. Repeat this cue two more times before reading on . . .



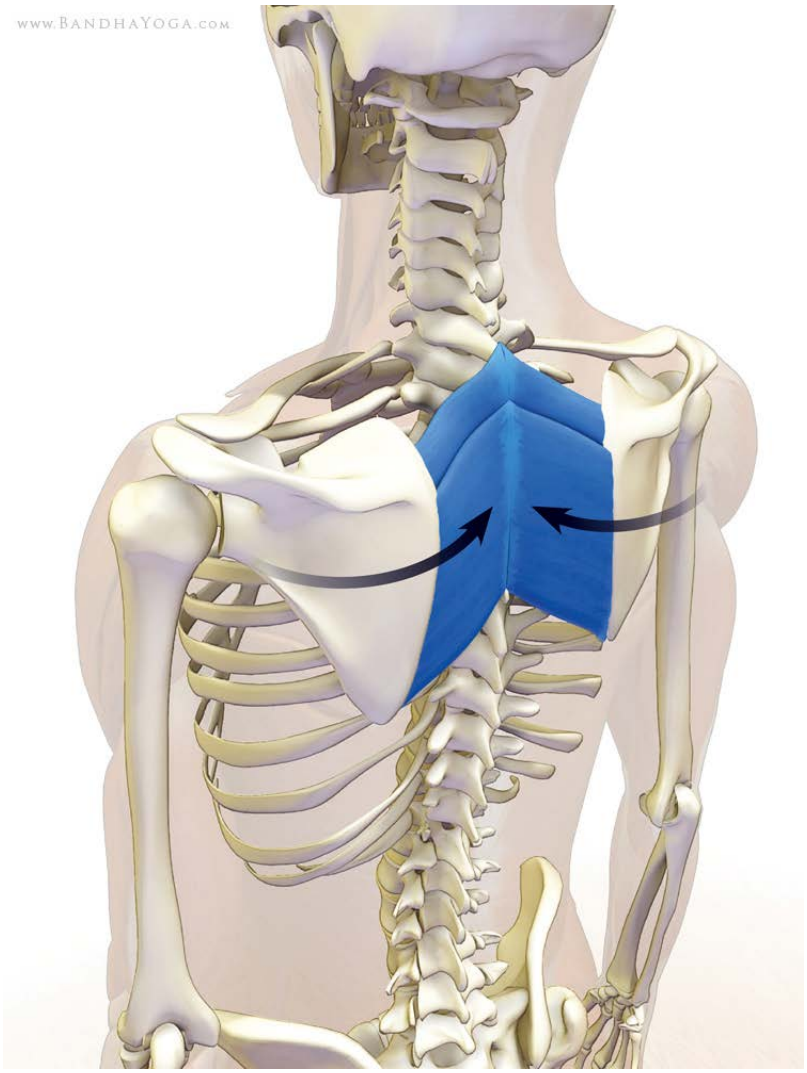
Activating the serratus anterior to expand the lungs.



Okay,
Welcome Back . . .

The rhomboids (major and minor) originate from the spinous processes of cervical vertebrae six and seven and thoracic vertebrae one through four. They insert onto the medial border of the scapula and act to stabilize and draw the shoulder blades towards the midline. The serratus anterior originates from ribs one through nine and inserts on the inside of the entire medial border of the scapula. If the scapula is fixed (by engaging the rhomboids) then contracting the serratus anterior lifts and expands the ribcage. Just focus on this action for the moment. (When the shoulder blade is released, the SA rotates and draws the scapula laterally—but that's another blog post.)

Ok, now repeat the steps from above—take a relaxed exhale, then draw the scapulae towards the midline and stabilize them there using the rhomboids (feel how this expands the chest forward). Then as you inhale, imagine pressing the shoulders and upper arms outwards against an imaginary wall. Take a relaxed exhalation and repeat two more times.



Rhomboids stabilizing the scapulae.

Do you notice how it's easier to engage these muscles the second time around? That's why I asked you to take a break, read about the anatomy, and then try it again. During the brief period you were reading, your unconscious brain formed new circuitry to activate these important muscles more efficiently. To see this process of chest expansion in action, we've created a video that illustrates this concept with the rhomboids and another accessory muscle of breathing, the pectoralis minor. This will give you an idea of how the ribcage expands when activating the accessories.

Use this cue when you practice this weekend. For example, as you do Surya Namaskar, when you inhale to raise your arms overhead from Tadasana, imagine pressing the shoulders outwards against a wall. Try it in other poses as well, such as Up Dog, Down Dog, and so on. This technique is especially effective for Vinyasa Flow—you guys will be floating!

Life is for enjoyment, friends, so enjoy this technique!

MONDAY, FEBRUARY 21, 2011

Chapter 2
Here's a Tip to Help You Get the Heels Down in Dog Pose

For something to be scientific, it has to be reproducible by another scientist. That's why I want to express my thanks to all of you who have shared your experiences with these techniques on our Facebook page. For example, one practitioner commented . . .

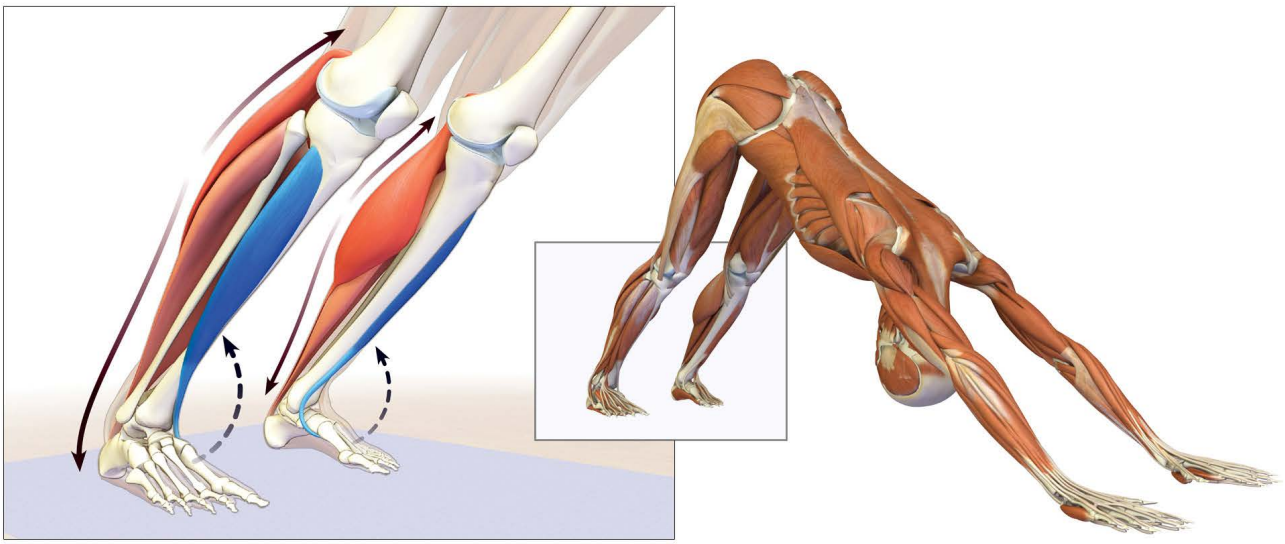
> *"I love the blog. My students appreciate the 'new' way that I explain how to move deeper into poses and you always get the credit. Myself, I was doing some of the things you describe naturally; I just couldn't explain them to my students. Like moving the feet away in Uttanasana to open the hips—brilliant! I never connected what I was doing to my feet. I thank you and my students thank you!"*

Scientific instructions should work for any style of yoga, in any country. In this case, when you press the feet into the mat and attempt to drag them apart, you activate the gluteus medius and tensor fascia lata. This will automatically produce the effects described above by this practitioner and in our first free eBook. So it's an honor to see this technique being validated. Truths like this exist independent of any individual (including me), but it sure feels good to be acknowledged!

Now on to the Post . . .

Say you've been working hard on your Downward Facing Dog and still can't get your heels to the floor. This cue can give you and your students that extra bit of length in the calf muscles and enable you to lower the heels.

First, warm up a bit with five or six Sun Salutations (Surya Namaskar A). This has the physiological effect of acclimating the muscle spindle stretch receptors of the muscles that lengthen, including the calves. Then take Dog Pose and attempt to draw the top surface of the feet towards the shins. This contracts the tibialis anterior muscle (and its synergists), dorsiflexing the ankles. It also signals the muscles at the backs of the calves, the gastroc/soleus complex, to relax through reciprocal inhibition, enabling the heels to lower to the floor. At the same time, engage the quadriceps to straighten the knees and the triceps to straighten the elbows. These actions synergize lowering the heels. We illustrate stepwise tips like this for all kinds of poses in the *Mat Companion* series. Click here to page through the books.



Tibialis anterior dorsiflexing the ankles to lower the heels (gastroc/soleus lengthening).

Here's the Anatomy . . .

First let's look at three muscles that move the ankle: the gastrocnemius, soleus, and tibialis anterior.

The gastrocnemius has two heads: one originates from the back of the femur above the medial femoral condyle, the other from above the lateral condyle. The soleus originates from the head and upper part of the fibula and the upper third of the inside of the tibia. The gastroc and soleus combine to form the Achilles tendon, which inserts onto the back of the calcaneus (heel bone).

For the purposes of this post, the main action of the gastrocnemius/soleus complex is to plantar flex the ankle. Plantar flexion increases the angle between the shin and the top of the foot, as when pushing off during walking. Thus, a tight gastroc/soleus complex can keep you from getting the heels to the floor in Dog Pose. (The gastrocnemius also flexes the knee).

The tibialis anterior is a muscle on the front of the shin. It originates from the lateral (outside) surface of the tibia and the interosseous membrane (which spans the bones of the lower leg). This muscle inserts onto the inside part of the midfoot (the cuneiform) and the first metatarsal (think of the inner middle part of the foot arch). It acts to dorsiflex the ankle, decreasing the angle between the top of the foot and the shin.

The gastroc/soleus and tibialis anterior muscles form an agonist/antagonist pair; i.e., they have opposite actions. This means that contracting one side helps to relax the other (through reciprocal inhibition). That is why attempting to draw the top of the foot towards the shin helps release the calf and enables you to bring the heel closer to the floor.

Once you've brought the heels to the floor, you can use other muscle groups to spread the weight evenly across the soles of the feet. See Chapter 4 for more on this.

THURSDAY, FEBRUARY 24, 2011

Chapter 3
The Importance of Theory (and Another Cool Tip for Deeper Breathing)

First, I want to thank the Ashtanga instructor who commented, as follows:

> *"…'when the going gets tough, Ashtangis breathe deeper'; 'as your control and depth of Ujjayi grows, so grows your practice'; and to quote Sri K. Pattabhi Jois, 'Ashtanga yoga is 99% practice, 1% theory. Practice and all is coming.'"…*

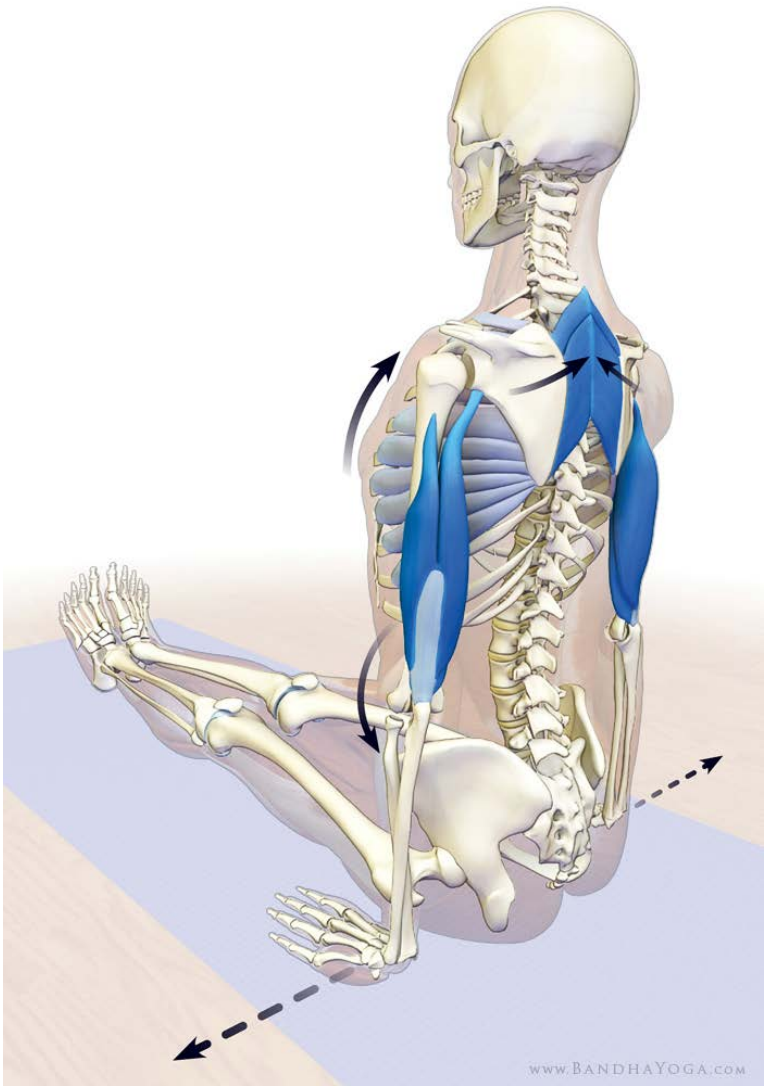
I would like to focus on the theory part of Master Jois' iconic statement, because it is theory that informs practice. As I mentioned in the last chapter, for a scientific principle to be valid, it has to be reproducible by other scientists. Now, take a moment and look at our Facebook page. Go to the people who like this" section and look at the awesome pictures of yoga on display. Some of the most amazing are Ashtanga practitioners—from all over the world. This is clear evidence of sound theory informing a practice. Master Iyengar's alignment principles have a similar scientific foundation. Aligning the joints maximizes joint congruency. This decreases the incidence of joint reaction forces being concentrated over a small region of cartilage and helps to prevent injuries in yoga. The same goes for his advice on pranayama (see below).

The flip side to sound theory informing practice is unsound theory misinforming practice. Put another way, 1% of bad theory can adversely affect 99% of practice. Take a read through this comment thread involving the "consulting neurophysiologist" who stopped by to warn of the perils of deep breathing. This is an example of unsound theory or pseudoscience misinforming practice.

I searched Pubmed and found some scientific articles that support the safety and efficacy of deep breathing techniques, especially for the management of hypertension (high blood pressure). I share them with you here. The first discusses the beneficial effects of exercise and respiratory training for patients with severe pulmonary hypertension. The authors conclude, "**This study indicates that exercise and respiratory training as add-on to medical treatment may improve exercise capacity and QoL (quality of life), and that they have a good long-term safety…**" The next concludes that "**Respiratory retraining using the slow breathing technique appears to be a useful adjunctive for cardio respiratory control in hypertensive patients.**" The third is entitled "**Breathing Control Lowers Blood Pressure**" ('nuff said). You can click through the links to read the full articles. So, we're beginning to see confirmation of practices the yogis have been doing for some time now—exciting stuff!

Bear in mind that anything as powerful as pranayama can also have adverse effects if practiced recklessly. You can find details of these effects and how to avoid them in B.K.S. Iyengar's "*Light on Pranayama*" (the bible for pranayama). I also had the privilege to discuss my personal experience of some of these effects with Yogacharya Iyengar himself (trembling, salivation, headache). He gave me this pearl: "If you feel these effects, stop for the day. If you don't feel them, continue on with your practice."

On to the Tip . . .



Using the accessory muscles of breathing to expand the chest in Dandasana.

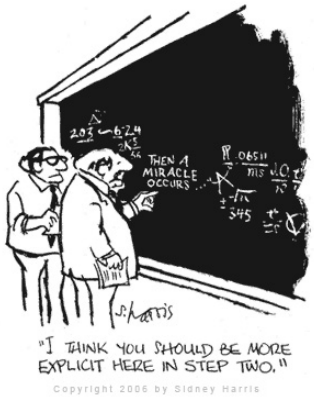
Another way to validate a theory is with a concept known as portability. In general, something that works in one lab should work in another (or it is suspect). What does this have to do with yoga? Sound biomechanical theories, such as PNF and reciprocal inhibition, can be incorporated into whatever style you practice and transported across muscle groups as well. On a smaller scale, something that expands the chest in one pose should work to enable a deeper breath in another pose.

Let's apply the concept of portability to our practice. Try the cue for activating the accessory muscles of breathing that we illustrated in Tadasana (see "A Cool Tip for Deeper Breathing in Yoga") and apply it in Dandasana. As you inhale, engage the triceps to extend the elbows and press your hands into the mat. Draw the shoulder blades towards the midline with the rhomboids and middle trapezius and then attempt to drag the hands apart to activate the serratus anterior. Feel how this expands your chest. Release during your exhalation. Refer here for the anatomy particulars on these muscles—they work the same in this as in other poses (an example of portability). Take a look at our first free eBook to see how you can use portability for other biomechanical principles, such as reciprocal inhibition and PNF.

Cool, so I'm on to my practice...

MONDAY, FEBRUARY 28, 2011

Chapter 4
How to Balance Opposites in the Foot and Ankle



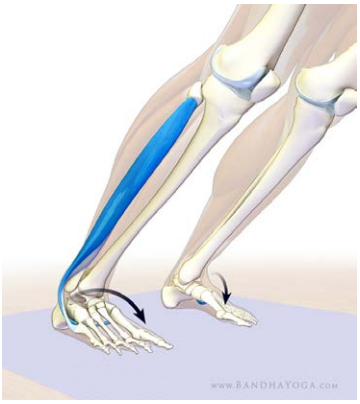
He he, Dig this cartoon a reader sent over with the following comment… *I think that the physical explanation for the miraculous fudge factors involves a "unified theory," including i.e. reciprocal inhibition. Thanks for all your observations - I look forward to your coming posts.*

Thanks for this insight.

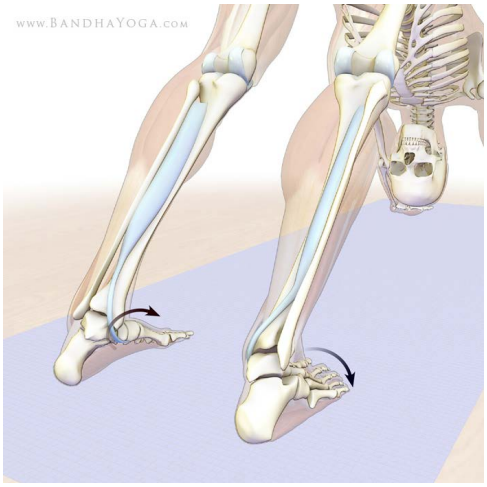
Since you mention it… I think that one of the keys to a unified theory lies in the name Hatha—sun/moon and balancing opposites. Here's a tip on balancing them for the foot and ankle.

First, the Anatomy . . .

The peroneus longus originates from the head and upper two thirds of the fibula. It then runs down the outside of the lower leg and under the foot to insert onto the medial cuneiform and base of the first metatarsal at the inside of the foot arch. It acts to evert the foot, plantar flex the ankle, and support the transverse arch of the foot. The peroneus brevis originates from the lower half of the outside of the fibula and inserts onto the base of the fifth metatarsal (on the outer edge of the foot). It acts to evert the ankle (and assists in plantar flexing the ankle).

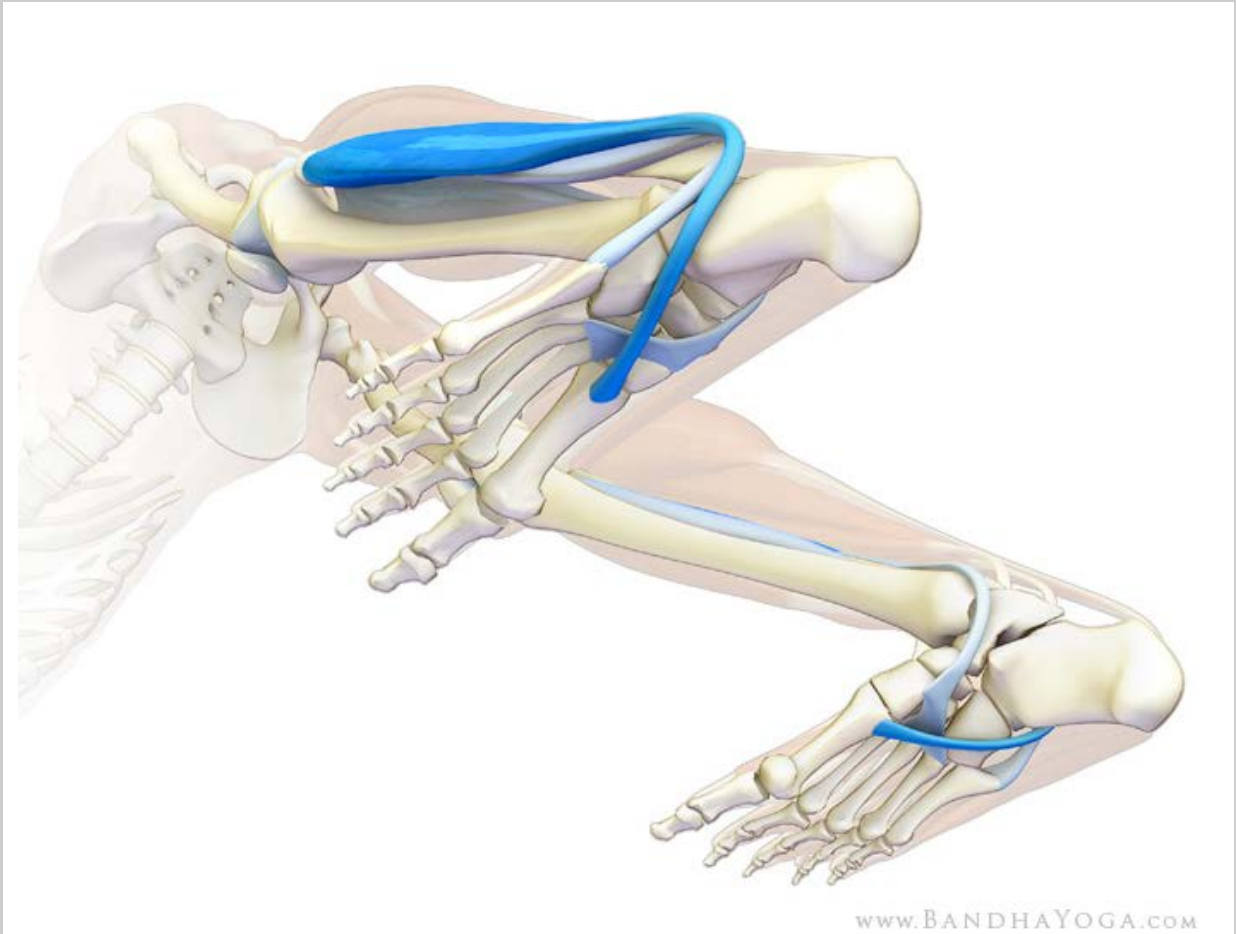


Peroneus longus
(and brevis in light blue).



Tibialis posterior.

The tibialis posterior originates from the back of the upper tibia and fibula and also from the interosseous membrane that spans the two bones. It wraps around the inside of the ankle behind the medial malleolus to the undersurface of the foot to insert onto the navicular, cuneiform, and cuboid bones. A fibrous expansion extends its insertion onto the bases of the second, third, and fourth metatarsals. Think "the midfoot" and use the image for reference. The tibialis posterior inverts (supinates) the foot and assists in plantar flexion of the ankle. It supports the transverse and longitudinal arches and is considered to be a key stabilizing muscle of the lower leg (by virtue of spanning between the length of the tibia and fibula).



Tibialis posterior, peroneus longus, and brevis insertions (underfoot).

Here are the Cues . . .

After you have engaged the tibiali anterior to release the gastroc/soleus muscle and lower the heels towards the floor (as described in Chapter 3), gently engage the peroneus longus and brevis by pressing the ball of the foot into the mat. Then activate the tibialis posterior to distribute the weight across the foot to the outer edge. Place the fleshy parts of the toes onto the mat. I sometimes will engage the peroneii before I draw the heels to the floor. Then I activate the tibialis posterior and bring the heels down. I finish up with the tibialis posterior to spread the weight across the bottoms of the feet and dynamize the arches. Feel how this stabilizes the feet and ankles.

Remember about portability of techniques between poses. Once you get a feeling for this in Dog Pose, try it in Trikonasana and other standing asanas.

Refer to Chapter 5 to see how to balance the forces up through the knees and into the hips to strengthen the muscles of the thighs and align the knees.

WEDNESDAY, MARCH 2, 2011

Chapter 5
Strong Thigh Muscles Benefit People with Knee Osteoarthritis (and a Tip for Engaging the TFL)

A series of recent articles from opinion leaders in the academic medical community have demonstrated the benefits of quad strength for persons with arthritis of the knee joint. One of these studies, which used MRI to directly assess knee cartilage, is particularly important because it sheds new light on an older study—that did not use MRI—and that suggested stronger quads were associated with a slightly greater risk of arthritis progression in persons with malaligned knees. Here's a quote from the Mayo Clinic article, which was published in the December 2008 issue of *Arthritis & Rheumatism:*

> *"In summary, in men and women with symptomatic knee OA [osteoarthritis], we found no association between quadriceps strength and cartilage loss at the tibiofemoral joint, including in malaligned knees. However, greater quadriceps strength, which may prevent lateral offset and tilt of the patella, protected against cartilage loss at the lateral compartment of the patellofemoral joint, a frequent site of symptom generation in knee OA. Subjects with greater quadriceps strength were also more likely to have less knee pain and better physical function. Our results suggest that strong quadriceps muscles have an overall beneficial effect on knee OA."* For *Science Daily's* composite of this article, click here.

Also, see Mayo Clinic researcher Dr. Amin's comments at The American College of Rheumatology Annual Meeting on Nov. 15, 2006:

> *"A stronger quadriceps muscle helps keep the patella from moving laterally and tracking abnormally with movement... Our study results emphasize that it's important to encourage people with knee osteoarthritis to maintain strong quadriceps muscles as recommended by their physician."*

These quotes are linked to the *Science Daily* summaries of the research. This is an excellent online publication you can use to stay current on scientific developments. They have a lot of integrity in their reporting and also provide full citations and links to the articles they summarize, as I do here for Dr. Amin's study.

So, current evidence demonstrates that quad strength is not associated with increased cartilage wear—even in malaligned knees. In fact, it appears to protect against it for part of the patellofemoral joint (where the kneecap articulates with the femur). This is one reason I recommend using up-to-date articles from reliable sources like those referenced here to expand your knowledge base. Sound theory informs good practice and teaching.

The flip side is that unsound theory misinforms practice and teaching. For example, if you were to subscribe to the falsehood that people with strong quads and misaligned kneecaps experience rapid progression of the disease—as some are now advocating for yoga—you might discourage your students from using these muscles in their poses. Then you would deny those same students the benefits of strengthening the quads, especially those with arthritis. You might also lose out on aligning the kneecap and reciprocal inhibition of the hamstrings. I'll

go over the importance of integrity in reporting on matters of health and a number of other key points about the knee in a five-part exclusive I'm preparing for the respected *Yoga and Health Magazine*.

On to the Tip . . .

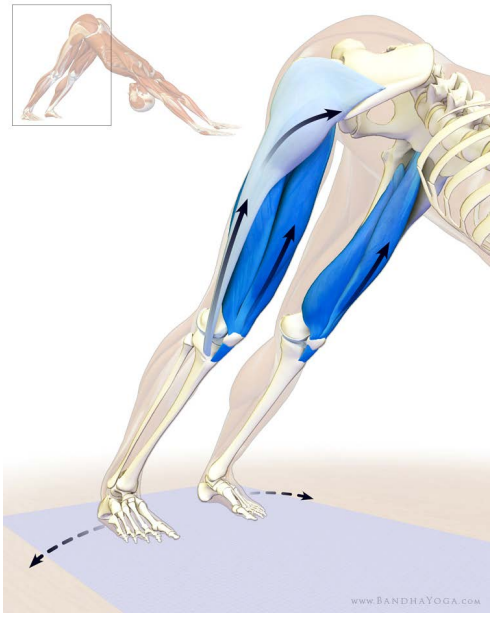
We've gone over the benefits of engaging the quads in a number of posts. These include reciprocal inhibition of the hamstrings, which helps to release the muscles and protect against symptoms of overstretching. Contracting the quads also strengthens them, with the benefits outlined above. Finally, these muscles and their synergists align the bones of the leg and maintain congruency of the knee joint, thus protecting the cartilage. The tensor fascia lata is one of the synergists that can be used to help stabilize the knee.

First, the Anatomy...

The tensor fascia lata can be used as a synergist of the quads for knee extension. This muscle originates from the outer surface of the front of the iliac crest and the anterior superior iliac spine. It inserts onto the fascia lata (iliotibial band). This fibrous band of tissue runs down the lateral thigh and attaches at the upper outer surface of the tibia onto Gerdy's tubercle (a small protrusion of bone). The TFL acts to flex, abduct, and internally rotate the hip. When you engage it, this also tenses the fascia lata, hence it's name—TFL. This tensing action is then transmitted to the insertion of the fascia lata on the tibia, aiding to stabilize and refine knee extension.

Here's the Cue...

Warm up first with four or five Sun Salutations to acclimate the stretch receptors of the hamstrings and other muscles that lengthen in Down Dog. Use the tips we have provided in the previous posts to lower the heels and spread the weight evenly across the soles of the feet. Then, keeping the feet fixed on your mat, gently attempt to drag them apart (as shown here). This attempt at abducting the feet engages the TFL and brings added stability to the knee joint. Feel how this also brings kneecaps that are turning outward back to face directly forward—the optimal position in the pose. This is because engaging the TFL acts to internally rotate the hip joint. Lastly, feel how this cue also refines the hip flexion that is part of the form of Dog Pose. You may recognize this tip from our previous post on nutation. This is yet another example of the "portability" of these techniques that illustrates the interconnectedness of yoga poses.



Using the quadriceps and TFL in Dog Pose.

TUESDAY, MARCH 8, 2011

Chapter 6
A Benefit of Using the Big Toes in Yoga

Have you ever noticed how the pelvis seems to drift backwards in standing forward bends, especially Uttanasana? Sometimes you get an assist from a teacher who pushes the pelvis forward from the sacrum to align the hips and leg bones back over the ankles. Oftentimes, however, when they remove this assist, your pelvis drifts back again . . .

Pressing the big toes into the mat in Uttanasana.

If you've had this experience, here's a cue you can use (for yourself and your students) to align the pelvis and the bones of the lower extremities perpendicular to the floor. As always, warm up with Surya Namaskaras. Then take Uttanasana. Engage the quadriceps to straighten the knees. This aids to release the hamstrings through reciprocal inhibition and helps to align the bones that form the knee joint. Now press the fleshy part of the big toes firmly into the mat. Feel how this brings the pelvis forward and the legs upright—the desired position of the pose.

This is an example of balancing opposites in yoga. When you flex forward, the pelvis will naturally drift back a bit to counterbalance the weight of the trunk so that you don't fall over. This angles the bones of the legs away from perpendicular to the floor. Ideally, you want these bones aligned so that their long axes are perpendicular to the floor —which has several beneficial effects. First, bones have tensile strength that is similar to cast iron and compressive strength similar to reinforced concrete. "Stacking" the bones so that gravity is directed down through the long axis allows you to use this passive bone strength rather than active muscular force to maintain the pose. Second, aligning the bones in this manner more optimally spreads the joint reaction forces evenly across the cartilage of the knee. If you are tilting the leg bones back, these forces are more concentrated at the front of the joint.

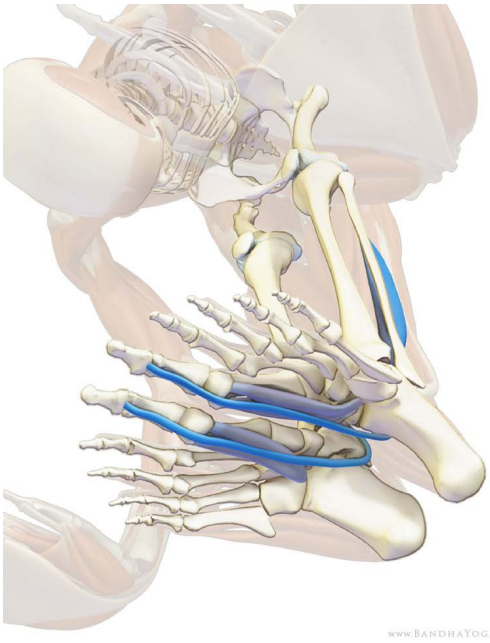
Why Does This Work? Physics . . .

The knees, ankles, and toes operate differently than the hips and trunk. Flexing these joints moves the extremity towards the back plane of the body, whereas flexing the hips moves the extremity towards the front plane of the body.

How Can the Small Bones of the Big Toes Accomplish This? Physics . . .

The contractile force of these smaller muscles is magnified by the long lever arm of the leg. The big toes act as a fulcrum to propel the pelvis relatively forward and bring the leg bones upright. Put another way, the pelvis has to come forward to counterbalance the force of the big toe flexors.

Here's the Anatomy . . .



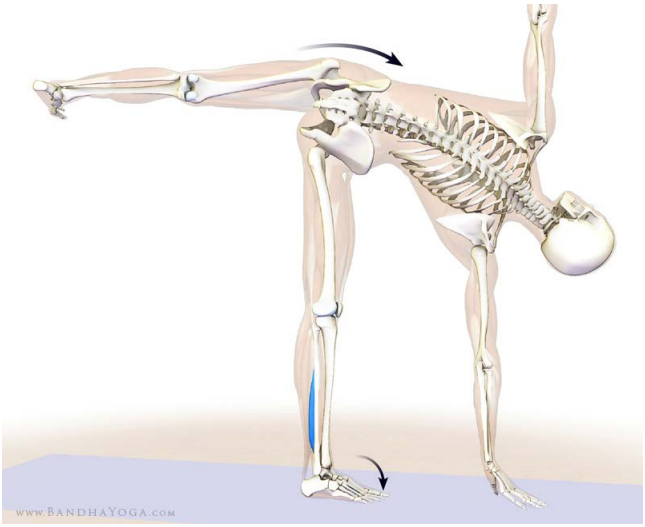
The flexors hallucis longus and brevis of the big toe.

The flexor hallucis longus originates from the lower two thirds of the back of the fibula and the interosseous membrane between the tibia and fibula. It inserts onto the base of the distal phalanx of the big toe. This means that it crosses multiple joints, including the ankle, subtalar, and metatarsophalangeal joints—i.e., it is a polyarticular muscle. Accordingly, it can act to flex any of the joints it crosses.

The flexor hallucis brevis originates from the medial and intermediate cuneiform bones and a ligament that runs between the calcaneous and cuboid bones. It then divides into a lateral and medial head. These insert onto the base of the proximal phalanx of the big toe via the medial and lateral sesamoid bones, respectively. (The sesamoid bones are mobile structures embedded in the ligaments). The flexor hallucis brevis acts to flex the metatarsophalangeal joint of the big toe and also supports the longitudinal arch of the foot.

Use Your Big Toe in Other Poses . . .

Try this technique in one-legged asanas like Ardha Chandrasana and these poses. This is another example of the "portability" of scientific principles between the asanas. Combine this tip with the cue for balancing opposites in the foot and ankle. You can also add the technique from our first post on working with the deltoids to deepen Uttanasana. Finally, augment the diaphragm by activating the accessory muscles to breathe deeply in your practice, as discussed in Chapter 1.

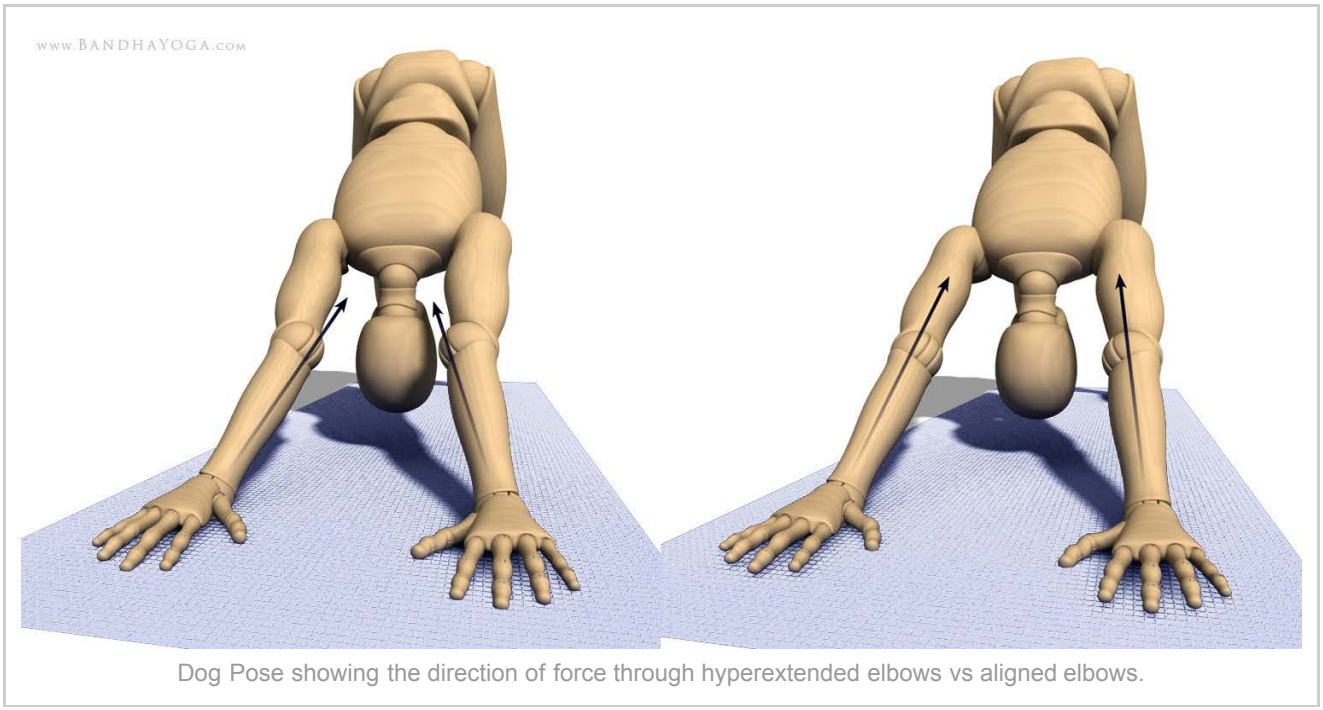


Using this technique in Ardha Chandrasana.

TUESDAY, MARCH 15, 2011

Chapter 7
A Tip for Helping Hyperextended Elbows and Knees in Yoga

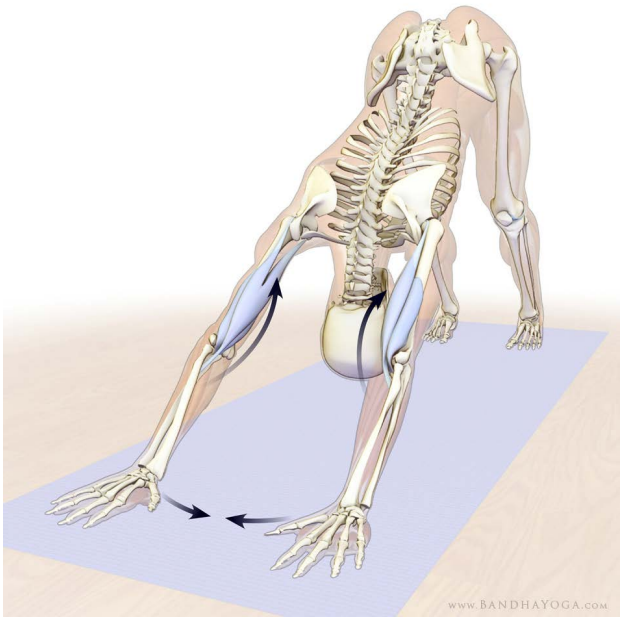
Aligning the bones accesses their inherent strength so that yoga poses ultimately require less muscular effort to maintain. For example, in our last post we gave a tip on using the big toes to correct the tendency for the pelvis to drift back in standing forward bends and one-legged standing poses like Warrior III. This correction brings the leg bones upright and perpendicular to the floor, which better supports the body weight. Aligning the bones in this manner also has the benefit of increasing joint congruency and spreads the joint reaction forces more evenly across the articular cartilage. Conversely, engaging the muscles that align the bones has been demonstrated to have a protective effect on the joint cartilage.



Dog Pose showing the direction of force through hyperextended elbows vs aligned elbows.

Hyperextending the knees or elbows in yoga poses can be disadvantageous because it misdirects the forces that create the form of the asana. For example, if the elbows are hyperextending in Dog Pose, then the force of the hands pushing into the mat is angled inward. Ideally this force should be directed through the long axes of the forearm bones, humerus, and shoulders and then through to the trunk and pelvis. Aligning the bones of the arms helps to create the proper form of Downward Facing Dog. Pressing the body back in this manner then synergizes the stretch of the muscles at the backs of the legs.

Hyperextending the elbows also has other undesirable effects, such as potentially overstretching the capsule at the front of the joint and concentrating the joint reaction forces abnormally. I will go over the various causes of hyperextended joints in a future post, but for now . . .

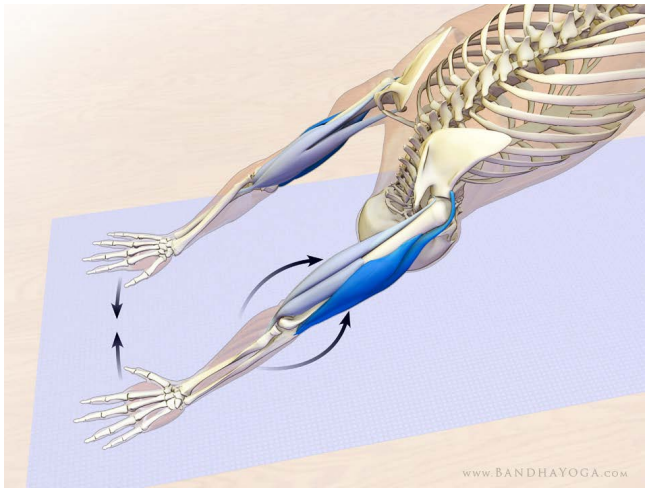


Attempt to drag the hands towards each other to engage the elbow flexors.

On to the Tip . . .

Warm up first with several Surya Namaskaras (Sun Salutations). Then take Dog Pose. Relax the triceps and, with the hands firmly fixed on the mat, gently attempt to drag the palms towards one another. This engages the elbow flexors—the biceps and brachialis muscles—and bends the elbows to counteract hyperextension. Keep the elbow flexors engaged with this cue and then gradually dial in contraction of the triceps to straighten the elbows. The biomechanical term for working in this manner is “co-contraction” or “co-activation.” This concept of simultaneously engaging an agonist/antagonist muscle group is discussed in detail in the *Mat Companion* series. Click here to see how to use co-contraction to correct hyperextended knees—and a quick tip on using the big toes to refine this action.

If you're teaching this to a student who is hyperextending their elbows, demonstrate the technique first, and then talk them through it. You can also have your student try it with the knees on the floor first—like a modified Child's Pose. This takes the weight off the hands, making the cue a bit easier to access.



Co-contraction of the elbow flexors and extensors.

A key to integrating these cues into your yoga is to try them once or twice to align the bones in the pose, and then use them again the next time you practice. This trains proprioception and muscle memory so that within a few sessions, practitioners can engage the muscles directly without attempting to drag the hands towards one another. The cue remains as a resource, however, and can be used to refine the movement. This is true for accessing nutation, engaging the tensor fascia lata to stabilize the knees, using the accessory muscles of breathing to augment the diaphragm, and so on. Once used several times, these techniques become automatic.

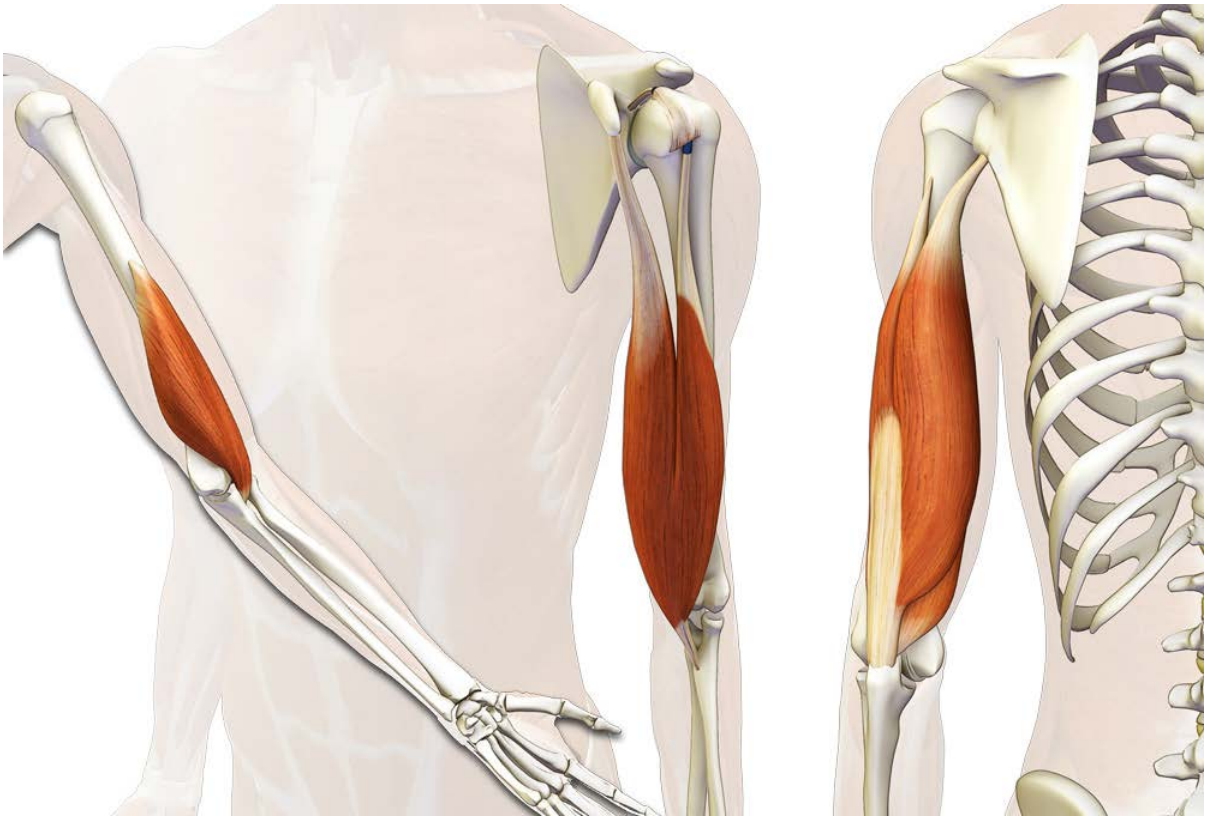
Here's the Anatomy . . .

The biceps brachii muscle has a long and short head. The long head originates from the supraglenoid tubercle of the scapula—a small protrusion of bone at the top of the shoulder socket. The short head originates from the coracoid process of the scapula—a beak-like extension of bone at the front of the shoulder. Both heads combine into a single tendon that inserts onto the radial tuberosity of the radius bone of the forearm. The biceps acts to flex the elbow and supinate the forearm and to flex the shoulder forward. In addition, it acts to adduct and internally rotate the humerus. The long head of the biceps also aids to stabilize the humeral head in the shoulder socket.

The brachialis muscle originates from the distal half of the front of the humerus and inserts onto the ulnar tuberosity, also known as the coronoid (crown-like) process at the front of the elbow. It acts to flex the elbow.

The triceps muscle has three heads. The long head originates from the infraglenoid tuberosity on the bottom part of the shoulder socket. The medial head originates from the back (posterior) part of the humerus, below the radial groove. The lateral head originates from the back part of the humerus above the radial groove. All three heads combine into a common tendon that inserts onto the olecranon process of the ulna (at the back of the elbow). The triceps acts to extend the elbow. The long head also adducts and moves the arm backwards and can aid to stabilize the scapula.

See Chapter 8 for a tip on how to stabilize the forearms, wrists, and hands in Downward Facing Dog Pose.



Brachialis, biceps, and triceps muscles.

MONDAY, MARCH 21, 2011

Chapter 8
Balancing the Forearms, Wrists, and Hands in Dog Pose

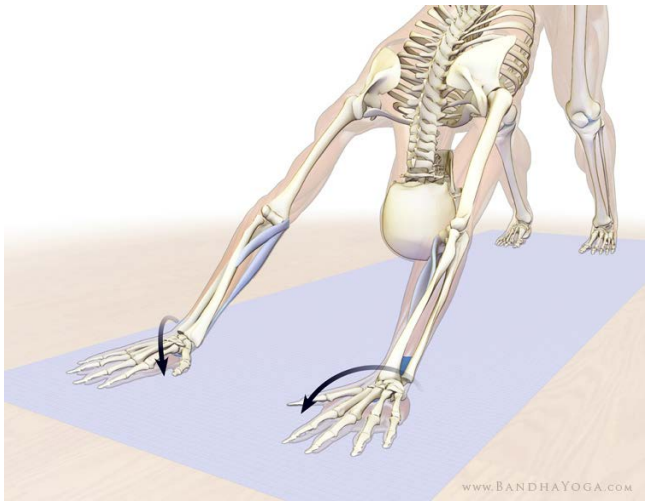
A starting point for combining Western science with yoga lies in the term Ha/Tha. This Sanskrit word means Sun/Moon or Yin/Yang and implies a balancing of energies or forces. Balance creates stillness. Apply this concept in your yoga practice by examining the various forces operating around a given joint in a pose, for example, the feet and ankles in Downward Facing Dog. You can also use it to correct hyperextending knees and elbows.

So, look at the elements that contribute energy or force throughout the body—including gravity and muscular effort—and the transmission of those forces from the muscle-tendon unit to the bones. Focus on those you can consciously affect—contracting and lengthening skeletal muscles, for example. In general, once you have the form of a pose, you want to minimize the muscular effort required to be in the asana and maximize the use of the inherent strength of the bones by aligning them. For an example of this, look at how to use the big toes to align the bones of the legs in Uttanasana.

What about poses where a particular movement predominates, for example, in Urdhva Dhanurasana where the hip joints are more extended than flexed? Consider a recipe for food. You wouldn't necessarily use equal portions of salt and pepper to create the final taste. In Urdhva Dhanurasana, contraction of the hip extensors predominates while the hip flexors lengthen. Balance in a pose such as this is the *right* amount of engagement combined with the *right* amount of release. All of this produces a motor and sensory imprint on the brain and establishes the mind—body "connection" of yoga.

On the next page we look at how to use this principle for the forearms, wrists, and hands…

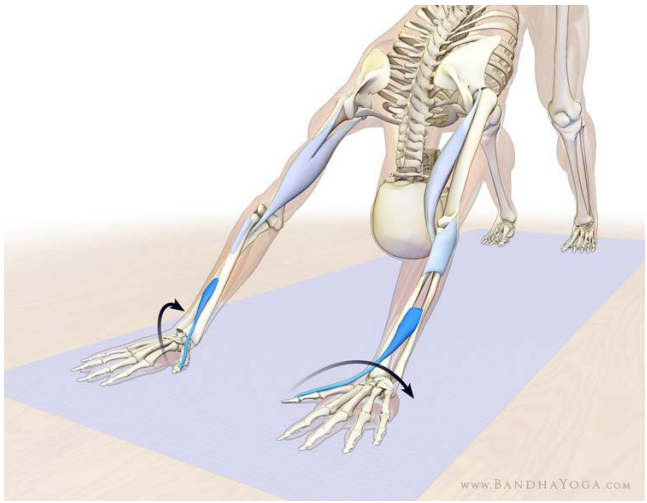
Try This in Downward Facing Dog . . .



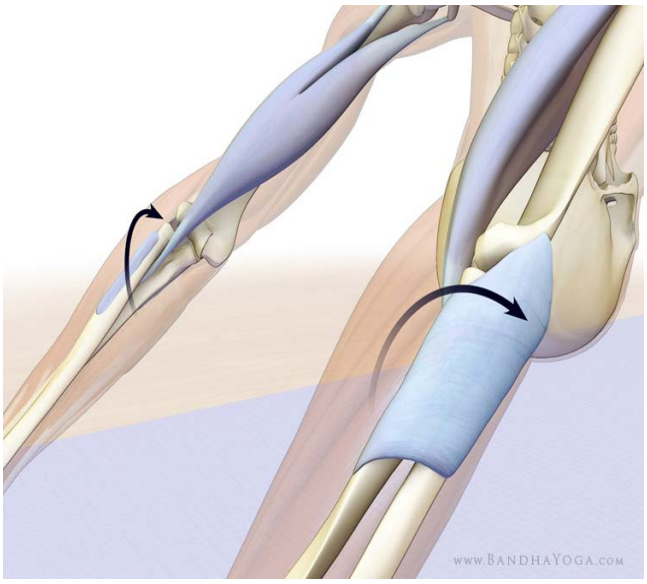
Forearm pronators in Dog Pose.

Close-up of pronator quadratus and flexor carpi radialis.

Gently press the mounds at the base of the index fingers into the mat and slightly flex the wrists. This engages the muscles that “pronate” the forearms, or turn the palms to face down—the pronators teres and quadratus and the flexor carpi radialis. Then spread the force evenly across the palms to the little finger side of the hands. This engages the muscles that “supinate” the forearms, or turn the palms to face up—the biceps and supinator. Gently attempting to drag the hands towards one another activates the biceps. You can refine supination by extending the thumbs up and away from the mat for a moment and then laying them back down. This engages the extensor pollicis longus. Feel how these actions balance the energies of the forearms, wrists, and hands. Read about the anatomy and try this concept in other poses such as Adho Mukha Vrksasana and Urdhva Dhanurasana.



Forearm supinators in Dog Pose.



Close-up of biceps brachii and supinator.

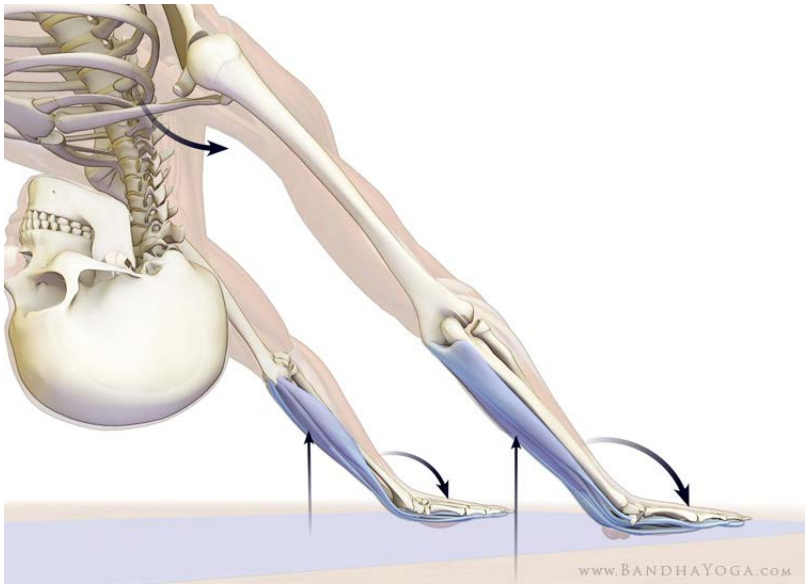
FRIDAY, MARCH 25, 2011

Chapter 9
Using the Wrist Flexors in Dog Pose

Sometimes you hear an instruction to “lift the elbows” or “lift the wrists” in Dog Pose. Normally, lifting the elbows entails lifting the entire arm in front of you—forward flexion of the shoulder. This is done primarily through the action of the anterior (front) third of the deltoids. Engaging these muscles with the hands fixed on the mat lowers the elbows. To lift the wrists and elbows in Dog Pose, contract the wrist flexors. This stabilizes the wrists and, at the same time, strengthens these flexor muscles.

Here’s a Tip for Lifting and Stabilizing the Wrists . . .

Once you have balanced pronation and supination of the forearms, engage the wrist flexors by gently pressing the mounds at the base of the fingers into your mat. Then press the palmar surfaces of the fingers into the floor. Do not actually raise your palms off the mat during this technique. You will feel your wrists lift slightly.



Gently press the mounds at the base of the fingers into the mat.

Next, combine stabilizing the forearms, wrists, and hands with bringing the heels to the floor and stabilizing the feet. If you are practicing Vinyasa Flow, try activating the wrist flexors just before jumping. Feel how this action draws you forward, creating momentum for your jump through. Try this cue in a modified child's pose to get a feel for it without weight on the hands. If you have discomfort in the wrists or hands, back off from flexing the wrists.

Here’s the Anatomy . . .

Several muscles contribute to flexing the wrist. These include the flexors carpi radialis and ulnaris, the palmaris longus, the flexors digitorum superficialis and profundus, and the flexor pollicis longus. The anatomy is somewhat complex, and it’s not necessary to memorize all of the details to benefit—just remember that these muscles all cross the wrist and thus can flex it.

And For Anatomy Buffs . . .

The flexors carpi radialis and ulnaris and the palmaris longus originate from the medial epicondyle on the inside of the elbow and cross the wrist. The flexor carpi radialis inserts onto the second and third metacarpal bases. The flexor carpi ulnaris inserts onto the pisiform and hamate bones and base of the fifth metacarpal. The palmaris longus inserts onto the flexor retinaculum and palmar aponeurosis.

The flexor digitorum superficialis has three heads: the humeral head originates from the medial epicondyle, the ulnar head originates from the coronoid process, and the radial head originates distal to the radial tuberosity. This muscle then branches out to insert onto the sides of the fingers at the middle phalanx. The flexor digitorum profundus originates from the proximal two thirds of the flexor surface of the ulna and the interosseous membrane. It inserts onto the palmar surface of the distal phalanges.

The flexor pollicis longus originates from the middle part of the anterior surface of the radius and the interosseous membrane and inserts onto the palmar surface of the distal phalanx of the thumb.

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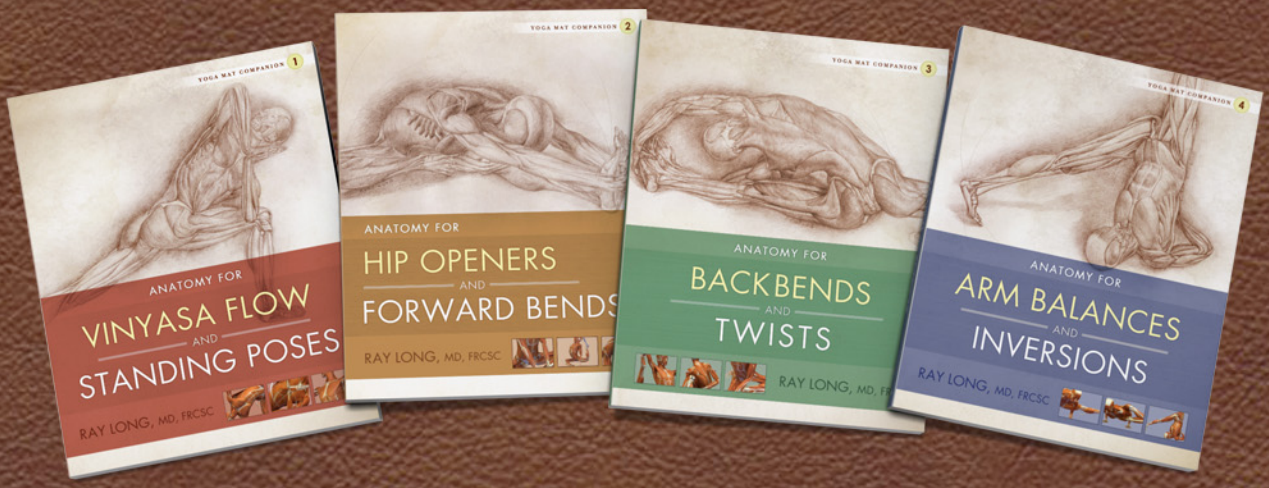

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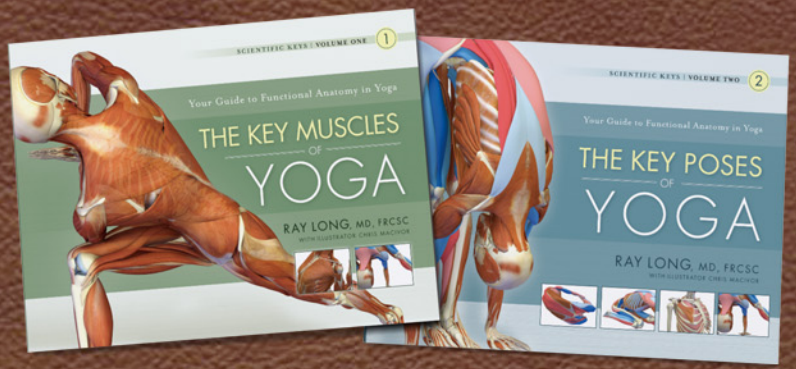

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