

Yoga Anatomy - Compression & Tension

By Barb Pierce

When practicing yoga, you activate, stretch and strengthen muscle and connective tissues as well as strengthen your bones. When reading this article please remember that muscle is very elastic, bone is very inelastic and connective tissue lies somewhere in between. For the purposes of this article, connective tissues will include tendons, ligaments and fascia.

When performing yang styles of yoga (i.e. power, vinyasa or ashtanga) you primarily activate muscle tissue to stabilize and protect your joints (this is because muscular tension compresses the joints and thereby limits their range of motion). An example would be the warrior pose, in which you engage your quadriceps, hamstring, gastroc nemeus, etc. and take stress off of your knee joint.

When you practice yin yoga, you primarily activate connective tissues by deliberately relaxing your muscles and putting safe stresses on your joints. An example would be cobbler's pose where you relax your leg and back muscles to allow the connective tissues in your groins, knees, lower back & ankles to gently open up & receive some stresses. A general hatha class will have a balance of yin and yang poses.

What happens when bone, muscle tissue or connective tissue is 'stressed'?

When bone is compressed, it stimulates new bone growth. Too much compression results in pain, irritation and inflammation. When muscle tissue and connective tissue is stressed (tension), it creates micro-tears in the fibres, which enables those tissue to grow longer and stronger. If you pull too hard, however, you can create larger tears that are very painful and may require an intervention to heal.

In addition to stretching and strengthening your connective tissues, you can also carefully & methodically break up scar tissues and adhesions with a regular yoga practice. Bit by bit, you can slowly increase your range of motion by increasing the length and strength of your connective tissues -- **if you listen to your body!**

In your movements, you are naturally limited by your current strength, bone structure and the composition of your connective tissues (length of tendons, ligaments, etc.), whether or not you have adhesions & scar tissue and by your natural ability to stretch your soft tissues -- these are different for everyone. The next few paragraphs will help explain how you can determine your current safe range of motion and how you can gently and safely reach your maximum potential range of motion.



figure 1

Back view of two scapula. Notice how the ridge of bone called the acromion process on the left specimen does not extend over the shoulder socket while the one on the right sample does. This would drastically limit the range of motion of the arm (humerus) of the right specimen.

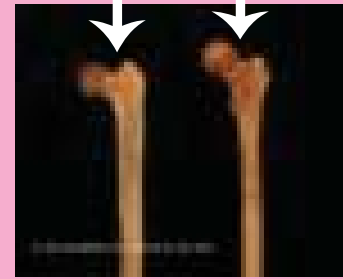


figure 2

The bend at the neck of the femur of these two specimens vary by 40 degrees. This could mean 40 degrees wider splits.

We are all born with different body shapes, with different capacities for motion. To keep safe when you practice any style of yoga, it is important to understand the limits of your joints in both compression and tension. Some people are simply born with more potential to be flexible based on the composition of their joints, and the length and orientation of their bones. For example, look at the photographs in the pink box (from www.paulgrilley.com).

The Shoulder Girdle

It is clear that a person with a short acromion process (see figure 1) will have an easier time with headstand, handstand & wheel than someone with a very long acromion process because the bone will simply get in the way when you put your arms up and behind your head (of course headstand also depends on the length of your humerus & wheel pose also depends on the flexibility of your spine). No matter how much yoga you do to open your shoulders, you will be inherently limited by your acromion process (or a shoulder injury that has created scar tissue or adhesions or some other limitation with your body structure).

The Pelvic Girdle

When looking at the pictures of the femurs (figure 2), it is obvious that, depending on the length of the 'arm' (the part between the 'ball' and the long femur bone), you will have different abilities to do swan, cobbler's, lotus or any other motion involving the pelvis. In addition, most people have some torsion in their bones. Even two people with femurs of the same length, and the same length of 'arm', will have a

different capacity of hip opening depending on how much torsion they have in their femur. No matter how much yoga you do, you may never be able to do lotus or even simple crossed legged sitting.

What is Compression and Tension?

If you feel discomfort while practicing yoga, there are two possibilities -- you are either experiencing compression or tension (see figure 3). If you are experiencing compression (i.e. bone pressing on bone or tissue pressing on tissue), you will not gain much by forcing the movement and you may even hurt yourself. To do the pose safely, you will either need to find a different way to do that pose (for example when doing horse pose lunge you can open your knee a little to reduce compression between your psoas or quadricep & hip bone) or you can simply back off a little bit.

If you are experiencing tension, then this may be an opportunity to open up your body - **if you listen to your body and do it safely**. The key is to know the difference between placing a healthy stress on your connective tissues or muscles and straining these tissues. For example, if you suddenly feel the need to engage your muscles to limit the stretch or if you feel pain (not just discomfort) then you have gone too far.

How Can You Find Your Limits?

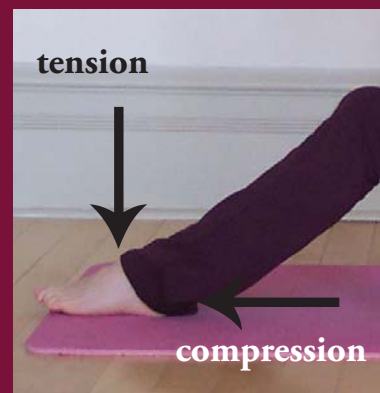
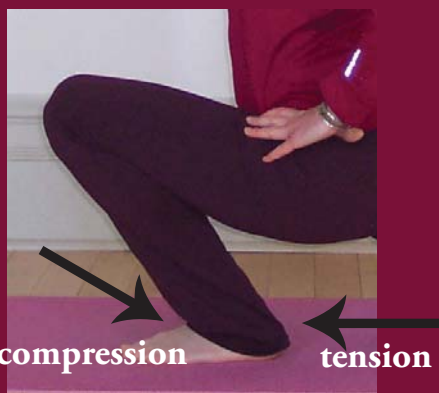
Yoga is not about being the most flexible or strongest person in the class who can do the coolest variations. Asana is simply a way of calming your mind, becoming more connected

with your body, releasing toxins through movement and improving your day to day life by having a stronger and more flexible body (according to your natural limits). Whether you are new to yoga or have been practicing yoga for many years, you likely already know that your body feels different each day, so you need to approach your practice with a new set of eyes each time. If in doubt, **it is always better to under do the pose rather than overdo it**. You can always sink down a little further once you are settled into the pose, but it is hard to undo an injury if you over do it.

There are always many different ways to perform the asanas and your yoga teacher should always offer several different variations to accommodate different levels of strength and flexibility. If you feel that the variations that have been offered still do not work for you, please let your teacher know - s/he can always suggest something that achieves the same intention but is better suited to your body.

Although your teacher will watch your body, breath and other cues to determine if you are doing the pose correctly, **the only person who really knows if you are experiencing discomfort is you** and it is your responsibility to ask for help if you need it.

The next time you practice yoga, take the time to slow down, go inside & really notice what is going on. Start to notice when you are experiencing tension or compression and give yourself permission to practice according to your natural limits.



The ankle joint in this photo is in a neutral position - experiencing neither compression nor tension.

By bringing the knee forward, you will create compression on the front side & tension at the back (achilles tendon) or bottom (plantar fascia) of your foot. If your connective tissues are flexible, you will be limited by **compression** between your tibia and the top of your foot. If your achilles or plantar fascia are tight, you will be limited by **tension** -- when you feel discomfort at the back or bottom of your foot.

By bringing the knee backward, you will now create compression on the back side of your foot & tension on the top of your foot. If the connective tissues on the top of your foot are flexible, you will be limited by **compression** between your heel and tibia and ankle bones (talus & calcaneus). If your connective tissues on the top of your foot are tight, you will be limited by **tension** -- when you feel discomfort at the top of your foot.

figure 3