



Understanding and Training Hip Flexion?

A recent post on my website forum (www.michaelboyle.biz) made me realize that often a short answer to a complicated question doesn't work. A few of my readers seemed to think that all of the recent talk about a weak psoas muscle or an under-active psoas muscle might just be people being trendy. I for one strongly disagree. I think my increased knowledge of the biomechanics of hip flexion is one of the most valuable things that I have learned in the past five years. The problem with understanding hip flexion in general and the psoas muscle in particular is that we use the term "hip flexor" as a generic term to apply to five muscles, four of which have distinctly different leverage positions from the other one. I must admit that, like most of us in the profession, I did not previously make any distinction among members of the hip flexor group. All of the hip flexor muscles seemed to work together to flex the hip and that, at the time, was enough for me. However, my recent reading into the work of physical therapist Shirley Sahrmann has changed my thinking about hip flexors, as it has about many other muscle groups. The wisdom that Sahrmann shares in her book *Diagnosis and treatment of Movement Impairment Syndromes* explains many of the injury riddles of the strength and conditioning field, particularly the "hip flexor" or "quad" pull.

The key to understanding the motion of hip flexion comes from looking at the anatomical leverages of the different muscles involved. There are five muscles that are capable of assisting in hip flexion; the tensor fascia latae (TFL), the rectus femoris (distinct in that it is both a member of the quadriceps group and a hip flexor), the iliacus, the sartorius, and the psoas. As previously mentioned four of these muscles possess something in common, one is distinctly different. As is often cliché, the key is in the differences, not the similarities. The TFL, rectus femoris, sartorius, and iliacus all have insertion at the level of the iliac crest. This means that all of these muscles are capable of hip flexion up to the level of the hip. This is simply a function of the principles of mechanical leverage. The psoas on the other hand is uniquely different in that it has its origin on the entire lumbar spine. This creates two distinct differences.

- 1- The psoas acts directly on the spine
- 2- The psoas is the only hip flexor capable of bringing the hip above ninety degrees. This is due to the fact the psoas is the only one of the five that has its origin above the iliac crest.

In the case of a weak or under-active psoas the femur may move above the level of the hip but it is not from the action of the psoas but rather from the momentum created by the other four hip flexors. With this knowledge in hand, I believe that our knowledge of back pain, "hip flexor strains", and "quad pulls" is drastically expanded. Before we discuss specific injuries let's first look at how to assess the function of the psoas. Sahrmann's test is simple. In single leg stance, pull one knee to the chest and release. Inability to keep the knee above ninety degrees for 10-15 seconds indicates a weak psoas. Other signs:

- a cramp at the iliac crest in the region of the TFL
- an immediate backward lean to compensate
- a large pelvic shift to the right or left
- a quick drop from the top with a “catch” at the ninety degree point

All of these will indicate that the client or athlete is attempting to compensate for the weak or under-active psoas.

The TFL cramp is a classic illustration of synergistic dominance. A muscle cramps when attempting to shorten in a disadvantageous position. With the hip flexed above ninety, the TFL is already shortened and unable to produce the necessary force to hold in a position of poor leverage. The attempt results in cramping, much like a hamstring cramp in bridging when the gluts are under-active. The same effects are often seen when attempting hanging knee ups (an exercise we almost never do as it teaches compensation), except the cramp or strain is in the rectus femoris.

If the tester is concerned that the subject is a skilled compensator, we have developed a better test that also has become our favorite psoas exercise. The test was actually developed by strength and conditioning coach Karen Wood. Have the client or athlete stand with one foot on a plyo box (24” works well for most) that places the knee above the hip. With the hands overhead or behind the head, attempt to lift the foot off the box and hold for 5 sec. Inability to lift and hold is indicative of a weak psoas. To add resistance and use this test as an exercise, lateral resistors or bands can be used to increase the difficulty of the isometric.

It is important to note that any test of the psoas originating from below the hip is inherently invalid as the iliac-originated hip flexors are now at a leverage advantage.

Understanding the unique functional contribution of the psoas illustrates how a weak or under-active psoas can be a factor in both back pain and in quadriceps strains.

With back pain, inability to flex the hip past ninety degrees will often cause many clients or athletes to flex the lumbar spine to give the illusion of flexing the hips. Watch how many of your clients or athletes will immediately flex the lumbar spine when asked to bring the knee to the chest. There is a clear distinction between bringing the knee to the chest and bringing the chest to the knee. Attempting to bring the knee toward the chest and above the level of the hip forces the athlete or client to use or attempt to use the psoas. If they are unable to do this one or all of three things happen.

- 1- The athlete or client will flex the spine and bring the chest to the knee. At first observation this seems the same but from a back pain perspective, could not be more different. Flexion of the lumbar spine is the leading cause of disk degeneration. Those athletes or clients that substitute back motion for hip motion get back pain.
- 2- The athlete or client will use the TFL and the other ischial hip flexors to flex the hip. In this case the athlete or client will begin to complain of a low level strain in the TFL. This is a result of overuse of a synergist and will feed into a synergistic dominance of the TFL and further psoas dysfunction. This is what we have classically seen in our hockey athletes who utilize a flexed posture.

- 3- The athlete or client will use the rectus femoris to create hip flexion. This is the mysterious “quad pull” seen in sprinters or on forty-yard dash day in football. In this case the etiology is the same as above, only the culprit is now the rectus femoris, not the TFL. It should be noted, that most “quad pulls” or “quad strains” are limited to the multi-joint rectus femoris. Soreness will be generally right near the insertion point of the rectus femoris into the quadriceps at about the halfway point of the thigh.

The psoas is to the anterior hip as the glute is to the posterior hip. A weak glute max will cause synergistic dominance of the hamstrings and extension of the lumbar spine to compensate for hip extension. This will lead to back pain, anterior hip pain (another Sahrman point, use of the hamstring as the primary hip extensor, changes the lever arm of the femur and can cause anterior capsule pain), and hamstring strains. On the literal opposite side a weak or under-active psoas will cause back pain from flexion rather than extension, TFL strain and rectus femoris strain.

The key to injury prevention and injury rehab is a sound understanding of functional anatomy. We need to stop repeating the mistakes of the past and begin to realize that we all still have a lot to learn from an anatomical and biomechanical perspective. I am amazed at how little anatomy I really know when I look a little deeper. One of the best things I have read in the past three years is Shirley Sahrman's statement, “when a muscle is strained, the first thing to do is look for a weak or underactive synergistic.” When we are looking at injuries, shit does not just happen, it happens for a reason that is governed by the laws of physics and controlled by functional anatomy.