

Our 'Junk in the Trunk'

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Muscle Training

Our 'Junk in the Trunk'

The untold story of the gluteus maximus

By Brian P. Lambert, PT

We all know that the gluteus maximus is the largest muscle in the human body. In fact, most patients know this, but they think of the glutei as mere "junk in the trunk."

Most exercise programs seem to be aimed at "shaping" and "toning," but do not address function. Function? It's mostly a seat cushion, right? Helps during squats, right? Pulls us back up when we bend over, right?

Relatively small muscles like the gluteus medius and minimus, multifidi and transverse abdominis seem to get all of the attention. Yet if you test the strength of the gluteus maximus, you will find that it is very weak in almost everyone you see who has a back or lower-extremity problem. Maybe it is time to think outside of the box and look at the largest of the muscles.

Just a Seat?

First, consider the process of evolution or, in other words, how we got to where we are. By most accounts, humans first appeared 2 to 3 million years ago on the African savannas. In order to compete with other animals for food, we evolved into one of the best endurance machines on the planet. We are designed to run or walk on uneven surfaces. Our bodies are ideally suited to these activities.

As you might have suspected, we were never designed to actually sit. Resting on the savanna would probably have been accomplished by standing still, squatting or lying down. The gluteus maximus is not a seat cushion. It is contractile tissue and not designed for weightbearing. The bottom of our heel, being a dense fat pad, is an area that is specifically designed for weightbearing. Once we sit on contractile tissue, compression alters blood supply, nerve conduction and severely compromises the ability of the muscle to contract. Since we are becoming a more sedentary society, this problem is greatly amplified.

Millions of years of evolution tend to minimize structures that no longer serve a function. Our little toes, coccyx and appendix are good examples of these kinds of structures.

One end of the gluteus maximus attaches to the pelvis, sacrum and sacroiliac ligaments. The other end attaches to the back of the upper portion of the femur. The gluteus maximus, with the gluteus medius and minimus, almost entirely surrounds the center of gravity of the body. With extensive attachments to the sacrum, it is basically a two-joint muscle.

The ideal action of the gluteus maximus on the femur is extension and external rotation. Extension of the hip during weightbearing will push the body forward at its center of gravity. Often, we think of propulsion being at the calf, quadriceps and/or hamstrings, but these muscles are too far from the center of gravity to be efficient. The calves, quads and hamstrings help, but the main work should be done from behind the center of gravity by the primary hip extensor, the gluteus maximus.

Contraction of the gluteus maximus during weightbearing will externally rotate the femur. The head of the femur sits on top of the short femoral neck. The femoral neck gives the gluteal muscles a lever for external rotation and abduction.

Having the gluteus maximus externally rotate the femur provides good alignment of the hip, knee, foot and ankle. The muscles traditionally thought of as rotators are simply not large enough to do this job efficiently. Their main function is probably regulated to stabilizing the pelvic floor. The main job of the hip abductors is to prevent adduction of the leg and to help keep the pelvis level.

Strong contraction of the gluteus maximus will pull the head of the femur into the acetabulum in a posterior and medial direction. The acetabulum is angled slightly forward to accommodate this direction of pull. This posterior/medial pull will help offset the ground reaction forces and pull of the hip abductors, which would otherwise create high-peak load at the top of the femoral head and acetabulum.

The gluteus maximus has extensive attachments to the sacrum and sacroiliac ligaments. These attachments let the gluteus maximus

provide unilateral control and force closure of the sacroiliac joint of the stance leg.

Very grossly, during the first half of right-side stance when walking or running, the femur is in some degree of flexion and the right innominate is rotated in a posterior direction. The top of the right side of the sacrum is moving in an anterior direction and the bottom of the sacrum is moving in a posterior direction. The spine (neutral mechanics assumed) is side-bending to the right and rotating to the left.

Again, very grossly, as we transition to foot flat and toe-off, a strong contraction of the gluteus maximus, with the help of the piriformis, will pull the inferior portion of the sacrum forward. This helps reduce the right side sacral flexion, as the spine is moving out of right side-bend and left rotation. As the right femur moves into more extension and the right innominate starts to rotate in an anterior direction.

The gluteus maximus is in a position to do a lot of work. It is ignored because it usually does not work. When people sit, they ruin the ability of the muscle to contract. The human body, being the adaptive machine that it is, will attempt to shift the work to other areas, but there is no muscle that can ideally substitute for the gluteus maximus.

Over time, we learn to do without it. The consequences include low-back pain, hip and knee pain, foot problems and loss of single-leg balance.

Getting Retrained

There are several exercises for re-training a poorly recruited gluteus maximus. Simple bridges or leg-lifts do not seem to do the job effectively. In our clinic, we usually start with prone gluteal re-training. The goal of the exercise is to teach the gluteus maximus to again be the primary hip extensor.

Begin prone gluteal re-training by lying with a pillow under the abdomen and with the ankles bent at 90 degrees. If we start with the right side, we have the client place the right hand on the right buttock area.

The client is instructed to clench both buttock muscles, then extend the right knee without lifting the toe. Keep the right gluteal muscle contracted and slowly lift the leg one inch. Have the client focus on using the gluteus maximus for this lift. Try to minimize use of the hamstring and low-back musculature. Hold this position for 3 to 5 seconds, then gently point the toe and lower the leg slowly. Repeat the exercise on the other side.

Generally, five repetitions per side are sufficient for a session. We have the client do this exercise two to three times per day. If someone cannot lie prone or has difficulty with this exercise, there is also a supine version of gluteal re-training. When the muscle is sufficiently re-trained, then we progress to closed-chain exercises. We use a single-leg squat that we call a reverse step-lunge.

Prone gluteal re-training is our main "entry level" exercise. It is very similar to exercises for re-training the multifidus musculature. The patient may get a double benefit from doing this exercise, but the main focus should be on re-training the gluteus maximus.

Recognizing that because of its size, location, attachments and potential actions, the gluteus maximus is the keystone of the musculoskeletal machine and should be considered the most important muscle in the human body.

If you are frustrated with the progress of your clients that have back or lower-extremity problems, then try re-training the gluteus maximus and see what happens. I bet you will be pleasantly surprised, as will your clients.

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