

# Calf Training Considerations

## What you need to know in order to train them properly.

By **Joe Giandonato**, MS, CSCS, writer, [joshstrength.com](http://joshstrength.com)



What do you use thousands of times on a daily basis...

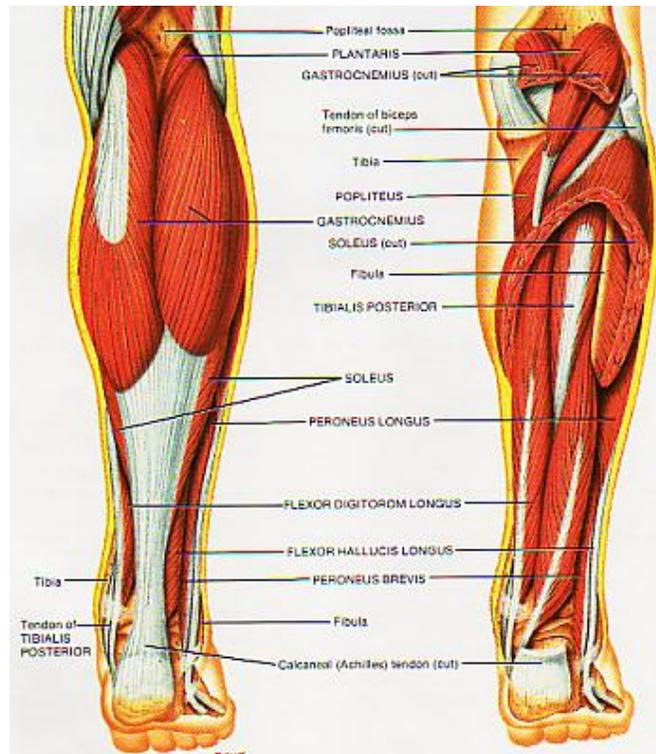
That contains a frame consisting of over: 30 solid parts - which interact with a corresponding network of nearly three dozen joints and is crossed by a web of ligaments, and is supplied with thousands of nerve endings?

What, if not properly paid attention to, can also potentially wreak havoc on your squat, deadlift, and impede performance in just about every sport?

If you answered, the foot, ankle, and lower leg, you'd be correct.

When people talk about the body's foundation, they are often referring to the core. Core training has been discussed a billion times throughout the years; however, people don't talk about what is the body's literal foundation – the foot, ankle, and lower leg. No, I'm not a podiatrist – who, unfortunately are frowned upon in the medical world. No, I'm not Rex Ryan, the New York Jets head coach, who admittedly has a foot fetish. And lastly, no, I'm not trying to piss off coaches and trainers who have discussed the importance of proper core training throughout the years. I'm just shedding light on an important area that has some pretty big implications on performance and may negatively impact the rest of the kinetic chain if not paid attention to.

## Anatomy



If you haven't been in an anatomy class since George W's first term in office, I would suggest checking out the section below, which will discuss the region's bones, joints, superficial and deep musculature, and the one thing that Rex Ryan gets more excited than pissing off the rest of the AFC East – the foot.

### Bones

Along with a web of ligaments and network of muscles, which will be discussed later, the tibia is the bone that essentially links the knee and ankle joints. It is the second longest bone in the entire body and among one of the strongest due to supporting the weight of the body. The fibula sits lateral to the tibia, attached by proximal and tibiofibular joints. Its head serves as an attachment for biceps femoris and the lateral collateral ligament (1). The fibula isn't as strong as the tibia, making it more susceptible to fractures; however, the recovery time from a full fibular fracture is much shorter than a full tibial fracture. In 2003, Michael Vick was able to bounce back from a fibular fracture after just three months and Reggie Bush came back after missing just seven games this year due to a fibular fracture. Their recovery periods were much shorter than that of Bryant Young, a retired defensive tackle, who gruesomely fractured his tibia and fibula, when a teammate's helmet collided into his lower leg. The injury took Young nearly one full year to recover.

### Muscles

#### Posterior lower leg muscles

If you don't do anything but read bodybuilding magazines found on the shelves of newsstands, then you may have not heard of any muscles beyond the gastrocnemius and the soleus. Along with the plantaris,

they are the superficial muscles of the posterior leg - which plantar flex (move the toe away from knee) the foot.

#### Gastrocnemius

The gastrocnemius is comprised of two heads: the medial head, which originates slightly above the medial condyle of the femur, and the lateral head, which originates slightly above the lateral condyle of the femur. The medial and lateral heads insert into the calcaneus through the lateral portion of the calcaneal tendon.

Both heads help stabilize the knee and ankle when standing, and as mentioned above, plantar flex the foot in concert with the soleus. The gastrocnemius contains the most fast twitch fibers out of the three (1), making it more capable of providing the rapid plantar flexion required to achieve triple extension in Olympic lifting, jumping, and in the rear support phase of sprinting. The gastrocnemius also assists with knee flexion - which is why you'll see it highlighted on a diagram of a leg curl machine.

#### Soleus

The soleus originates in the upper fibula and from the soleal line of the tibia. It inserts in the calcaneus, or heel bone, through the medial portion of the calcaneal tendon. The soleus also plantar flexes the foot, but since it has a far greater proportion of slow twitch fibers in comparison to the gastrocnemius and because it does not cross the knee, it is better suited for postural actions – such as standing for prolonged periods.

#### Plantaris

The plantaris muscle originates just above the lateral head of the gastrocnemius on the femur, blending with the calcaneal tendon. It too, assists with plantar flexing the foot.

Going deeper, we encounter the Tibialis Posterior, which stabilizes the ankle, inverts and adducts the foot, and helps plantar flex the foot and the Flexor hallucis longus, which assists the tibialis posterior with plantar flexing, inverting, and adducting the foot; and the Flexor digitorum longus, which also helps the tibialis posterior with its tasks.

Now let's examine the Anterolateral lower leg muscles.

#### Tibialis Anterior

The Tibialis Anterior is the strongest dorsiflexor (toe to knee) of any of the Anterolateral lower leg muscles. It originates from the lateral condyle of the femur and the superior half of the lateral surface of the tibia with the medial and plantar surfaces of the base of the first metatarsal and the cuneiform as its points of insertion.

#### Peroneals

The peroneal group consists of the Peroneus longus, the Peroneus brevis, and the Peroneus tertius. Together they evert and abduct the foot. It is recommended that individuals with a history of inversion ankle sprains and injured lateral ligaments strengthen the peroneals (1). This can be accomplished via banded ankle traction exercises and isometric foot abduction against a wall or another solid surface.

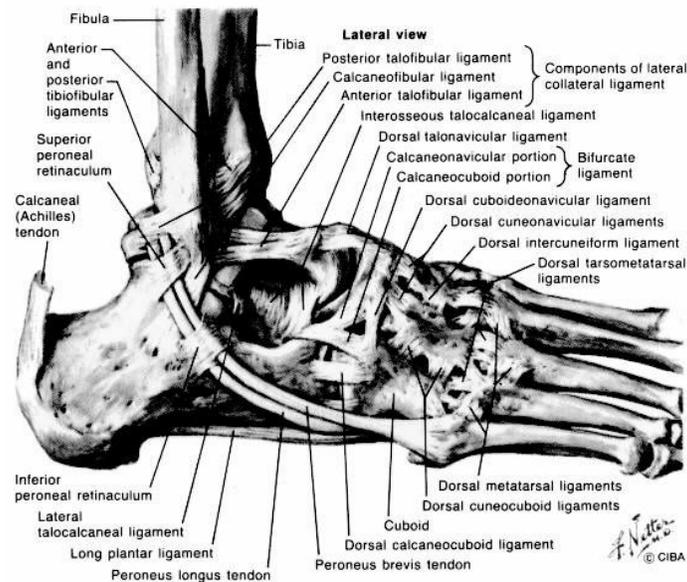
Smaller muscles of the Anterolateral compartment, include the Extensor digitorum longus, which assists with eversion of the foot, and the Extensor hallucis longus, which is a weak with inverter and adduct[er]. Together the extensor muscles assist with dorsiflexion.

## Tendons

### Achilles Tendon

Running the entire length of the lower leg, stemming from the calcaneus and blending into the fibers of both the medial and lateral aspects of the gastrocnemius and the soleus is the Achilles Tendon. The Achilles is the longest and strongest tendon in the entire body and is subjected to forces much greater than body weight during sprinting and jumping activities, when it acts as a mechanism for the plantar flexion initiated by the gastrocnemius and soleus. It is susceptible to overuse injuries, which often present themselves in endurance athletes.

Traveling further down the leg, we find the ankle, its three main joints and the foot. Because of this region's complexities due to its intricate structure of 26 or so bones, 33 joints, and over 100 ligaments and my lack of professional expertise in this area, it will only be briefly described. You know that's why medicine dedicated an entire field to its study – it's called podiatry. But we're going to examine the main areas of the ankle and foot, as well as highlight some concerns which may land you in a podiatrist's office.



## Ankle

### Joints

The ankle is comprised of three main joints: the Talocrural joint, a hinge joint, formed the distal heads of the fibula and tibia that enclose the upper surface of the talus\*. It is responsible for both dorsiflexion and plantar flexion. The Subtalar joint also involves the articulating surfaces of the talus as well as the calcaneus and inverts and everts the foot. It also helps absorb shock during landing from jumps and helps reduce impact throughout the gait cycle. Lastly, the Inferior Tibiofibular joint, comprised of proximal and distal joints, is a strong joint linking the distal segments of the tibia and fibula.

\*The talus is a smallish, square-shaped bone that sits between the heads of the fibula and tibia and the calcaneus and is crucial in the multi-planar movement of the ankle and foot.

## Ligaments

The main ligaments in the ankle include the lateral collateral ligament and the medial collateral ligament. The lateral collateral ligament consists of three parts: the Anterior talofibular ligament, which passes from the fibula to the front of the talus bone, the Calcaneofibular ligament, which connects the calcaneus and the fibula, and the Posterior talofibular ligament, which passes from the back of the fibula to the posterior surface of the calcaneus. The medial collateral ligament, which is sturdier than the lateral collateral ligament, covers the distal end of tibia, and inner surfaces of the talus and calcaneus.

## Foot

I'll leave Rex Ryan out of this one, but if Sal Alosi tripped...okay I'll leave the Jets out of it. Much like they'll be left out of the playoffs in a week or two. Ouch! I'm just kidding. But something that does hurt and definitely isn't a laughing matter are foot injuries. The main muscles of the foot and its common pathologies of injury will be discussed.

Among one of the most commonly discussed and problematic is the plantar fascia. It's widely speculated that Plantar Fasciitis results from excessive pronation (or Pes Planus) of the foot due to the lack of a supportive medial arch. This condition is often worsened by inappropriate footwear, excessive or improper exercise protocols, specifically, endurance exercise, and of course being overweight. All of these factors can lead to tight calves, which can also cause foot pronation. Excessive pronation may be a contributing factor to patellofemoral issues. Pes Planus, which is characterized by a supinated foot with a coiled arch, may also cause patellofemoral issues.

Before things get too out of hand and require the intervention of a medical professional, one may want to consider using a ball to roll beneath the foot to break up any adhesions in the tissue. I'd suggest using a tennis ball at first, progressing to harder balls (such as a softball, or lacrosse ball). I've found that rolling your foot on the ball throughout the day (i.e. at your cubicle, on your couch, even between sets at the gym) to be helpful in addressing a tight plantar fascia. If you can't handle a tennis ball, then you should most likely seek out medical help.

## Plantar Fascia Ball Roll

<http://www.youtube.com/watch?v=sW-CEzn1cFw>

So we talked about a stiff foot, but what about a stiff ankle?

Ankle mobility or lack thereof, is an issue that has received more coverage from trainers and coaches than when CourtTV covered the O.J. Simpson murder trial. So instead of rehashing everything they've said, I will say that a lack of ankle mobility will impede your athletic performance and for all you "I hate leg day" newbies and bodybuilding magazine reading wannabes - could make leg training even more unsavory. Achieving good depth on squats and being able to execute a 1.5 BW power clean won't be possible if you have poor ankle mobility. A lack of ankle mobility may render the calves rigid, causing your body to adopt compensatory mechanisms to walk (tight calves affect gait) and lift - which will likely invite back pain.

## Ankle Mobility Exercises

### Wall Ankle Mobility Drill

<http://www.youtube.com/watch?v=20stdh0atKQ>

### Ankle Circles (in water)

<http://www.youtube.com/watch?v=u2sliaQx1fA>

### Dynamic Dorsi Flexion Stretch

[http://www.youtube.com/watch?v=\\_e5RzBQ\\_Bww](http://www.youtube.com/watch?v=_e5RzBQ_Bww)

### Heel Wipers

[http://www.youtube.com/watch?v=T6u\\_W2QJZh8](http://www.youtube.com/watch?v=T6u_W2QJZh8)

### Ankle Pivots

<http://www.youtube.com/watch?v=KJm0iUnMLFk>

### Ankle Drillers

[http://www.youtube.com/watch?v=lEk3Nq\\_Vm-k](http://www.youtube.com/watch?v=lEk3Nq_Vm-k)

### Ankle ABCs

<http://www.youtube.com/watch?v=iTZ43NV8Kw>

Here are some surefire things you can do to address tight calves:

Foam Roll Calves, courtesy of Todd Bumgardner, MS, PES, of [beyondstrengthperformance.com](http://www.beyondstrengthperformance.com)

<http://www.youtube.com/user/BeyondStrengthDC#p/u/32/mbvMGUVPefM>

Foam Roll Anterior Tibialis, courtesy of Todd Bumgardner, MS, PES, of [beyondstrengthperformance.com](http://www.beyondstrengthperformance.com)

<http://www.youtube.com/user/BeyondStrengthDC#p/u/33/vy4-MxFfGj0>

### Stick Calves

<http://www.youtube.com/watch?v=aHB69MbCzGs>

### Stick Peroneals

[http://www.youtube.com/watch?v=4k\\_u\\_hjzdoA](http://www.youtube.com/watch?v=4k_u_hjzdoA)

Here are some exercises you can use to strengthen the ankles:

### Iso Inversion

<http://www.youtube.com/watch?v=7pLDZLfQuvI>

### Iso Eversion

<http://www.youtube.com/watch?v=mSzxHliW1ro>

### Ankle Traction Exercises with Tubing or Banding

<http://www.youtube.com/watch?v=e3Ss0azlvSk>

Backwards Heel Walk

<http://www.youtube.com/watch?v=vEcStE9Pdxd>

Lateral Plate Sweeps

[http://www.youtube.com/watch?v=-DfR5\\_FXFOU](http://www.youtube.com/watch?v=-DfR5_FXFOU)

Bosu Toe Crushes

<http://www.youtube.com/watch?v=yKkUp0K8oT0>

Reverse Calf Raises

<http://www.youtube.com/watch?v=CU2qkiDSsg4>

I got this one from Josh Hewett, CSCS, of [www.top-form-fitness.com](http://www.top-form-fitness.com).

Now once you have a good understanding of the anatomy of the lower leg, ankle, and foot and have addressed any joint mobility issues and establishing extensibility of the surrounding tissues, only then should you consider training the calves.

Calf Training

Calf Training for Hypertrophy\*

Outside of possessing 20" arms and a rock hard chest that looks like it is carved from granite, nothing is more coveted than a prized pair of wheels. When I say wheels, I'm referring to the lower leg - which many commercial gym goers haphazardly train on leg day, that is, if they even have a leg day. Then of course you have the faction of people that piss and moan they can't add any size to their calves "due to genetics." That's a copout, sorry. In fact, I was hard pressed to find any studies regarding genetics specifically determining the size of a person's calves. Though genetics can influence one's muscle bellies and insertion rates, you can still turn your calves into bulls, if you adhere to the guidelines listed below.

1. Use compound exercises. To the newbs out there: try putting a barbell equaling your bodyweight and putting it on your back. Take it a step further by simultaneously sinking your hips and bending your knees. Did you know that you just trained your calves? Indirectly, albeit. But still, you trained them. When you have a loaded barbell on your back, just about every muscle is firing to keep your body erect, so the loaded barbell doesn't tumble down on you, as it did on Jean-Pierre Fux, during a FLEX magazine photo shoot years ago. The muscles that are keeping you erect include your calves, which are isometrically contracting to give your body the firm base it needs upon descending into a squat.
2. Eat more. Pretty simple stuff here. It's January, so unless you reside in the Southern Hemisphere, having a visible linea alba is irrelevant. Also, having a defined six pack serves no purpose if you're trying to crush PRs and by the way, unless you're running some crazy ass compounds, your "ABZ" will likely fade if you're trying to add some mass. Also, if you add some size, say 20 pounds during your winter bulk, you're going to indirectly grow your calves, because now they're forced to lug around something that's 20 pounds heavier than it was once accustomed to.

A few things that did not make the list include: Synthol, having Lymphedema, calve implants, or ultra high volume calf workouts.

\*This section was dedicated to the trolls – you know the people who want pictures of isolation exercises and programs to get bigger body parts.

### Calf Training for Functional Hypertrophy

A lot of people think that merely loading up the stack on a standing calf raise machine and bobbing around as if they're having an epileptic seizure while performing a few choppy reps will elicit increases in size. To me, using a standing calf raise and doing reps with a limited range of motion is just flawed calf training for a few reasons.

1. If you're already subjected to a lot of axial loading via training and contact sports, why on earth do you want to place compressive forces on the spine unnecessarily? Often times, people use way more poundage on the standing calf machine than they do on a free weight squat. In fact, you see displays of these not-so-impressive feats of strength on YouTube.
2. Shortchanging your range of motion. People, including champion powerlifters, get flamed by armchair strength coaches for not performing ass-to-grass squats on YouTube, however, if the same powerlifter was doing some calf raises with a limited range of motion, I bet the video would have zero comments in its thread. Also, I've had a host of clients who couldn't even perform a body weight calf raise during their initial assessments. If you want bigger calves, that function the way they were intended to function, you should use a full range of motion. Full range of motion mimics the plantar flexion required for the lauded triple extension to occur, so you can be a faster, stronger, more powerful athlete.
3. What carryover does the standing calf raise have to sports? Very little, if you're using a load that's far too heavy to budge in the first place. Again, calf training should focus on achieving plantar flexion via a full range of motion – you want the movement to be explosive, yet controlled.

### Considerations for Calf Training

Often debated is the importance of foot placement and the correlating muscles that are targeted when you rotate your foot either inward or outward. EMG studies have shown that altering your foot placement can impact what muscles are targeted, as in this study conducted on cyclists (2) and what heads are predominantly called upon during partial weight bearing, isometric plantar flexion contractions under varying percentages of body weight and maximal contractions (3). If you evert, or rotate your foot outward, you'll hit the medial aspect of the gastrocnemius more, if you invert your ankle, or rotate your foot inward, you'll hit the lateral aspect of the gastrocnemius more. Protocols employing the principle of time-under-tension have been proven effective, because in comparison to the rest of the body's muscles, calves are largely slow twitch, thus responding better to longer sets.

### Calf Exercises

#### Smith Machine Seated Calf Raises

<http://www.youtube.com/watch?v=JSIIBVcLUmU>

Donkey Calf Raise with Dip Belt

[http://www.youtube.com/watch?v=xXFnsH7yC\\_c](http://www.youtube.com/watch?v=xXFnsH7yC_c)

Glute Bridge Calf Raises

<http://www.youtube.com/watch?v=lvMTKw7MABc>

Towel Rolled Calf Raises

<http://www.youtube.com/watch?v=7Hhe1MvwFO8>

Braced Dumbbell Calf Raise

<http://www.youtube.com/watch?v=q3i40GyBhGg>

Typically, I'll toss these in following my ankle mobility exercises, or in between my sets of assistance exercises, following a set x rep scheme of 3-5 x 15 – 20. If you do, I'd suggest training calves one to two times per week.

Also, performing hill sprints will torch the calves in addition to hitting the hamstrings, glutes, and quads.

Hill Sprints, courtesy of Tom Conner, of Snap Fitness, Marlton, NJ and [tctrainingsystems.com](http://tctrainingsystems.com)

<http://www.youtube.com/user/tsc9198#p/u/110/u158jyYgaok>

Well hopefully some of the major issues involving calf training and its relation to foot and ankle issues have been addressed.

Stay strong.

## References

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