

The Ultimate Anatomical Guide To Freaky Big Calves Part III

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Abstract

The anaerobic energy pathways govern in large part the capacity for peak performance during supramaximal exercise. Within this framework, capacity, power, and the time continuum will be discussed. Further, each step in the glycolytic pathway will be carefully analyzed, from reactants, to products. Additional attention will be partitioned to eleven specific enzymes responsible for the direction, and speed of glycolysis. Finally, techniques used to measure anaerobic energy systems will be reviewed.

Postural Calf Muscles

The rear calf muscles are the main focus, and get the bulk of work in most bodybuilding circles. However, the fact still remains, that the majority of athletes in our sport are underdeveloped in this area. By compiling a true physiological understanding of these muscles, you will not only be able to correct their weakness, but actually make them a great strength in your bodybuilding arsenal! There are 5 muscles to the rear, and some break it up into six, due to diversity within muscle groups.

Note: We will also cover the two muscles that made up the side region of the lower legs.

1. The Gastrocnemius, Medial and Lateral Head - Aesthetic attributes.



The gastrocnemius medial head is to the left of your screen. The gastrocnemius lateral head is to the right of your screen, while the Achilles Tendon cord like structure shown at the bottom of the pic.

As far as pure freakiness, nothing in the world can match a fully developed gastrocnemius! On stage, and oiled up, it resembles an oversized diamond, cut and fashioned in a way that a jeweler could never match. Others view it as a backwards heart, which is fitting, because a freaky gastrocnemius will get the crowds own hearts to beat 100 miles an hour!

In the pure realm of beauty and admiration, this muscle group stands alone. Great sculptors of all time have concurred with this and taken special care to chisel incredible posterior muscles on their works of art. Another amazing fact regarding this region, is that not only is it the most prominent muscle of the rear lower leg, but the medial head can be seen clearly from the front (on the medial aspect of your calves). Combine this muscle with the tibialis anterior and you will have created a masterpiece!

List of Aesthetic Features

- A.** The largest muscle in the rear calf region, therefore a prime focus for enhancing your overall calf's size/tape measurement. If you ever want to develop, big 21 inch calves, you will need to seriously target this area.
- B.** Cannot be hid, in any pose. You can hide other weaknesses, but the gastrocnemius will always either make, or break you! Its like trying to win a race with deflated tires!
- C.** If you are a casual bodybuilder and just want to improve your appearance, no one can deny, the inspiring beauty of a well developed gastrocnemius. When greatly built, you'll be counting the days till shorts season!

D. Combined with the tibialis anterior, it make your calves look drastically huge from the front.

E. The Medial Head, provides inner calf thickness

F. The lateral Head provides outer calf thickness

And much, much more!

Physiological Analysis

Technical Origin and Insertion Points

Origin: Medial and Lateral Condyles of the Femur

Insertion: Tendocalcaneus or Achilles tendon. This tendon inserts into the heel bone, or calcaneus.

An examination of this muscle group will lead to some startling conclusions! Conclusions that most athletes never consider when working this massive region. You see, unlike other muscles in the lower leg, the gastrocs does not originate in the tibia, or fibula, but rather on the femur! This the main upper leg bone, that connects into the lower leg to form the knee joint. It is this particular joint that the gastrocnemius crosses. Due to this intersection, you will find that this muscle has properties at two joints, rather than one! The lateral head of the gastrocnemius inserts into the very bottom, lateral aspect of the femur, and the medial head inserts into the medial edge of this bone. Each are connected, by two separate tendons, which as you will see has extreme significance.

The meat of this muscle spans a majority of the rear, lower leg, and then about 3/4's downward it connects to a tendon we are all familiar with, called the Achilles tendon, also known as the heel cord or tendocalcaneus. As you can see, this is a very thick tendon, which unfortunately is a target for many injuries, the tendon then ends at the middle of your heel bone.

Actions

1. Due to its insertion point (into the heel) the gastrocnemius first acts as a planter flexor of the heel. However, its origin effects the efficiency of this tremendously. You see, when your knee is flexed or bent the gastrocnemius becomes very slack, and cannot generate much tension. Therefore, attempting to work this muscle through plantar flexion, while seated would be rather futile. Its positioning, makes it a poor planter flexor when in this position.

When the knee is extended or straightened however, the gastrocnemius becomes a stupendous planter flexor, and most definitely should be worked against resistance (it can develop maximum tension). It is for this reason, that standing exercises are preferable when working this region. The basics would be standing machine calf raises, standing feet on the ground barbell calf raises, standing heels elevated calf raises, donkey calf raises, one legged donkey's, etc. (more theories on variations will be discussed in the final calf article in this series). The gastrocnemius will be shocked into growth quickest, through constant variation. This variation can be

extremely simple. For example, try performing standing calf raises, with your feet flat on the ground with your shoes on, now try performing them with only your bare feet. There was a complete difference in the movement. Now try performing them in your socks on carpeting. Even that was a different contraction. This is in line with Henry's Specificity hypothesis. That variations in tasks will effect the activation of the musculature drastically. In fact while performing them in socks, you also had to worry more about balance, due to the slipping action. The process of balancing, and performing the exercise will recruit more muscle fibers than you normally would have.

Listen, if your goal is to develop freaky calves, you need to get out of your comfort zone, and start varying in every way possible. It's about getting into the uncomfortable zone! Only then will you grow at an optimal rate! This means that you need to use every variation possible. Another technique is to change the platforms you use to elevate your toes with. For example, I may use a hard, high box one workout, then another; I may use a platform that is rounded at the edges, providing a smoother contraction. Another week I will take one of the hundred pound, thick plates, and perform one-legged calf raises on them without anything to lean on. I essentially never use the same platform to elevate my toes in two consecutive workouts, and I suggest that you do the same. In fact, if you are comfortable with your current platform, then switch immediately, you are undoubtedly slowing growth!

Additionally, I feel that no exercise on earth can beat the leg press calf raise for the gastrocnemius. It allows you to do something that other exercises do not. Which is to actually view the muscle group while it is being worked. It also enhances focus. Therefore make sure and incorporate these into your gastrocnemius training. And as stated in my article on frontal calf raises I would highly recommend resisted plantar flexion curls with both a cable and a theraband (see anatomy of the calves part one for more info on therabands). A person emailed me and asked how he could break his calf slump. I told him, to use curls, just as he would for his forearms in every routine. When he took my advice, he put on tremendous size in the first month and emailed me back ecstatic over his new gains!



use resisted plantar flexion, with a cable and therabands

I emphasized this before, and I will do it again. There is no way, that you would not include wrist curls in your forearm routine. Why treat your calves differently? Not to mention it's an easy exercise (at least from a functional standpoint). Try incorporating this one into the Austrian Blitz and watch your gastrocnemius grow like a forest fire! Towel extensions work like a charm as well. Simply grasp a long towel, and extend your legs in front of you. Wrap it around one or both of your feet. Pull your foot backwards and towards your shin for resistance, and then plantar flex against the towel.



starting position for towel extensions

Get that Heel Up Man!

If you honestly asked most athletes what they focused on when performing calf raises, they'd say, that it was raising the weight. Weight lifters lift weights, bodybuilders focus on the movement. Remember, the gastrocnemius inserts into the heel and is responsible for plantar flexion, of the heel! This means, that your focus, needs to be on raising the heel as high as possible! Literally create a mind body part connection with your heel and only focus on raising and lowering it, as high and as low as possible. When your focus is off, renew it! All your concentration, needs to be centered entirely around the heel when working the gastrocnemius. I cannot stress this enough! The higher you bring it up, the more fibers will be stimulated! Furthermore, this muscle will be exposed to more tension.

How to Target The Medial or Lateral Head

Even though you may have well developed gastrocs, your medial head may be lacking, and lateral well developed, or your lateral may be lacking and your medial well developed. Due to their different origins, you can place more stress on one head, as when compared to another, and in turn specialize that head for more selective growth. Magnetic resonance imaging (1) has shown that standing, bent at the waist exercises place more stress on the medial head of the gastrocnemius, and little on the lateral head. While standing calf raises enhanced involvement of the lateral head. It is clear that if your goal is to emphasize the medial head (inner thickness and mass) that you should utilize donkey calf raises. Furthermore, it is clear through electromyography that pointing the toes outwards or inwards can have an effect on a specific head of the gastrocs. It is suggested that pointing the toes inwards will place more stress on the lateral head and pointing them out will place more stress on the medial head. Next time you perform calf raises, try both variations and you will understand why this is so.

2. Due to the fact, that this muscle originates in the femur, and crosses the knee joint, it becomes evident that it will have a profound effect on this joint. The question, however is what will this effect be? The answer turns out to be three fold.

A. Firstly, when you are not placing your weight on your foot, the gastrocnemius acts as a knee flexor. However, physiologically speaking, this action becomes maximized further, when the heel, is plantar flexed (generates more tension on the target muscle). This would mean, that any leg curling movement, be it lying leg curls, standing leg curls, one-legged leg curls, or alternating will all work this region significantly! Again, the key is to plantar flex your heel the whole time you are performing these leg curling movements. As you know, the hamstrings are also "knee flexors." It is for this reason, that countless athletes work the hamstrings and

calves in the same workout! You can either pre-fatigue the calves with hamstring work and then hit the gastrocnemius afterwards, or try supersetting them! Anyone who has ever done standing calf raises, supersetted with lying leg curls, knows just how painful this combo can be, and also how effectively it can stimulate growth. This superset, literally works the calves from top to bottom. With standing calf raises focusing on the ankle joint below, and lying leg curls focusing on the knee joint above.

Yessis Raises

Dr. Mike Yessus developed an excellent exercise that works the glutes, hamstrings and calves in one swoop. I call them Yessis raises, and others call them glute-ham-gastroc raises. This was originally developed to enhance a sprinters speed. However, this would seem to violate the specificity hypothesis. Regardless of this flaw, it does serve as an excellent movement for the gastrocs. Essentially it is a hyperextension with a bend in the knee. Therefore set yourself up like you are doing a hyperextension, when you reach the point in which your body is straight, bend your knees in and bring your torso all the way up wards and backwards until it is perpendicular to the ground. It is this curling or bending motion of the knees that blasts the gastrocs (make sure and plantar flex them during the curling movement)! Another great combo is Yessis Raises, followed by donkey calf raises, immediately polished off with lying leg curls. It's all about hitting the calves with as many angles, techniques and sequences as possible! Do not blame your genetics, when your program is lacking. That is never the answer.

B. A very intriguing fact concerning functionality, is that the gastrocnemius, also combines with the hamstrings to extend the knee. However, this only takes place when you are standing, the leg and foot are bearing your weight, and your knee is flexed (bent). At this point, the hams and gastrocs combine forces to extend the knee and bring it back it to a straightened position. The above conditions, must be met however. So do not think that leg extensions will work this region.

C. This muscle group also rotates the knee inwards.

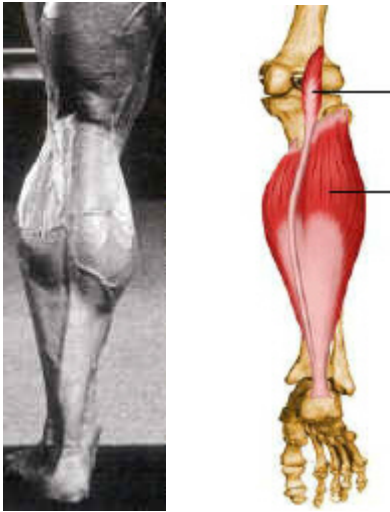
Muscle Fiber Ration of The Gastrocnemius, Medial, and Lateral Head

There has been a tremendous amount of research done on this particular muscle and the findings are of extreme importance to the hypertrophy athlete! The medial head is made up of approximately 50.5 percent fast twitch muscle cells and 49.5 percent slow twitch cells. However, the lateral head is 57 percent fast twitch and only 43 percent slow twitch in makeup (1, 2, 3, 4, 5, 6, 7, 8, 9, 10)! This information confirms, that a slower twitch rep scheme could conceivable build the medial head more than the lateral head, and a faster twitch rep scheme(i.e. heavier weight, and lower reps) could build the lateral head more than its neighbor!

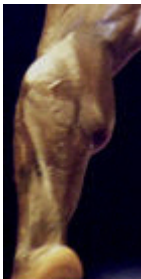
Finally, several articles proclaim that the gastrocnemius is primarily fast twitch, and that it should be worked with purely low reps. However, this can be deceiving(because type II fibers are only in the majority by a few percentage points, and authors who do not know the percentages, but have heard of the majority lean on this concept). Slower twitch fibers still make up, almost half of the muscle group. To ignore these would be to ignore hundreds of thousands of

muscle fibers (and for most bodybuilders walking to our cars isn't going to work these enough!)! To give you the exact numbers, the gastrocnemius medial head has 1,000,000 muscle fibers in total (10)! This means that over 490,000 fibers are slow twitch, which makes for a lot of growth potential! Therefore my suggestion is to use rep schemes that hypertrophy both your fast and slow twitch fibers! (I actually explain how to do this, in the following article [click here](#))

2. The Soleus - Aesthetic attributes.



Athletically speaking, the soleus is perhaps second to no muscle, in the lower leg! Its appearance is often likened to the letter V. In fact, I can think of no better way to describe it! It adds mass, thickness and shape to the lower half of the postural leg. Much of the soleus also lies underneath the gastrocnemius, which means that building it up, will thicken the entire calf region, and make it appear, as if you had directly added mass to the gastrocs.



That's what I call Freak!!!
Look at how the Soleus
adds the V-shape and
The Width.

Furthermore this muscle sprawls outwards, and even though it lies underneath the gastrocs, its width surpasses its suppressor! In fact, when speaking of calf width, no muscle adds more, than the soleus! And it does so from the ankle joint all the way up past the gastrocnemius! As for posing, the soleus will enhance everything from the rear, and also heavily enhance side poses.



The soleus is the thick muscle that hangs to the outside of the gastrocs, and spirals down. Even from this side pose, you can see its V shape.

Physiological Analysis of The Soleus

Origin – Soleal Line

Insertion – Achilles Heel

This muscle originates in the very upper fibula and tibia. Unlike its neighbor it does not cross the knee joint. It then sprawls downwards and hugs/connects to the edges of the Achilles tendon. Again, because it does not attach to the femur, it can be almost completely isolated from the gastrocnemius.

Actions

1. The soleus, like the gastrocs is activated purely at the heel! And acts as a prime dorsi flexor in this respect. However, unlike the gastrocs, it is best worked when your knees are bent, or there is flexion at the knee joint. In fact, both electromyography and magnetic resonance imaging show little or no involvement in the gastrocs while seated, and conversely so heavy involvement in the soleus (1). Therefore, you can best work this muscle in a seated, or squatting position! These include, seated machine calf raises, seated barbell raises, seated smith machine calf raises, seated one dumbbell calf raises, seated weighted raises etc. Another excellent variation, is seated vertical leg press calf raises. Simply place your knees underneath the pad of a vertical leg press machine (this is where your feet would normally go) then elevate your heels on plates or a block. From here perform seated calf raises.

For those of you who have not heard of beefcake raises, you need to try them! These are perhaps the best mass builders of all time for the soleus (see exercise section). These can be adapted in several ways! For example, if you sit on a leg press and bend your knees so that your calves touch your hamstrings, you can perform beefcake raises on the machine! I like using them on the vertical leg press as well! I would also do them with dumbbells, elevated with plates, not elevated with plates, on a smith machine etc. Only if you understand the physiology behind calf training, can you appreciate such a brutal exercise!

Did You Say Seated Donkey Calf Raises!?

This exercise is only meant for the hardcore athlete. If you are squeamish, scroll past this! I would say, that this builds mass in the soleus, just as effectively as

traditional donkey calf raises build up the gastrocs! Simply take a seat on the edge of a sturdy bench. I would recommend placing the bench under a chinning bar. Then elevate your feet (the front half) on a calf block, or a pair of plates! From here have your partner stand on your lower quadriceps, essentially right where the seated calf machine pad would normally go! Now perform calf raises! *If you are hardcore,* and super warmed up, you will utilize this exercise! Not only is it challenging, but it works, and I mean big time!

Curling and Cable Motions

In order to utilize curling motions here, you will want to maintain a bend in your knees to isolate the soleus. Extend them for the gastrocs, and bend them for the soleus.

Full Range of Motion For The Soleus - Form

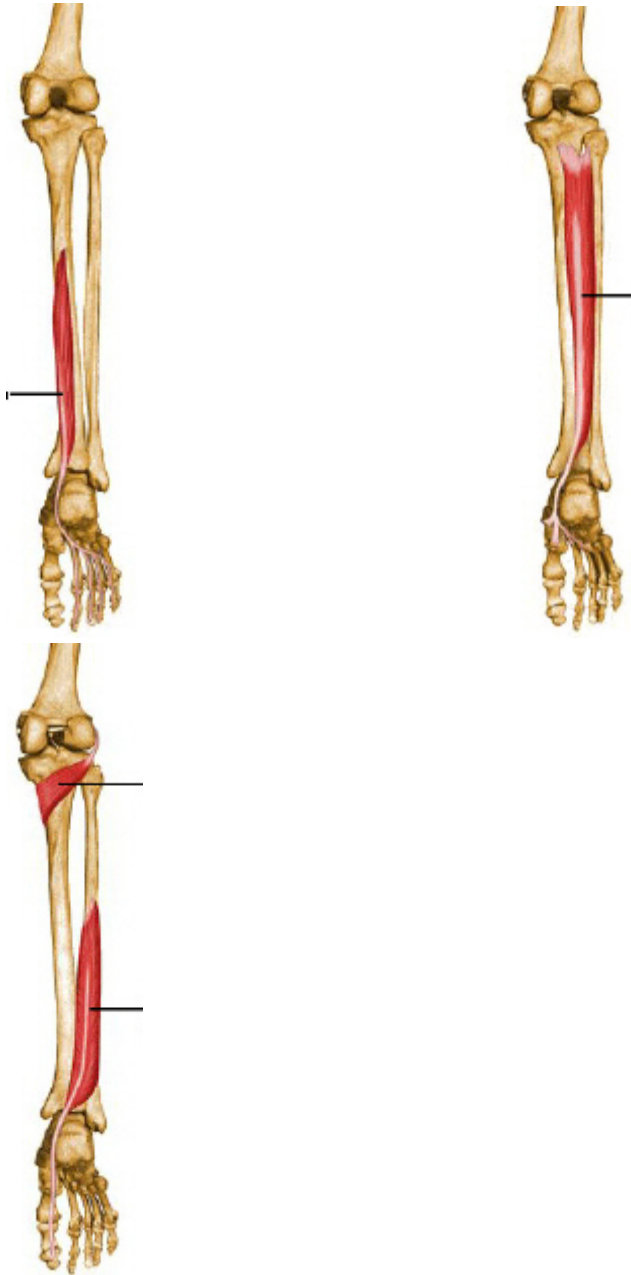
The following information is vital to Soleus training! This muscle group is best incorporated, and isolated when the starting position has your foot dorsi flexed and your knees are bent, taking even more stress off of the gastrocs and onto the soleus. In other words, the farther you bring your legs inwards on the seated calf machine, the better. The key is to bring the pad of the machine into your body and to bend your knees, so that your lower legs are as far backwards as possible. For example, next time you go into the seated calf raise machine, measure the angle your lower legs and thighs make. Its approximately 90 degrees correct? Most trainees take this approach to the seated calf raise, and it's slowing their growth! You need to break this angle immediately. Bring that lower leg closer into your body, and you will work the soleus way more efficiently, and your pump will double in its effectiveness, which stretches the connective tissue!! Again, this is why beefcake raises are so genius!

Muscle Fiber Ratio in The Soleus

Get ready for this: The soleus is on average 89 percent slow twitch and only 11 percent fast twitch in its makeup! Further, people can have this muscle consist of up to 98 percent slow twitch fibers (6, 10)! What does this mean? It means, low reps will do little in the way of hypertrophy. You need painfully high repetitions to burn it out. One of my favorite methods is the rest pause technique. You see, because these fibers are so resilient, and so rich in mitochondrial density, they will recover almost immediately! Therefore, if you perform a set of 15 reps to failure, after 10 seconds you will almost be able to repeat it. Try picking a weight you can only do 15 reps with, and rest pause out 60 on the seated calf raise machine! Better yet, try choosing a weight you can do 25 repetitions with and rest pause out 125 on the seated calf raise! Your soleus will be so enflamed the next day, that you'll have trouble getting out of bed!!!! Since 10 percent of the muscle is fast twitch, a heavy set here and there can still be beneficial. Just make sure that your prime focus is to target and hypertrophy the slower twitch muscle fibers.

Note: Again, this inserts into the heel. Your focus needs to be raising the heel, not the weight!

3. Flexor Digitorum Longus, Flexor Hallus Longus, & Tibialis Posterior - Aesthetic attributes.



1. Flexor Digitorum Longus Posterior

2. Tibialis

3. Flexor Hallus Longus (lower larger muscle)

" I can feel his presence Master Yoda. " Bodybuilding is a gladiatorial sport. In essence, we must develop our senses, beyond sight, and when this occurs, you will be able to master, the " unseen. " The above three muscles, lie underneath the soleus and gastrocnemius, and thus cannot be detected, directly with the naked eye. Does this mean, that they should not be a major focus? Absolutely not! Hypertrophy, literally means to increase in size. If these muscles grow, then they will still " thicken " the entire calf region! From a judge's point of view, it will appear

as if you have developed larger gastrocs, and soleus muscles. When in reality, you had built the muscles that lie behind them, in turn pushing the muscles superficial to them outwards. I call this the balloon effect!

Broken down further, the flexor digitorum longus enhances mass on the lower medial half of the postural calves. The tibialis posterior enhances center thickness big time throughout the entire length of the shin bones (this should be a major, major focus!) ! And finally the flexor Hallus Longus enhances, the lower, lateral half of the postural calves.

Physiological Analysis of All Three Muscle Groups

A. Tibialis Posterior

Origin – Posterior surface of the superior aspect of the interosseus membrane and tibia and fibula.

Insertion – Navicular and cuneiform bones, and bases of the second, third, fourth and fifth metatarsal bones.

The first I will discuss is the tibialis posterior. Simply because, I feel that this muscle group, has the highest effect on mass out of these three regions. As far as pure thickness and density, this muscle is tops!

The tibialis anterior's postural brother originates at the very top of the tibia and fibula, with a short, thick tendon. The meat of the muscle then runs downwards along the middle of both bones. At the ankle joint, the fascia expands out into a tendon, which goes around the heel (medially), under the foot, spreads out into four extensions and connects itself into the base of the second through fifth toes, right before they actually begin (called the metatarsals).

Actions

1. This muscle group plantar flexes the foot. It also is responsible for foot inversion! Essentially, this means that if your goal is calf thickness, you will want to plantar flex and invert your foot at the same time. If you are doing standing or seated calf raises, your peak contraction will be reached when, at the end of the movement you contract toward your pinkie toe, rather than onto your thumb toe! **All the methods above in plantar flexion** will work for the tibialis posterior, but you must emphasize the inversion process, if you want it to fully develop!

Another method, which works fantastically, is to plantar flex your foot. Then use your hand, a towel, a cable, or theraband as resistance and inverse your foot for repetitions.

2. The tibialis posterior also helps support the lateral, medial arch. Therefore, you will want to also incorporate calf raises on one foot ([see the ultimate anatomical guide to freaky big calves part II](#) for further detail on the medial arch).

B. Flexor Digitorum Longus

Origin – Middle third of posterior surface of tibia

Insertion – 2nd through fifth phalanges.

The flexor digitorum longus, is a very long, and narrow muscle. It originates into the back of the tibia, then the muscle sleeks downward, along the bone, until it splits off into a tendon, which then extends out into four parts, each connecting into the very ends of the second through fifth toes (the fifth toe being the pinky toe)!

Actions

1. Like the previous muscle, this both plantar flexes the foot and inverts it as well. Therefore the same techniques above work here. However, because of its positioning, this muscle group also flexes the last four toes, and helps to grip the ground. Therefore, I suggest if your goal is to work this, with greater efficiency to take your shoes and socks off and go bare foot. And at the top of the movement, push downwards with your last four toes. If you focus on that insertion point, the flexor digitorum longus will grow quicker. Finally, I recommend newspaper toe grasping. It sounds strange, but it's really simple. Just place a newspaper on the ground, and grasp and un-grasp it with your toes. Everyone is familiar with handgrips for the forearms. This is basically the same principle here. In fact try a set of 100 reps of just crunching and uncrunching a newspaper, and you will feel a serious blood pump and lactic acid build up in this muscle group. You can also pre-fatigue it with newspaper grasping movements, and then finish it off, with inverted toe raises!



C. Flexor Hallucis Longus

Origin – Middle two thirds of the posterior surface of the fibula

Insertion – Base of the distal phalanx of the big toe, under surface.

The flexor hallucis longus originates into the back of the middle of the fibula, runs down the remainder of the muscle, then its fascia extends into a tendon, goes around the heel and inserts into the very end of the big toe!

Actions

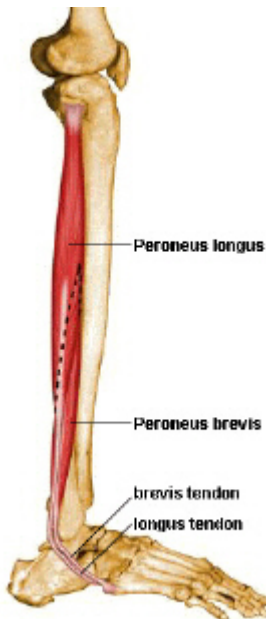
Again, like the two previous muscles, this both plantar flexes the foot and inverts the foot. However, it also flexes the big toe. This is a rather large muscle, and is worth your effort. I suggest pre-fatiguing it with newspaper grasping and then performing standing calf raises, with an inversion of the foot at the end of the movement. In fact, you may as well kill two birds with one stone, and grasp the newspaper with all 5 of your toes, hitting both the flexor hallucis and digitorum longus. Then when you go to standing calf raises, you can finish them both off! Consequently, this is the

muscle responsible for push off in both sprinting and walking. Every time you push off of your big toe, you bring in the Hallucis Longus!

Side Calf Muscles -

I often liken the calves to the deltoids. There are essentially three regions in both, and if one is left out, the much sought after 3d look is sacrificed. We have already covered the anterior, and posterior lower leg regions, in order to conclude, we need to discover the muscles that lie at the sides of the calves.

Peroneus Longus & Peroneus Brevis - Aesthetic Features



As you can see, these two muscles, add serious mass, and thickness, from the top to the bottom of the lower leg region! Furthermore, they add lateral width when standing straight forward or backwards to the crowd. Again, these two combined can be likened to the side(lateral) head of the deltoid complex.

Physiological Analysis of All Three Muscle Groups

The peroneus longus originates at the very top of the fibula, the peroneus brevis originates midway into the fibula. Both curve around and underneath the foot and on the medial cuneiform.

Actions

Both of these muscles assist in plantar flexion and also eversion. Therefore, if your goal is to bring the side calf muscles into play, you need to finish your peak contraction, with an eversion at the end. Which would mean that you need to roll onto your big toe, naturally everting the foot. If possible, try and lift the other half of your foot off of the ground, as it will enhance contraction. These muscles also support the lateral arch, which is of extreme importance!

Finally I would suggest plantar flexing your foot and then using a cable, theraband, towel or your hand as resistance, while you evert your foot for repetitions. This is by far, one of the best ways to build mass on the side region of the calves.

Muscle Fiber Ratio's of The Peroneus Longus and Brevis

The peroneus longus is 62.5 percent slow twitch type one fibers, and 37.5 fast twitch(6, 10). With this in mind I would train equally high reps, as I did lower rep, heavy sets for the peroneus longus. I believe that the Brevis is similar in composition. I do not have the extensive and actual human studies on the brevis as I do from the longus. But I do have the composition from a host of animals, and they are all similar to the longus, as compared(2).

How To Stretch The Preceding Calf Muscles

I discussed in detail how to stretch the calf muscles in my [muscle memory article](#). However, let me stress, that the gastrocnemius can only be stretched properly when the knee is extended and maximum tension is placed on the muscle. Aside from the stretches I mentioned in the above, I would recommend a basic towel stretch. Simply extend your knee in front of you, wrap a towel around it and pull backwards on the sole of your foot. Here is what I mean:



The soleus however, is best stretched with:

- A. A bend in the knee
- B. Dorsiflexion at the ankle like so:



Conclusion

The last three articles, have covered an insane amount of information on the ankle joint, twelve individual muscles making up the lower leg, advanced techniques, insane exercises, stretching instructions, and a host of other factors. We certainly have come far. However, you know my style, and I never leave my readers wanting more! That being the case, I will finish this insanely difficult subject off with one more article! An article that goes back to what abc is all about...being hardcore and innovative! In order to find out what, you need to read [The Ultimate Anatomical Guide To Freaky Big Calves Part IV - The Final Frontier!](#)

Yours in Sport

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References

Target Bodybuilding Per A. Tesh

Ariano, M.A., Armstrong, R.B., Edgerton, V.R. Hindlimb muscle fiber populations of five mammals. *J. Histochem. Cytochem.* 21:51-55, 1973.

Boyd, I.A., Davey, M.R. The composition of peripheral nerves. pp35-52 in *Control and Innervation of Skeletal Muscle*, ed. B.L. Andrew. E. & S. Livingstone Ltd. Edinburgh. 1966

Boyd, I.A., Davey, M.R. The composition of peripheral nerves. E. & S. Livingstone, Ltd. Edinburgh, 1968.

Acosta, L., Roy, R.R. Fiber-type composition of selected hindlimb muscles of a primate (cynomolgus monkey). *Anat. Record* 218:136-141, 1987.

Johnson, M.A., Polgar, J., Weightman, D., Appleton, D. Data on the distribution of fibre types in thirty-six human muscles. An autopsy study. *J. Neurol. Sci.* 18:111-129, 1973.

Buchthal, F., Schmalbruch, H. Contraction times and fibre types in intact human muscle. *Acta Physiol. Scand.* 79:435-452, 1970.

Buller, Dornhorst, A.C., Edwards, R., Kerr, D., Whelan, R.F. Fast and slow muscles in mammals. *Nature* 183:1516-1517, 1959.

Garnett, R.A.F., O'Donovan, M.J., Stephens, J.A., Taylor, A. Organization of human medial gastrocnemius. *J. Physiol.* 287:33-43, 1979.

Cooper, S. Muscle spindles and motor units. pp 9-17 in *Control and Innervation of Skeletal Muscle*. ed. B.L. Andrew. E. & S. Livingstone Ltd. Edinburgh, 1966.

