

6 WEEKS TO

INDESTRUCTIBLE

KNEES



By John Izzo, NASM-CPT, PES

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Constructing Indestructible Knees

A 6-Week Program Utilizing Fascia Enhancement, Integrated Flexibility & Associated Movement Control

By John Izzo, NASM-CPT, PES

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Author Biography: John Izzo is an accomplished fitness professional with over a decade of experience working with people to achieve things they never thought possible. He is a commensurate professional and coach, that supports others achieve great levels of fat loss, sports performance, and optimal health. He is a listener and an opportunist that believes in working hard by meeting challenges with passion and tenacity. John is certified through the National Academy of Sports Medicine (NASM); is an avid writer for his popular blog (www.TrainerAdvice.com), and is an avid weight-lifter. He trains clients at his facility IZZOStrength & Performance, located outside of

Hartford, CT.

Constructing Indestructible Knees

By John Izzo

According to a report by Consumer Reports recently, knee replacement surgery has become one of the most common major orthopedic surgeries performed. You can read this study in its entirety here: (<http://www.courant.com/business/custom/consumer/hc-ls-consumer-reports-better-joints-20130119,0,6766056.story>)

Where did they get this study done? It was derived from Medicare data published in the Journal of American Medical Association. What has caused the rise in this very evasive surgery? The rise can be attributed to aging baby boomers—but also reflects a rise in obesity rates and an unwillingness to live with pain or disability. As a personal trainer working with primarily active older adults (over 55) that love to play golf, tennis and travel, I see more and more the “acceptance” of getting knee replacement surgery first hand. Many active individuals with proper insurance, financial resources and support; opt into receiving a new knee. However, this surgery is possible to delay or even prevent with an effective exercise program performed regularly.

As with any joint in the body, susceptibility to injury increases with age, activity levels and sport. As a trainer I have seen my share of clients with debilitating joint injuries. And with many joint injuries, some can be worked around. However, injuries to the knee have always taken their toll on individuals. Debilitating knee injuries or pain have always lead to a decrease in activity levels due to the pain experienced while standing, walking or taking stairs. These basic locomotive movements are the fundamental essentials for activity. With a decrease in activity levels, one will experience an increase in fat levels, lowered cardiac-work capacity, and decreased strength levels (mainly in lowerbody). As

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an individual becomes more de-conditioned, expect changes in mental health—specifically depression and energy levels.

Understanding the Knee Joint

As a trainer, when I think of the knee joint I immediately think of a door hinge. In between two larger masses that come together you have a “device” that conjoins them. This device or joint, is responsible for bringing together the lower leg and thigh—at two articulations: the femur and tibia and the femur and patella [image 1]. Comparing the knee joint to a door hinge may be over-simplifying it, as the knee joint is the largest joint in the body and is complex. In exercise terminology, the knee joint allows for flexion and extension primarily—with VERY little medial and lateral rotation. The knees support the entire weight of the body and therefore, are susceptible to acute and chronic injury.



Image 1.

The joint is bathed in synovial fluid within its joint capsule. This fluid acts as a lubricant to avoid friction from the bone ends (femur and tibia). The patella, or kneecap, serves to protect the articulating

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cartilage and surface of the joint. In order to move smoothly, the joint is surrounded with numerous bursa sacs. The ligaments surrounding the knee joint offer stability by limiting some movements.

As mentioned earlier, the knee joint resembles a door hinge. It permits flexion and extension. According to the joint by joint approach—popularized by Coach Mike Boyle and Physical Therapist Gray Cook—the knee joint is considered a stable joint. [image 2.]

Joint by Joint Approach

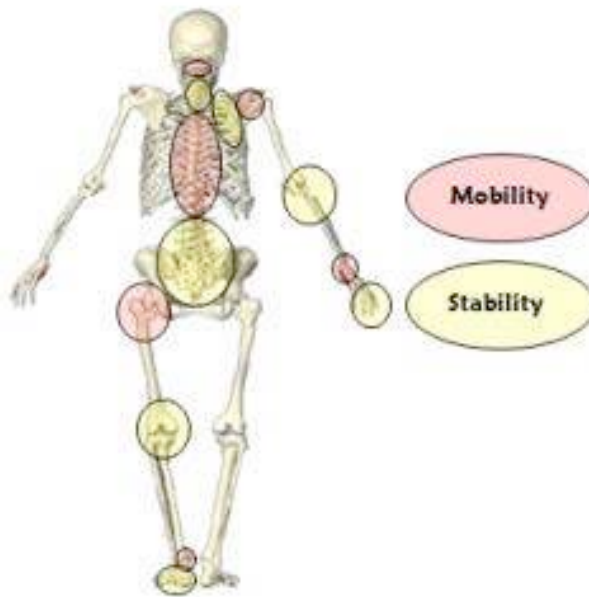


Image 2.

However, the knee joint does provide a slight medial and lateral rotation when it is flexed. The knee joint is called "mobile" because the femur and lateral meniscus move over the tibia during rotation, while the femur rolls and glides over both menisci during extension-flexion. Much of the rotation is possible by the shape of the femur bone's shape. Rotation is also controlled by the twisting of the two cruciate ligaments (anterior cruciate and posterior cruciate ligaments). These two important pieces of connective tissue limit the amount of rotation and usually end up being injured during high velocity sports or movements.

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When designing an exercise program to strengthen the knees, most people concentrate on the actual knees. Seems normal to focus strength training efforts on the area in which you want to strengthen. But the knees are highly influenced by the musculature surrounding them. This coincides with the joints above and below the knees. The knee joint is the center joint between the ankle and hip joint. There are key muscles around these joints that we can target to help strengthen the knees. For this program, I will focus on three areas:

- 1.) **Popliteus Muscle**
- 2.) **Glute Medius**
- 3.) **Feet or more specifically, first metatarsal (big toe joint)**

Popliteus

An important player in keeping the ligaments of the knee taunt and stable, is the popliteus muscle. [Image 3]

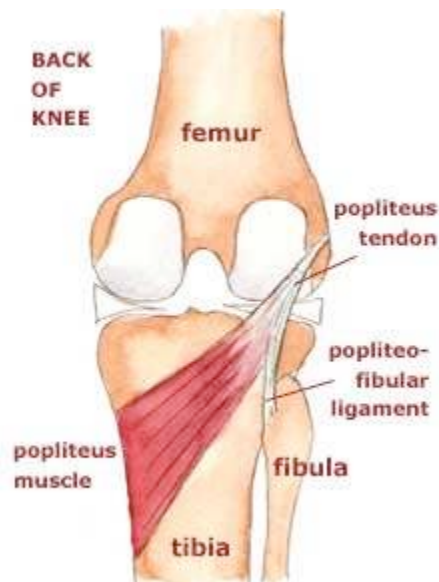


Image 3.

The popliteus originates from the middle facet of the lateral surface of the lateral femoral condyle and inserts onto the posterior tibia under the tibial condyles, with its tendon running into the knee capsule to the posterior lateral meniscus. As you can see by the illustration, the popliteus crosses the two bones and assists in flexing the leg upon the thigh; when the leg is flexed, it will rotate the tibia inward. When the knee is in full extension; the femur slightly medially rotates on the tibia to lock the knee joint

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in place. Popliteus is often referred to as the "key" to unlocking the knee since it begins knee flexion by laterally rotating the femur on the tibia.

Glute Medius

Another player in creating healthy knee joint is the gluteus medius muscle. Located under the massive gluteus maximus, the gluteus medius is responsible for externally rotating the thigh from the hip. The gluteus medius (GM) is also a major player in stabilizing the pelvis. With proper pelvis alignment, the surrounding joints—sacral and knee—can move as intended without additional wear or tear.

Theoretically the knee joint does have some “rotational properties” through connective tissue; however, from a musculoskeletal standpoint, it is functionally designed to be stable. This is where the Joint by Joint Model by Boyle and Cook has emphasized. Helping the knee joint to become stable relies heavily on the strength of the gluteus medius muscle.

When the gluteus medius is weak, a dysfunction is present. One type of dysfunction is termed as Trendelenburg’s sign [image 4.]. Trendelenburg’s sign can occur when there is presence of a muscular dysfunction (weakness of the gluteus medius or minimus) or when someone is experiencing pain. The body is not able to maintain the center of gravity on the side of the stance leg.

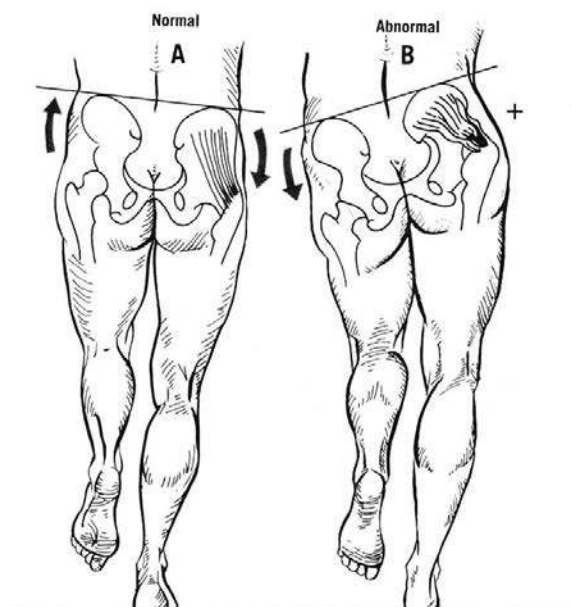




Image 4.

Normally, the body shifts the weight to the stance leg, allowing the shift of the center of gravity and consequently stabilizing or balancing the body. However, in this scenario, when the person lifts the opposing leg, the shift is not created and the person cannot maintain balance leading to instability. http://en.wikipedia.org/wiki/Trendelenburg%27s_sign

Trendelenburg's sign is mostly demonstrated in the elderly population and sometimes, a younger sedentary population. Atrophied gluteus muscles lose pelvis stabilization during walking. Over time, this altered gait wears the articulating ends of the connecting bones and increasing stress in the knee joint. [image 5.] Ultimately, a knee joint replacement will be required.

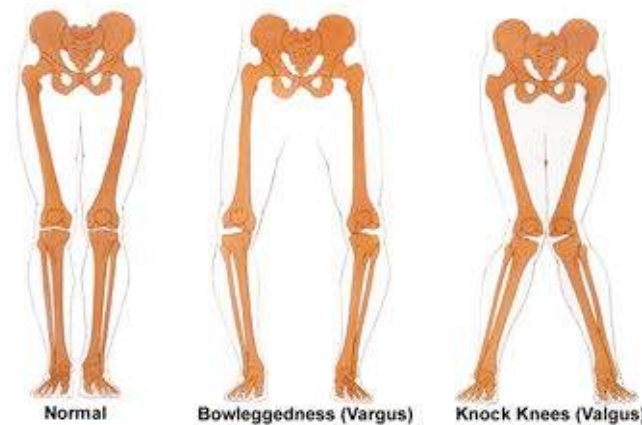


Image 5.

Although the conditions mentioned may be congenital in the younger population, the adult population may experience them due to poor movement habits and lack of proper exercise selections.

Feet/1st metatarsal

A third important factor to knee joint health is the mobility of the first metatarsophalangeal joint (MTP). This is better known as the big toe joint.

Why is the big toe joint important in knee health? There are a couple of reasons, but it is important to note what this joint is capable of doing. Firstly, it can flex, extend, abduct, and adduct and even more, perform circumduction (move the toe in a circular pattern). When the fascia on the bottom of the foot becomes irritated, inflamed and painful, the big toe joint is often not moved by the individual. The plantar fascia becomes tight and begins to restrict movement. The muscles of the feet begin to alter function and when the body is loaded, as in squats—the distribution of weight is changed. Rather than getting an optimal “tripod” distribution of weight from the heel and fore foot becomes impaired. **[image 6]**



Image 6.

With fascia disruption in the foot, individuals will supinate (lean towards the outside of the foot) or pronate (lean inside) —also called flat footed—while walking, and more significantly when performing exercises like lunges, squats, and deadlifts. This alters the joints above—ankle and knee—and collapses the pelvis.

A mobile big toe joint ensures that weight can be distributed evenly because it keeps the fascia and underlying muscles elastic **[image 7.]** You will find that most individuals cannot flex their big toe or plantar-flex the joint without discomfort, strength, or mobility. A mobile first metatarsal joint ensures proper foot mechanics and locomotive action because it allows for the tripod weight distribution position.



Image 7.

Rationale for Indestructible Knees

It is time to take action and become proactive with knee health. This program will focus on three areas relevant to knee health.

- 1.) Tissue Quality** – Taking care of the tissue and fascia of the human body is becoming more and more important when it comes to joint health. Most underlying muscular pains can be minimized with routine massage administered by a professional or self massage tool. The first phase of this program will concentrate on stimulating the proprioceptors within the muscles surrounding the knee joint and releasing trigger points that have developed from prolonged static posture and scar tissue. This will be important whether you are a desk-sitter or a routine weight-lifter that squats too much.
- 2.) Integrated Stretching** – Flexibility is most effective after some sort of myofascial treatment is performed. Once receptor sensitivity is heightened, muscular elasticity is best achieved. A concentrated effort needs to be put into stretching on a daily basis. With age, physiological changes take place that creates a stiffness and restriction in normal joint range of motion. This is exacerbated with dehydration and heavy lifting on a consistent basis. The flexibility component of this program is placed right after addressing the tissue quality.
- 3.) Activation Integration** - Most of the exercises in this 6-Week Program are designed with the weight-lifter in mind. Although, some may be familiar, they are effective as long as they are performed consistently in a program. Each phase in the program constitutes 2 weeks. It is assumed that you will perform the exercises religiously, to progress through each phase. Once

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the 6 weeks are finished, it is also assumed, and strongly recommended that these drills and exercises become mainstays in your exercise program.

Where This Program Fits with Your Current Program

Some of the exercises can be placed in various places within your current program. They can be performed on lower-body days or even cardio days. **As previously mentioned, each phase in the program is 2 weeks. That means you will be performing the recommended drills and exercises for 2 weeks before moving on to the next phase. Be patient.**

If you already have creaky or weak knees, begin this program and follow it precisely. The exercises can be performed during your normal workout routine—even during upper-body training. I like to add them in during warm-up periods before certain lifts and also during recovery sets. A recovery set is a set of exercises or drills performed after a set is completed of a major exercise. Normally used as a “rest” period, this is the time to use performing drills that aid our muscles. Instead of sitting down on a bench playing with your iPod, a recovery set can be performed to save you time and keep your head in the action. For instance, if you were to perform a set of squats; after your set of 10 repetitions, you can use an elastic band to perform a quick set of lateral band walks, and then return to the squat for your second set. With all that being said, these phases must be completed the way they are designed in order to build indestructible knees. If they seem boring or miniscule to you, remember that it is better than sitting on your bed complaining about knee pain and not being able to enjoy activities.

Cues: Building the foundation begins with focus on the pelvis region with stabilization drills. The point of stabilization work is to develop good technique in regards to “setting the pelvis” and “tightening the core”. Stabilization work is great for building isometric strength and improving muscular coordination—including balance. Cues like “tightening the buttocks” usually mean contracting the gluteal. “Tightening” means creating stiffness throughout the targeted region. If the glutes are squeezed or contracted, there is a “stiffness” created that allows the global muscles to stabilize the knee. This also applies to the core.

Self Massage: Tissue quality treatment will be uncomfortable, but manageable. If you have never performed self-myofascial release with a foam roller or something similar (in this program I use a massage stick), then it may be agonizing. The good news is...the more you perform it, the easier it gets. In some cases, you may be very sore the next day to even perform it again. I recommend you vary your pressure and the time you spend on actual muscle knots.

Feedback: For the first week in each phase, it is advised to perform these drills with a workout partner or in front of mirror. Receiving feedback is important as we want to engrain the proper technique within the nervous system. A friend or a workout partner that is rehearsed in this program or shoulder health would be a perfect fit for coaching feedback. If neither is available, try setting up a

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video camera and watching yourself perform the drills from all phases of the program. A camera can be set in the beginning of the week, and then later, follow-up filming conducted later. It is actually pretty cool to watch your form improve over an 8 week period.

How to Use this Information?

I am never a big fan of learning from photographs. They are limited in that they only show the action two dimensional. Unfortunately, it is a highly used vehicle for learning visual actions. More importantly, is the introduction of video nowadays. With that being said, each phase will have a list of the exercises and/or drills with images of the start and end [of each]. On some of the exercises listed throughout this program, **I've accompanied a YouTube link** to check out the exercise being executed on video. I encourage you to check out the link to the video to gain the full learning effect.

Nevertheless, if you have questions pertaining to anything in this 6-Week Program or the video links, feel free to email me a message at john@izzostrengthtraining.com

Now...on to the actual program.

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Phase 1: Tissue Quality Treatment

Phase Duration: 2 weeks

Training Modality: Fascia Treatment

Training For: Improved tissue quality – improved blood circulation, reduce stiffness

Tools Needed: Massage stick, tennis balls or other SMR tool (Foam Roller)

Areas of Focus: Hip Flexor/Adductor Junction, IT Band

Rationale: The glute medius is inter-twined at a very complex junction of the body—the lateral pelvis area. This area is a mixed bag of muscular insertions and tendinous junctions. Most individuals that sit for long periods of time will exhibit the common tight muscles such as the hip flexors, psoas, and the lateral aspect of the thigh including the IT band. The rationale behind this first phase is to improve tissue quality by self-inflicted massage. The drills will help improve blood circulation and help break up fascia strands that are causing restriction and tenderness. I like using the massage stick and tennis ball where applicable because I can vary the amount of pressure used on certain areas. Some parts may need a bit more pressure than others and you can localize the pressure on very specific tender spots. Foam rolling is sufficed in this phase if you don't own a massage stick. Although the foam roller (high density model) is great, you cannot pinpoint certain areas that need special attention or varied pressure. If you don't own a massage stick, try using PVC pipe or a rolling pin from your kitchen drawer.

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Drill: SMR with Massage Stick on Lateral Thighs

How to Perform	Time	Coaching Cues
Lay your leg on a bench or chair and keep straight, without overly contracting any muscles. With the massage stick, roll the hip flexors, outside “sweep” of thigh and psoas area—by varying the amount of pressure you use with the stick.	Time spent rolling depends on the individual tolerance levels and degree of tissue quality. Begin with 20-45 seconds. Perform daily.	You can slowly bend the knee as you focus on the area around the lateral aspect of it.
Placed in Program: Perform daily as part of the warm-up		
See video of this drill here: http://youtu.be/HFO8Hgs2KCg		

See images below:



Massage stick IT band junction with knee flexed for 30-45 seconds.



As you roll, straighten leg.

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Roll lateral hamstring for 30-45 seconds.

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Drill: SMR with Tennis Ball on Foot Bottom

How to Perform	Time	Coaching Cues
Using a tennis ball, lacrosse ball or golf ball, stand on the ball and perform circular and linear patterns along foot bottom. Focus on tender areas and vary the amount of pressure you place.	Time spent rolling depends on the individual tolerance levels and degree of tissue quality. Begin with 45-60 seconds. Perform daily.	Vary your pressure by shifting your bodyweight to each leg.
Placed in Program: Perform daily as part of the warm-up		
See video of this drill here: http://youtu.be/prBFcM-I_RQ		



SMR with tennis ball on soles of feet. Perform circular patterns where applicable and linear patterns along arch. Vary the pressure (shifting bodyweight into and out of the leg of the foot). Perform for 45-60 seconds.

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Phase 2: Integrated Stretching

Phase Duration: 2 weeks

Training Modality: Flexibility

Training For: Reducing joint stiffness, fascia and elongating muscle fibers

Tools Needed: Stability ball with stretching strap, rope or band and small 6-8" step

Areas of Focus: Hamstrings, hip flexors, quadratus lorborum, gluteals and plantar/flexor musculature of foot

Rationale: I prefer most stretching performed DIRECTLY after self massage. The more blood drawn to an area and more proprioceptive alertness, the better stretch you will get out of a muscle. When it comes to knee health, the hamstrings are not really mentioned. Although, a tight hamstring can contribute to knee problems seldomly, we are trying our best to enhance range of motion above the knee joint. Joint stiffness in the pelvis will alter how the knee reacts to certain ground forces. Most people do not stretch their hamstrings often—especially weight-lifters, let alone desk-sitters—and the pelvis will tilt. With a static pelvic tilt, the quadriceps group may alter the pull of the patella (knee cap). Working around the area of symptoms will be the premise of this phase. I don't like people performing quad stretches for better knee health. It puts too much stress on the knee without addressing what the real causes may be coming from.

People never stretch their feet. For some reason, we don't look at feet as muscular components of the body. However, they greatly influence how the rest of the body moves. This is where we pay particular attention to the muscles that underline the feet. Stretching the feet and focus on mobilizing the big toe joint are important in this phase. With all the drills involving the feet, I prefer being barefoot to enhance receptor sensitivity.



Drill: Supine Hamstring Stretch with Band

How to Perform	Time	Coaching Cues
<p>Lying on your back, place a band, rope or strap around your foot. Raise your leg up and keep a “soft” knee. Press your hips into the floor. As you use some exertion to stretch your leg up towards your torso, feel the “pull” of the band and relax the muscle. Then, contract the hamstring and drive the leg down. Allow the band to pull the leg back up each round. You can also angle your leg to target the groin and inner thigh.</p>	<p>Perform reps of 6-8 per leg. Repeat 2x</p>	<p>Keep your hips down to isolate the hamstring. Do not let the opposite leg come up off floor.</p>
<p>Placed in Program: Directly after SMR work or as part of the cool down.</p>		
<p>See video of this drill here: http://youtu.be/84utVczxRHk</p>		

See images below:



You can also anchor the band to an object near your head as in photo. Make sure you keep your pelvis and opposite knee down as your leg is raised.



The stretch should be uncomfortable, not painful. Hold each stretch for 4-6 seconds and perform 6-8 repetitions

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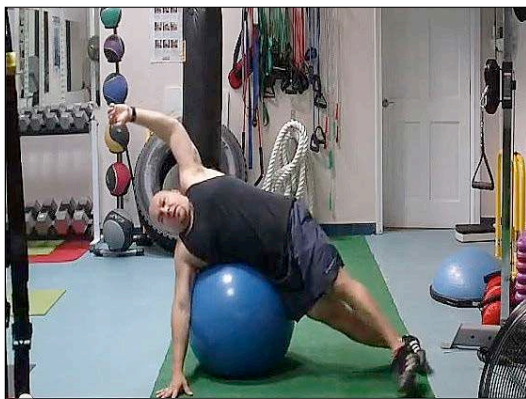
Turn your leg out to target the inner thighs muscles.



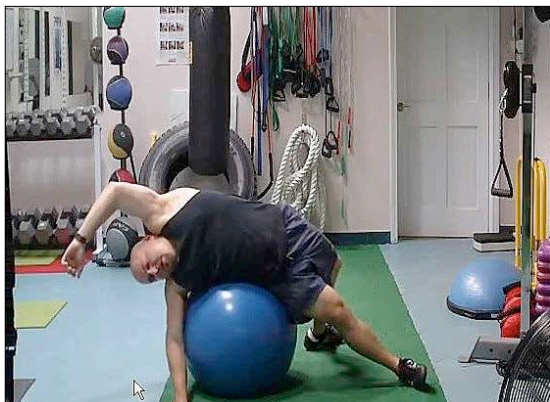
Drill: QL/Lateral Body Ball Stretch

How to Perform	Time	Coaching Cues
Lying on an appropriately sized stability ball. Next turn to your side while on the ball and use caution. Scissor your legs to gain stability and begin to lie completely on the lateral aspect of your body. Use your arm to rest on the floor and assist in balance. Use your outer arm to intensify the stretch. Raise your arm when comfortable in the stretch; and turn your hips up to target the hip flexors.	Hold this stretch for 10-15 seconds on both sides. Repeat 2x	The goal of this stretch is to conform to the spherical shape of the ball with your body as much as possible.
Placed in Program: Directly after SMR work or as part of the cool down.		
See video of this drill here: http://youtu.be/fKVWd0W-us4		

See images below:



Raise outer arm to target lats, obliques, QL, and bring outer thigh over (scissor) to target outer thigh sweep.



Pretzel the body over the ball when comfortable.



Drill: Foot Stretch with 6-8” Step

How to Perform	Time	Coaching Cues
<p>Place a step about 6-8 inches high behind you. Preferably barefoot, place on foot behind you on step. With the front foot and leg in front, descend in a semi-split squat position allowing for a stretch of the back foot. Press your big toe into the step and bend the joint. You will feel a tremendous stretch in your plantar fascia (foot bottom). Control the amount of pressure placed in the stretch with the amount of descent placed in the squat. Keep your torso erect and lower back neutral.</p>	<p>Hold this stretch for 10-15 seconds on both sides.</p> <p>Repeat 2x.</p>	<p>The goal of this stretch is flex the big toe joint—which should be uncomfortable, but tolerable after a few reps.</p>

Placed in Program: Directly after SMR work or as part of the cool down. Can also be performed in between sets of lower body work.

See video of this drill here: <http://youtu.be/J99RbxycHP8>

See images below:



Use caution with this drill. If you suffer from pain or discomfort before performing it, limit the time you hold.



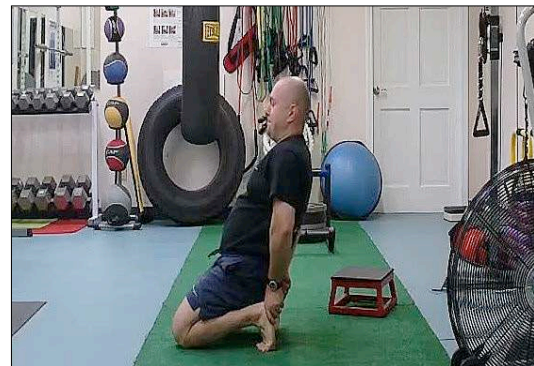
Drill: Double Kneeling Foot Stretch

How to Perform	Time	Coaching Cues
<p>Begin with kneeling on both legs. Plant the toes into the floor behind you and keep an upright position. Slowly, lean the torso backwards so that a stretch can be felt in the bottoms of the feet. The mobility of the joints in the foot will determine how far back you can go. Use caution when leaning back. If this stretch is too aggressive, you can also perform a rocking motion (side to side) as you plant each foot and stretch the soles.</p>	<p>Hold this stretch for 10 seconds on both sides.</p> <p>Repeat 2x.</p> <p>If rocking, rock side to side for 8-10 reps 1x.</p>	<p>The goal of this stretch is flex the big toe joint—which should be uncomfortable, but tolerable after a few reps. Stop this exercise if you feel any pain in lower back or knee area.</p>
<p>Placed in Program: Directly after SMR work or as part of the cool down. Can also be performed in between sets of lower body work.</p>		
<p>See video of this drill here: http://youtu.be/i4h8cYqCAv0</p>		

See images below:



(rear view)



(side view)

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Rocking version.

Simply rock body side to side while in stretch.

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Phase 3: Integration

Phase Duration: 2 weeks

Training Modality: Muscular Control and Movement Education

Training For: Glute integration and overall lower body coordination

Tools Needed: Cable tower or long bands (41") and rope

Areas of Focus: Lower Body, Core

Rationale: Integrating muscles to work together is mostly important when all the muscles are “on” and “alert”. Now is the time to integrate the muscles of the lower body after we have focused on better tissue quality and activated the gluteals. If you remember, we are enhancing knee joint health and we start with the surrounding musculature. The lunge is possibly the most challenging movement to coach and perform optimally. Most individuals perform a lunge with the wrong mechanics and place too many stresses on the knees. At this point after manipulating the tissue surrounding the glute medius, we will attempt to “turn it on” by isolating the glutes with a mini band. Mini loop bands come in different tensions based on manufacturer and color. I prefer using a medium-based tension, but for some with atrophied gluteals, a lighter tension (most of the time yellow), will suffice. This is a simple movement preparation drill to get the glute medius to “fire” during flexion and extension exercises under loads. It should be performed directly after using the massage stick or foam roller, as proprioceptive and nervous system responses are high at this point. Ideally, you should go into your lateral band walking drills within 1 minute of ending the massage stick drills. In the images that accompany this section, you will notice that I place the band at certain points along the leg. Different lever points will stress different parts of the gluteal muscles and I like to incorporate all. Most people with tight hips and tender IT bands will feel an automatic burning sensation with this drill. It’s important to keep the feet externally rotated to concentrate on the GM and find the right band location for you.

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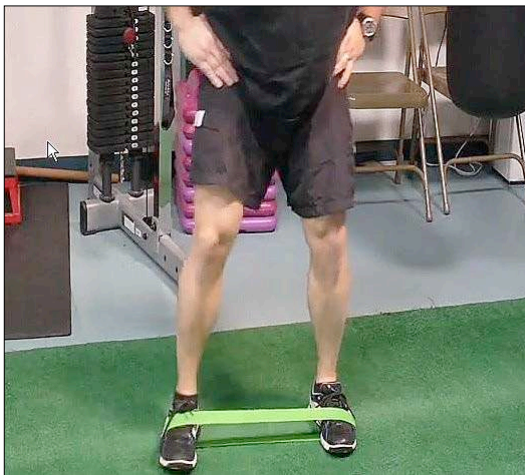


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Drill: Lateral Band Walking

How to Perform	Time	Coaching Cues
Place the band beginning with the foot. Each loop should come around the fore-foot and stay on securely. With a tight core, and knees slightly turned out (externally); keep the hips squared and take a small step out to the side. You should try to keep tension in the trailing leg at all times and keep the steps controlled (not dropping foot down).	Try 10 steps left and 10 steps right. If one side is stronger, keep the amount of the weaker side and build it up evenly.	If you lose tension in the band of the trailing leg, decrease your steps. If you begin to laterally shift your torso left and right (like a teapot), ease off on the steps and re-set your core.
Placed in Program: Can be performed in between sets as a recovery or as an exercise in itself.		
See video of this drill here: http://youtu.be/IPn_ledZp4c		



See images below:

Band at foot point (longest lever location)

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KNEES

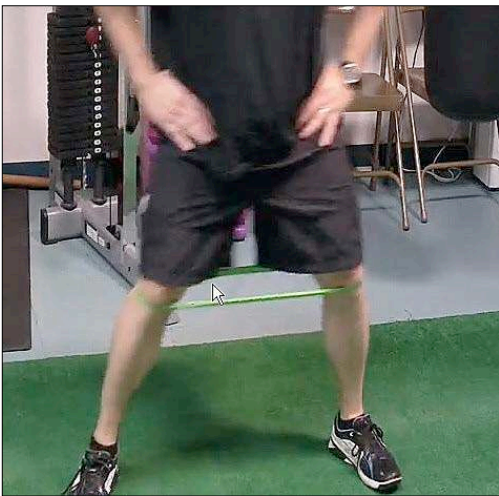


By John Izzo, NASM-CPT, PES

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Band at mid-calf point (mid-lever location)



Band above knee point (low lever location)



Drill: Lunge with Cable Assist

How to Perform	Time	Coaching Cues
Place a rope or band at the highest position on a wall or if you are using the cable tower. Hold rope across your upper shoulders and keep close to body. Split the legs into a lunge position. Try to keep the back foot straight and avoid turning it out. Use a weight that will allow some light resistance as you descend into a lunge—but not too heavy. As you lower your body, allow the cable resistance to pull your body upwards. This is a combined effort by you and the pull of resistance.	Try 6-10 reps per side.	With the assistance of the cable, try to work on your form and feel the lower body muscles work the movement. Avoid the knee from traveling inwards or outwards during the lunge.
Placed in Program: Can be performed in between sets as a recovery or as an exercise in itself.		
See video of this drill here: http://youtu.be/vGWhY1mdE9k		

See images below:



START

Start with a split (scissor) position with cable held along shoulders. Weight on cable is determined through trial and error—typically start with 50% of bodyweight and



FINISH

As you lower your body, push off your front foot and allow the cable to assist in pulling your body back to the starting position.

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Acknowledgements

IMAGE 1: <http://www.aclsolutions.com/anatomy.php>

IMAGE 2: <http://robertsontrainingsystems.com/blog/is-scapular-stability-a-myth/>

IMAGE 3: <http://massagetherapy.careerpathblog.com/tag/popliteus/>

IMAGE 4: <http://www.studyblue.com/notes/note/n/brain-and-behavior-part-1/deck/2106297>

IMAGE 5: <http://www.tumblr.com/tagged/knock%20knees>

IMAGE 6: <http://www.nolagoodfeet.com/footprint-shoes-good-feet/>

IMAGE 7: <https://healthy.kaiserpermanente.org/html/kaiser/index.shtml>

All exercise photos feature the author.