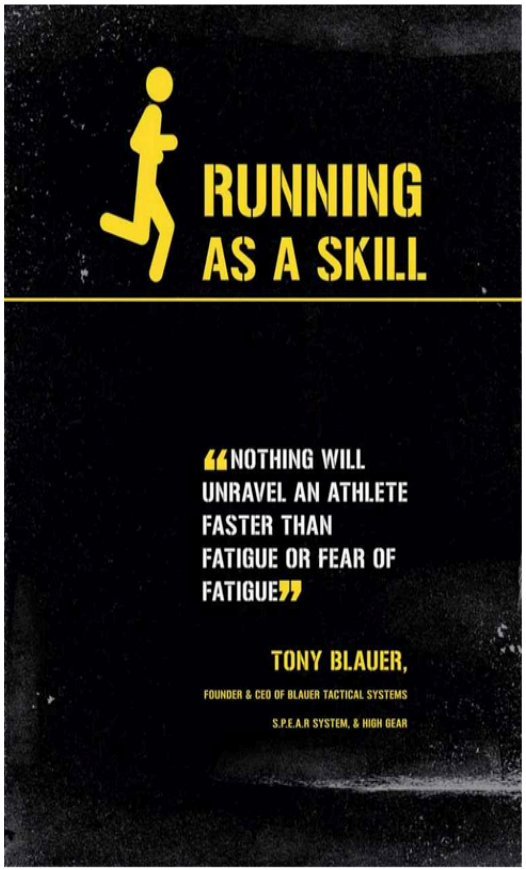


Sweating and running, that was our edge in the evolutionary arms race. Our ability to run at a consistent pace for long distances, and to regulate our temperature through sweating, played a critical role in our survival as a species. Humans—slow, weak, and lacking natural weapons like claws and teeth—could doggedly pursue animals to exhaustion under the merciless African sun. Whether we were escaping predators, tracking down and hunting animals, moving to a new landscape with fresh foraging, relaying a message to a neighboring village, or playing games in the form of sport, we ran. Our ability to run allowed us to not only survive, but also to thrive. So if someone says they are built to run, they are just connecting to a fundamental truth of our species.

Although running is no longer essential to our survival, it doesn't change the fact that our bodies are designed to do it. However, numerous studies indicate that roughly 85 percent of the 44 million recreational and competitive runners in the United States succumb to injury, so if we are designed to run, what's with all the injuries?

A lot of the blame can be attributed to the shoe industry, founded on bad ideas and a victim of its own success. But that isn't the root of the problem. The issue at the heart of all running-related injuries is mechanics. Instead of moving as our bodies are intended to and working with the laws of nature, we work against them. Most of us assume that running is a natural instinct and so requires no training. As a result, athletes rarely consider that improper technique is to blame for their injuries.

People born into running cultures, such as the Tarahumara of Mexico or the high-altitude Ethiopians or Kenyans, get a natural indoctrination. In our own culture,

running plays a very small role in daily life; some people might dash across an intersection occasionally or even get on a padded treadmill at the gym, but that's about it. Running needs to be taught to the average person, even, as hard as it may be to hear, to the average runner. Fortunately, there is a very complete and very scientific method of learning this skill that was once so fundamental to our species.

The Pose Method, developed by Dr. Romanov, has allowed us to see running from a different perspective. Through extensive research and personal experimentation, Romanov devised a model for running: fall forward, utilizing gravity; shift supports; and drop the feet directly under the body as you move forward. This changing of supports, or transitioning from one position to the next (one Pose to the next), as you fall is the basis of his method.

Today, running mechanics, as revealed by Romanov, is a worldwide phenomenon. Professional athletes and recreational runners everywhere have embraced this running technique, which seeks to harness the power of gravity. Whether you call it Chi Running, barefoot running, or evolutionary running, it all comes down to treating running as a legitimate skill to be acquired, not an innate human instinct that develops of its own accord.

I subscribe to this school of thought and implement Romanov's running strategies, but my evolution as an athlete and coach didn't stop with Pose. I've continued to experiment with different methods, techniques, drills, and strategies for running. Over the coming pages, I'll shed light on the conventional running lore and present a running method based on Pose principles that will not only help reduce injury, but also get you performing at your full potential. My method isn't all that different from Pose or other running-mechanics systems, but the way in which I layer the positions that comprise the movement is unique. In other words, my intention is not to reinvent the wheel, but make it spin more efficiently.

Running-Stance Checklist

Before I delve into the mechanics of running, it's imperative that you understand how to position your body for movement. My good friend Kelly Starrett, owner of CrossFit San Francisco and creator of the Starrett Movement and Mobility Method, has a saying: "Position is power." Setting athletes up in a strong position (or posture) prior to movement is at the core of everything we do. For example, you wouldn't prepare for a dead lift—a power-lifting exercise that requires you to bend over to pick up a barbell and stand up with it—with a flexed back because it would make you round forward as you pull the weight off the floor, compromising your power and increasing your risk for injury. Instead, you set up for the lift by stabilizing your trunk, tightening your body, and then lifting the weight off the ground while maintaining the integrity of your posture. This increases your leverage, allowing you to lift the weight with less effort, and reduces your susceptibility to injury. Running is the same as a dead lift in that if you set up for a run in a structurally weak position, you compromise the movement by decreasing power, balance, and stability.

To increase your learning curve and put you in the strongest position possible, I've provided a running-stance checklist. As a general rule of thumb, you should check off each step on the checklist before starting to run. Is my midline stabilized? Check. Do I have a neutral posture? Check. Are my arms in the correct position? Check. After you've checked everything off, you're ready to move on to the next step, which is applying motion to that position.

DEAD LIFT SET-UP

RUNNING STANCE CHECKLIST

- **MIDLINE STABILIZATION**
- **HEAD POSITION**
- **ARM POSITION**

Midline Stabilization

Throughout this book, you will see the term "midline stabilization" over and over again because all movement begins and ends with it. Our limbs are designed to work around a stable body. It's what allows us to transition from one position to the next without injury.

Running is merely your ability to fall forward under a stable body while shifting supports, that is, falling from one position to the next. If your midline is not stabilized when you fall forward and shift your weight from one foot to the other, the shock wave that gets sent up your body will make your spine compress and flex. This compromise in posture places additional leverage on your extremities, which causes you to overload or misuse the muscles and joints that are in action. The result: You move slower, become fatigued sooner, and invite injury.

To avoid these problems you need to establish a neutral posture (flat back) and stabilize the position by engaging your abs. Don't make the mistake of trying to stand straight up without using your core. Time and again I've seen athletes try to correct forward flexion (rounded back) by pulling their shoulders back and driving their chest forward, causing them to overextend, which is another structurally weak position. In order to run as efficiently as possible and handle the force placed on your body when you land, you have to not only turn on the musculature in your trunk to lengthen and flatten your back, but also understand how to set your hips and ribcage in a stable position.

A neutral posture, or the flat back position, represents the key setup stance for all the forthcoming techniques. To teach this setup, I'll often use the hollow rock exercise because the load order sequence (step-by-step setup) is the same as setting up in the correct running stance: Flatten your low back and set your hips in a good position by squeezing your glutes, brace your trunk by engaging your abs, lengthen your spine by setting your rib cage over your pelvis, and then increase tension in the abs to maintain the position. The hollow rock test also gives you a general idea of the tension required from your midline to achieve and maintain a neutral posture while moving fast, or while handling a heavy load.

Note: the amount of muscle engagement in your core depends on the intensity of the situation. For example, if you're sitting in a chair or standing upright, only 15 to 20 percent tension is required to maintain a stable posture. But if you're sprinting or back-squatting a heavy weight, you have to increase that intensity to match the force being applied to your body, which in this case could be as much as 80 to 100 percent contraction.

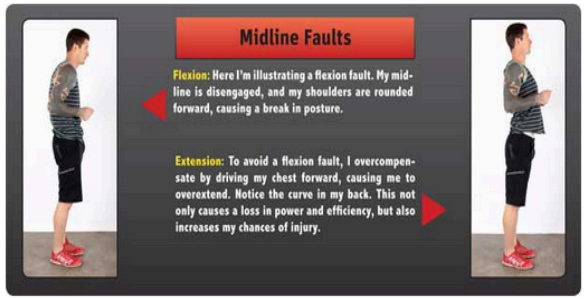
Hollow Rock (Finding Midline Stability)

1. To execute the hollow rock, lie on the ground with a relaxed body. Look closely at the photo, and you'll notice that my back is arched. If you take this same position and flip me upright, I'm overextended, which is a broken position.
2. To achieve a stable position, I engage my glutes and contract my core, drawing my belly button toward my spine. Notice that my lumbar spine is now flat on the ground. This position represents roughly the level of tension necessary for standing upright or sitting in a chair. My core is engaged at about 15 to 20 percent tension—just enough to keep my upper body stabilized and my posture straight.
3. To achieve the hollow rock position, I elevate my lower legs, draw my lower ribs in as if I were doing a crunch, and extend my arms overhead. Note that I keep my glutes engaged, which causes my legs to externally rotate, and my shoulders pulled back. When done correctly, this position is extremely difficult to hold.

Remember, the purpose of this drill is to illuminate the level of tension that you must achieve before you apply force to your body—whether in the form of running, lifting, swimming, or cycling—as well as teach you the load order sequencing for establishing a neutral posture.

Correct Running Posture

1. I've achieved the correct running posture by squeezing my glutes and engaging my core.



Head Position

After you've figured out how to stabilize your posture by engaging your midline and glutes, the next step is to establish a neutral head position. In the photos, you'll notice that my head is positioned directly over my shoulders and is centered over my midline. With my head balanced perfectly over my base of support, I can preserve the integrity of my posture while expending very little energy to do so. In addition to being energy-efficient, a neutral head position stabilizes the cervical spine, which helps absorb the shock sent through the body during the striking phase of the run.

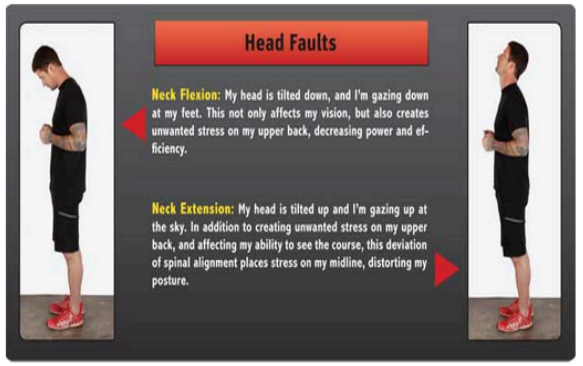
Although the notion of keeping your head in line with your trunk seems straightforward enough, a lot of athletes still tilt their heads up or down. The former is common during a hard sprint, and the latter usually during the onset of fatigue or if the athlete looks down at his feet as he runs. In either case, this deviation from neutral creates additional pressure on the cervical spine, which in turn places more stress on the trunk. Over time, this will cause the midline to collapse. And then the dominoes don't stop falling. Once midline stability is lost, mechanics are compromised, fatigue sets in, and risk of injury dramatically increases. It's important to note that

a deviation from a neutral head position can also be a result of a broken midline: when your midline collapses, your body searches for stability wherever it can.

To establish a neutral head position, place your thumb and pinky on your collarbones, raise your index finger, and set your chin on top of it (see Neutral-Head Test, below). To avoid asymmetrical muscle loading, which can result in a break of the midline or tension or stiffness in the neck, it's important that you limit flexing, extending, or lateral shifting of your head as you run. The only parts of your head that should move are your eyes.

Neutral-Head Test

1. To find my neutral head position, I lift my left hand to chest level with a hang-loose sign.
2. I place my thumb and pinky on my collarbones.
3. I extend my index finger and rest my chin on it. This roughly centers my head in the correct neutral posture.
4. I've achieved a neutral head position. Notice that I'm focusing my gaze straight ahead, and my head is centered directly between my shoulders.



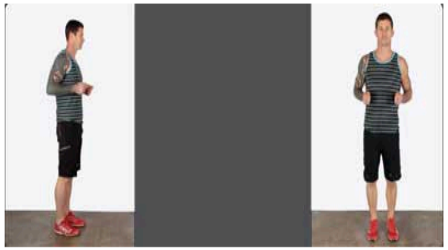
Arm Position

Once you understand how to establish a neutral posture, the next step is to set your arms in the correct position. To accomplish this, bend your arms at a 90-degree angle or more, pull your shoulders back, externally rotate your arms so that your thumbs are facing the sky, and close your hand as if you were holding a piece of paper between your thumbs and outside knuckles of your index finger.

The key is to stay as relaxed as possible. Your arms are not there to work, but to provide balance and stability as your run. For example, if you lift your right foot off the ground, your left arm moves forward to compensate for the weight shift—contralateral motion. The distance the arms move depends on the rate at which you're traveling: if you're sprinting a short distance, your arms need to move more to generate momentum and compensate for the higher foot pull than if you're running a marathon, in which case your arms will move only slightly to keep up with the faster cadence.

Regardless of the running intensity, your arms should be held close to your body—no flaring elbows. If you bow your elbows out or flail your arms from side to side as you run, not only is energy dissipated, but additional torque is also applied to your spine, which compromises the structural integrity of your posture. Another common fault related to arm positioning is an alternating forward and backward movement of the shoulders. Ideally, the shoulders should remain square and fixed. If you're corkscrewing your body, your core is either disengaged or your foot is crossing in front of your opposite hip. When this happens, you have to counterbalance your weight by twisting your shoulders. To remedy this problem, you have to readdress trunk stability and learn proper running mechanics, which I will get to shortly. For now, it's imperative that you spend time mastering the checklist. If your core is not stable, your posture is not neutral, or your arms are not in the correct position, nothing else I teach you will work.

Arm Position (Upper-Body Mechanics)



1. To assume the correct arm position, I bend my arms at about 90 degrees, pull my shoulders back (pull shoulder blades toward each other), externally rotate my arms so that my thumbs are pointing upward, and make a soft fist as if I were pinching a piece of paper between my thumbs and knuckles of my index fingers. Note that my arms are in tight to my body, my midline is stabilized, and my head is in a neutral position.
2. Keeping my arms relaxed—there is just enough tension to maintain my position—I pull my right elbow back and swing my left arm forward as if I were landing on my right leg. Notice that my shoulders remain square and pulled back. To avoid internal rotation of the shoulders or to prevent your shoulders from rolling forward, focus on keeping your elbows in tight to your body and your thumbs pointed to the sky.
3. I momentarily return to a neutral running position as if I were shifting supports.
4. I pull my left elbow back and swing my right arm forward as if I were landing on my left leg.

6 FACTORS IN RUNNING

There are six key factors involved in proper running mechanics. Without getting into the minutiae of each category, I've provided a summary of each factor as it relates to running. There are natural laws at work that affect economy of motion. If you abide by these laws, working with them instead of against them, you will make great strides in improving your running efficiency. For a more detailed breakdown of the following concepts, I suggest that you read Dr. Romanov's Pose Method of Running or Pose Method of Triathlon Techniques.

1

GRAVITY

Gravity affects everybody and everything the same way. As far as gravity is concerned, you are not special or unique. Proper running mechanics allow athletes to use this natural acceleration force to their advantage. Instead of pushing off the ground and using muscular effort to achieve forward motion, if you shift your general center of mass (GCM) over your base of support (i.e., fall), you will use gravity to initiate and maintain forward motion.

2

GROUNDREACTION FORCE

Ground-reaction force corresponds to the striking phase of the run. For example, if you land on the ball of your foot with your leg under your general center of mass, you minimize impact and increase propulsion, allowing you to keep up with your leaning position so that you can maintain forward motion. However, if you extend your leg out in front of your body and land on your heel, you're creating more force than necessary, and to maintain forward motion, you have to shove yourself off the ground. The former technique reduces muscular activation and saves your body from unnecessary punishment, while the latter is more punishing to the body and requires more muscular effort to move forward.

3

MUSCULAR ELASTICITY

Muscular elasticity is the muscles' ability to stretch or contract when forces are applied and then return to their natural state once that force is released. Jumping rope is a prime example of muscle elasticity at work: you have to drive off and land on the ball of your foot to propel your body into the air and absorb your weight as you land. Imagine trying to jump rope off your heels; it's impossible. You have more muscle elasticity below the knee, primarily in the foot, than anywhere else in the body. The muscles in your calf; your Achilles tendon; and all the intricate muscles, ligaments, and tendons in the foot help you absorb the force of your body's impact with the ground.

4

MUSCULAR CONTRACTION

Muscular contraction and muscular elasticity work in conjunction with each other. The more muscular elasticity you use, the less muscular contraction you need. For example, if you land on the ball of your foot when you run and allow your heel to kiss the ground, muscle elasticity cushions your impact, reducing muscular contraction. But if you land heel first and roll through the ball of your foot, muscular elasticity is taken out of the equation because you're not cushioning the impact with the muscles of your foot. In this situation, you not only transmit more force through your ankle, knee, and hip, but also need to recruit more muscles to carry out the movement.

5

TORQUE

Torque is created when your GCM passes beyond your base of support. To avoid falling on your face, you need to keep accelerating to maintain forward motion. For example, if I place a baseball bat in the palm of my hand, I have to keep my hand positioned underneath the bat's GCM to keep it from falling out of my hand. The acceleration force being applied to the object is the torque. In other words, I have to compensate for the torque being created on the top of the bat by creating torque on the bottom. The human body works the same way. When we fall forward to run, we create torque at the top end. In order to prevent falling to the ground, we have to maintain the equilibrium of our body by applying an acceleration force with our feet, which is provided by the cycle of shifting from one foot to the other. That acceleration (or deceleration) produced by alternating your feet is the torque that you're applying to your body.

6

MOMENTUM

Think of a car that has to accelerate to 60 miles per hour from a dead stop. While accelerating, RPMs increase and additional gas is required to bring the car up to speed. Once that car hits 60 miles per hour, it shifts into a higher gear, the RPMs drop, and it can maintain that speed using less gas than it did while accelerating. Its momentum helps keep it in motion. It works the same way with running, cycling, and swimming. Once you're in motion, it's easier to maintain that pace because you're using the momentum of your body to your advantage.

Proper Running Mechanics

Traditional running wisdom tells us to push off the ground with a long stride, lift the knee, land the foot in front of the body, strike with the heel, roll through the foot, and repeat. As you will come to understand, this model of running, which is still common even among elite endurance athletes, is highly inefficient. In addition to working against the forces of gravity, you increase muscular contraction, take muscular elasticity out of the picture, reduce torque, and stop the momentum of your body with every step. While running in this fashion for a short distance at a slow pace will probably have little detrimental effect on the body—it's just not enough volume to cause damage—tack on high-intensity training and long-distance runs, and you're asking for trouble.

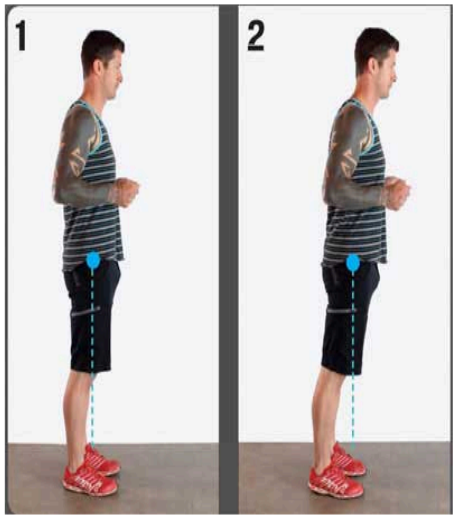
To run efficiently and reduce your chances of injury, you have to use gravity to your advantage, maximize torque to maintain momentum, and use muscle elasticity to reduce muscular contraction. In short, you have to learn how to run using the forces of nature to your advantage.

Forward Motion

What is the first thing you do when you're trying to move forward? Most of us push off the ground with one foot while stepping forward with the other one. Although this puts us in motion, every time we push our foot away from the ground we wage a momentary battle against gravity: you are using your own energy to propel your body. In addition to exerting unnecessary energy, this is a direct violation of our primary goal, which is to let the forces of nature do as much work as possible.

A much better approach to moving forward is to simply shift your general center of mass over your base of support. The moment you do this, the power of gravity will take hold, forcing you forward.

Forward-Lean Test



1. I've assumed the correct running posture.
2. Keeping my posture intact, I fall forward from the point of support and maneuver my hips over my feet.

To help you understand this concept, take a second to perform this test: Assume the proper running stance previously demonstrated and then lean forward from your hips as if you were a tree falling in the woods—see forward-lean test. Make sure to flex over your point of support (ankles) and avoid bending at the hips.

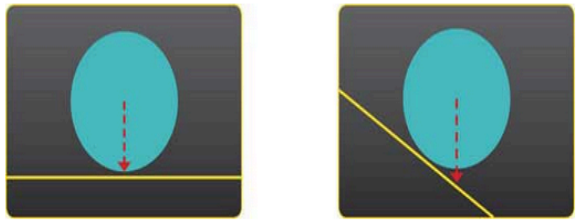
What happened?

If you stepped forward with your dominant foot to keep from falling on your face, you just used gravity to accelerate forward. No pushing off the ground or energy was needed. Nature, in this case, did all the work for you.

Maintaining Forward Motion

Forward motion, as you just experienced, is simply the loss of balance in the form of a fall. Instead of pushing away from the ground and wasting energy to initiate forward movement, you fell forward and then used your leg to prevent a fall. To keep up with the momentum of your fall to maintain forward motion, you have to alternate your feet and land underneath your GCM.

Another way of thinking about this is to imagine a fully inflated ball resting on a perfectly flat surface. Its GCM is located in its center, and its contact point with the ground is positioned directly underneath its GCM. Unless you force the ball into motion with a push, it remains fixed in the same position.



Now take that same fully inflated ball and place it on a slight downward slope. The ball's GCM is still located in its center, but its contact point with the ground is now slightly behind its GCM. Because the GCM is in front of the ball's base of support, the power of gravity pulls it down the slope. No outside force, other than the power of gravity, is needed to get the ball rolling.

Forward motion in running is analogous to that fully inflated ball. The moment you move your hips past your base of support, gravity starts pulling you forward. To prevent falling to the ground and maintaining forward momentum, you have to alternate your feet and place your supporting foot underneath your GCM to keep up with your forward fall. Think of it like this: Your body represents that fully inflated ball, and your fall represents the slope. The steeper the slope, the faster the ball rolls. The same is true with running. The farther you fall, the quicker you have to maneuver your feet to keep up with your GCM, and the faster you run.

If you're still struggling to grasp this concept, find a perfectly straight object, like a baseball bat or broom handle, and balance it in the palm of your hand. If you can keep that object perfectly balanced it will maintain its equilibrium. However, if it begins to fall, which it will do all on its own, you will have to maneuver your hand in the direction it's heading to prevent it from dropping. The greater the degree of the fall, the faster you have to move your hand. This simple test is analogous of your body moving forward when you run, in that the degree of your fall determines how fast you have to move your legs.

Stopping Forward Motion (Motion Faults)

There are several faults associated with falling mechanics, most notably breaking at the hips, leading with the chest, and landing out in front of your body. The first two faults are posture related and should be addressed using the checklist and falling mechanics. The third, however, is usually perceptual in nature. Falling as a means of moving forward is not instinctual to most adults. Unlike children, who seem to breathe, walk, and run naturally, adults change the mechanics of innate movement patterns. We start taking short, choppy breaths through the upper chest instead of long, smooth diaphragmatic breaths. We walk with our feet ducked out instead of keeping them straight. And we run by pushing off the ground and landing on our heels instead of falling forward with a stable body and letting gravity do the work.

To reverse-engineer these motor patterns, you have to spend an ample amount of time training the skill of the movement. For running, that means keeping your feet under your body and shifting supports as if your legs were spinning around an imaginary wheel under your hips. The moment you step out in front of your GCM, you stop the momentum of your forward fall and slow down. To continue moving forward, you have to reaccelerate up to speed, which can be accomplished only by driving your foot off the ground. This is like accelerating a car to 60 miles per hour, slamming on the brakes to slow down, and then repeating the process over and over again. In addition to burning a ridiculous amount of gas, you will wear out the car's engine. Your body reacts just like the car in that you burn energy and effectively beat your body into submission. It's an expensive and unforgiving cycle. If you were a ball, you would now be deflated and rolling down a bumpy surface. Your GCM is still centered, but the contact point with the ground is positioned out in front, slowing the momentum of the roll.

PERCEPTION OF FALLING

The fear of falling is innate, just as the actual practice of running is innate. So we have two natural instincts that are competing with each other. When we're just learning how to walk, the fear of falling doesn't prevent us from moving forward because our lack of stability keeps us moving. Hitting the ground is simply part of the learning process. As we grow older, however, experience tells us that hitting the ground won't feel so great. The fall is perceived as a potentially harmful action, so to avoid hitting the ground, we instinctually step out in front of our bodies to prevent a crash. But the quicker you learn to love falling, the quicker you will learn proper running mechanics.

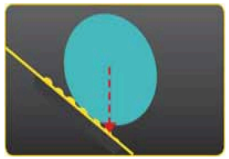
So how to conquer this fear of falling, reverse-engineer the instinctual reaction, and accelerate your learning curve?

It's really quite simple. Remember when you first learned how to ride a bike? If you're like most of us, you started out using training wheels to gain confidence and improve your balance and coordination. Once you could ride without struggle, the training wheels came off and you tested your abilities on two wheels. Although failure was guaranteed in the beginning, you quickly learned how to stabilize your body and use forward momentum to keep yourself upright. With each passing week, you got more skillful and more skillful, and before long, you were jumping off curbs, bombing down hills, and attacking corners.

Running requires a similar progression laden with deep practice to let go of the fear so that we can develop skill. In other words, if you're new to the fall, you may want to put on some training wheels by practicing falling into a wall to get used to the mechanics. Once you can fall forward with a stable body, step away from the wall and practice falling forward and alternating your feet underneath your GCM. You're bound to make some mistakes, just as you did when the training wheels were taken off your first bike. But as you learn the proper mechanics and hone the techniques, your perception of falling will no longer be dictated by fear. Instead, the fall will turn into a useful tool for efficient movement.

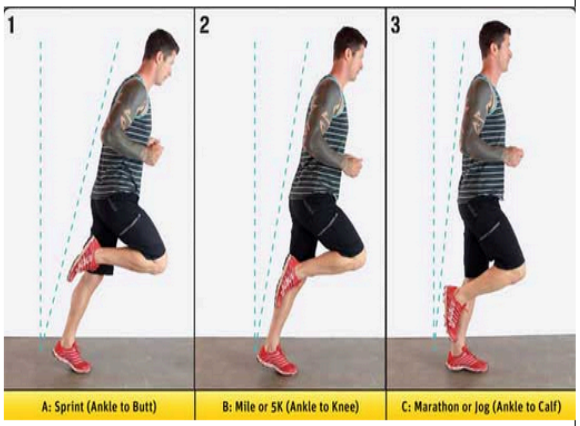
Falling Wall Drill

1. I'm in my running stance.
2. I extend my arms directly out in front of me.
3. I gently fall forward from my point of support until my hands hit the wall.



Pulling Mechanics, Shifting Supports, and Landing

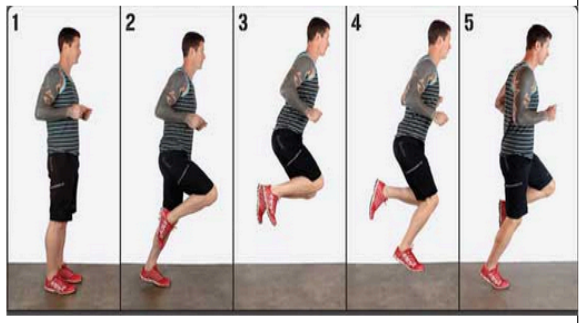
As I mentioned before, the angle of your fall dictates your speed at which you travel. Your fall also dictates the height of your foot pull (and, as you will learn shortly, the manner in which you land). For example, if you're running a marathon, you only need a slight foot pull—ankle to calf or ankle to knee depending on your fitness—to meet the demand of your slight lean. However, if you're in an all-out sprint with a lean that's 17 degrees or more, you need to pull your heel all the way to your butt. In addition to getting your foot under your GCM faster, a higher foot pull allows you to exert more force off the ground and allows you to cover more distance with your stride.



1. To effectively maintain forward momentum and keep up with the degree of my forward fall, I pull my foot up to my butt. Notice that my right foot is relaxed and still in line with my supporting leg despite the high pull. It's also important to notice that I'm on the ball of my left foot.
2. I've pulled my foot up to knee level to represent a moderate/intense speed, which would be characteristic of a hard 5K or mile pace. My right foot is relaxed and in line with my left leg. It's important to note that I still land on the ball of my foot but allow my heel to drop slightly to compensate for the lean.
3. Falling slightly forward to maintain forward momentum, I pull my foot up to my calf, which is characteristic of a slow to moderate jog. Just as in the other foot pulls, my right foot is relaxed and in line with my supporting leg. It's also important to note that although I still land on the ball of my foot, I allow my heel to kiss the ground before shifting supports.

Shifting Supports

When you shift supports there is brief moment when both of your feet leave the ground and you're completely suspended in midair. This airborne stride is what separates running from walking. If you're falling and pulling correctly, your feet should cross paths and your legs should remain under your body as illustrated in the photos. If your catch foot trails out in front of your body or your opposite leg swings out behind your body, you might want to consider readdressing your foot-pulling mechanics.

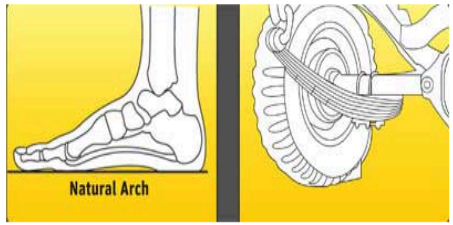


1. I've achieved the correct running stance.
2. Keeping my posture intact, I fall forward from the point of support and pull my right foot straight off the ground using the strength of my hamstrings.
3. As I pull my right foot off the ground, I shift supports by drawing my left foot up to my butt. Notice that my feet are on the same horizontal plane as they cross paths.
4. As I pull my left foot up, I extend my right leg and catch my fall by positioning my right foot under my GCM.
5. Maintaining a forward lean with a straight trunk, I land on the ball of my right foot and continue to travel forward.

Common Fault: Pushing off with Forward Leg Swing

Here I am pushing off the ground with a forward leg swing. Notice that my left leg is trailing behind my body and that I'm landing on the heel of my left foot. In addition to slowing down my momentum, this faulty mechanic restricts the efficiency of my stride and increases my chances of injury.

Landing (Catching Your Fall)



Medial view of the Foot.
Leaf spring

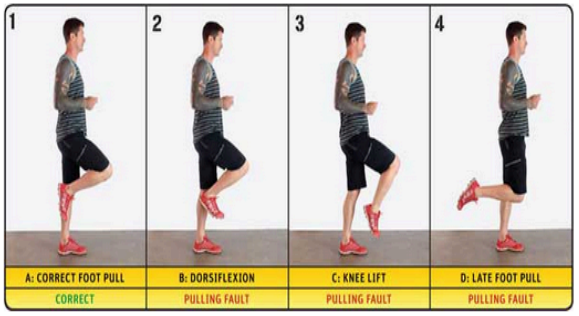
The foot is an intricate shock-absorbing system. In addition to having numerous bones, your foot has a series of ligaments (which attach bone to bone), tendons (which attach bone to muscle), and muscles and that give the foot a natural arch. This arch acts just like the leaf spring of a car in that it helps absorb the pressure of your body as you make contact with the ground. However, unlike the suspension of a wheeled vehicle, which centers the arch of the leaf spring directly under the car's axle, the leg (tibia and fibula) is positioned directly over your heel, which displaces the load. This anatomical design allows us to distribute our weight on any point of the foot, depending on where we put it during contact. In other words, we can land on the heel, on the heel and ball of the foot, or on the ball of the foot. As will become clear, in order to use your arch as it was designed, you have to land on the ball of the foot every time you strike the ground.

- **Pulling mechanics:** The removal of your foot from the ground.
- **Shifting supports:** The transition from one foot to the next.
- **Landing:** The manner in which your foot hits to the ground—otherwise referred to as catching the fall.

Now that you understand how motion is created and maintained, let's examine proper technique and some of the factors that prevent you from running effectively. Remember, your ability to maintain forward motion is predicated not only on your ability to fall forward with a stable body, but also on your ability to pull, shift supports, and land correctly.

The Foot Pull

To execute a correct foot pull, draw your heel toward your butt using the power of your hamstrings while maintaining a neutral foot position. In Figure A, you'll notice that my foot is directly in line with the opposite leg and centered directly under my hips (GCM). Tendencies to avoid are dorsiflexion of the foot (Figure B), lifting the knee up (Figure C), and extending your leg behind your body (Figure D). Flexing your foot creates tension through the support system as well as impedes your ability to land on the ball of your foot. Pulling your knee toward your chest engages the hip flexor and quadriceps and shuts off the glutes and hamstrings, which can not only irritate the knee and hip, but can also cause your foot to end up out in front of your GCM. And swinging your leg out from behind your body indicates a push, which makes it difficult to pull your leg back under your GCM. All of these faults cause you to exert more energy than necessary and dramatically increase your susceptibility to injury. To avoid these common tendencies, pull your heel toward your butt—using the strength of your hamstring. Put simply, don't leave your foot behind your body. In addition to conserving energy, it will be easier for you to land your foot directly under your GCM to catch your fall.



1. To execute a correct foot pull, I draw my right leg straight off the ground using the strength of my hamstring. Notice that my right foot is relaxed and in line with my left leg.
2. This is dorsiflexion, which you don't want to do. I've managed to pull my right foot off the ground using my hamstrings, but instead of keeping my foot relaxed, I've flexed it upward, engaging my shin muscles.
3. Using my hip flexor, I've pulled my knee up toward my chest. My foot is now in front of my GCM, increasing my chances of landing with my foot in front of my body.
4. I'm demonstrating a common fault that occurs when you push off the ground with your supporting foot. Notice that my right leg is trailing behind my body. This not only increases my susceptibility to injury, but also makes it difficult to position my foot under my GCM as I continue to move forward.

Pulling Mechanics Changing Under Speed

Besides absorbing the shock of your body weight, which can be up to two or three times greater upon impact, landing on the ball of the foot engages the muscular-tendon elastic system, which reduces impact and energy expenditure. In a nutshell, this tightly bound system of bone, ligament, tendon, tissue, joint, and muscle is your body's suspension system. If you land with your heel or with a flat foot, you don't take advantage of your body's shock-absorbing system (arch), which is a formula for injury. This is analogous of driving a car with no suspension in that it affects the speed and efficiency of travel, as well as places unwanted wear and tear on the engine and supporting parts.

Ball of the Foot Landing Mechanics

To maximize the muscle, tendon, and ligament elasticity in your foot, you want to plant the pad of your foot on the ground—otherwise referred to as a ball-of-the-foot landing—so that your arch can absorb the shock of your body hitting the ground. However, just because you land on the ball of your foot, it doesn't mean that you take the rest of your foot out of the equation. Athletes implementing proper running mechanics will often make the mistake of keeping their heel off the ground with a rigid ankle as they run, regardless of speed. If you're running a mile or longer, this can literally destroy your calves, ankles, and feet. Staying on the balls of your feet is necessary only when sprinting a short distance or running up a steep hill. In all other circumstances, your foot should be relaxed and your heel should touch the ground for a fraction of a second before you transition back on to the ball of your foot to shift supports. This "heel kiss" reduces the eccentric load placed on your calf muscles, Achilles tendons, and ankles during the striking phase of the run, which minimizes the injuries associated with a ball-of-the-foot landing. If you have faulty mechanics or your body is not strong enough to handle the new technique, you're asking for trouble. So give your feet time to get stronger, and give your body time to adapt to the new movement patterns before you enter them in a race.

1. Leading with the ball of the foot.
2. Ball-of-the-foot landing.
3. Heel touch.
4. Rebound.

Heel Strike and Midfoot Landing (Landing Faults)

Despite overwhelming evidence that supports ball-of-the-foot landing, runners will still argue until they are blue in the face that a midfoot or heel-strike landing is the way to go. The foot is not structurally designed to absorb the shock of a midfoot single-leg landing. Landing on the heel is also less than ideal. With only a thin layer of fatty tissue and skin to cushion your fall, you take muscular, ligament, and tendon elasticity out of the equation. As a result, the ankle, knee, and hip joints have to take the brunt of your body weight's impact on the ground, which slows you down and can result in injuries.

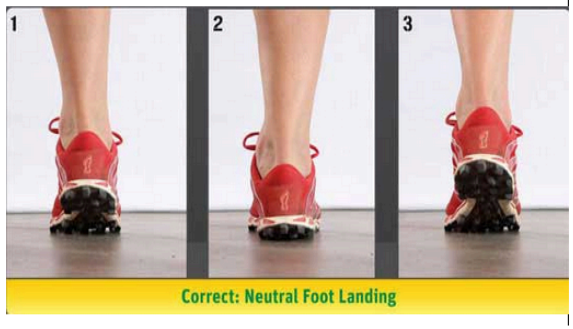
Landing Fault: Heel Strike | Landing Fault: Midfoot Strike

Overpronation (Landing Fault)

Overpronation of the foot is another landing fault that results from poor running mechanics. In this case, the runner lands on the outside of the foot as he heel-strikes (supination), and then transferring his weight to his supporting leg (pronation), his ankle collapses (overpronation) and the knee twists inward—otherwise referred to as a valgus knee bend. While this "technique" has been shown to take a terrible toll on the body, running enthusiasts still argue that this is a natural rolling of the foot that reduces the impact of landing; to avoid injury, all you have to do is buy a shoe with extra padding that compensates for the problem. As I've stated again and again, the best way to prevent injuries is to correct dysfunctional movement patterns. Buying a shoe as a means of solving a mechanical issue will do nothing but put a dent in your bank account. In order to run efficiently and reduce your susceptibility to injury, you have to learn to land on the ball of your foot.

Landing Fault: Over-Pronation

1. I land on the outside of my foot (supination).
2. My ankle collapses as I overpronate, stressing the ankle and compromising the integrity of my knee.
3. As a result of overpronation, my leg is forced into external rotation as I extend my leg to shift supports, and the process is repeated.



Correct: Neutral Foot Landing

1. I land on the ball of my foot.
2. I allow my heel to kiss the ground. Notice that my ankle is neutral and not collapsing to either side.
3. My heel naturally lifts straight off the ground. From here, I can maintain the integrity of my ankle and knee as I pull my right foot off the ground and shift supports.

Landing Fault: Inside Knee Bend

1. I've pulled my right foot off the ground.
2. I shift supports by extending my right leg in front of my body. Notice that my right leg has crossed over my centerline.
3. I land in front of my body and make contact with the outside of my right heel (supination).
4. As I transfer my weight through my foot, my ankle collapses (overpronates), which causes my knee to cave in (valgus knee). In addition to causing stress on both my ankle and knee, which will inevitably lead to injury, I compromise the integrity of my midline, slow down my movement, and expend unnecessary energy.

BAREFOOT RUNNING

There's no doubt that barefoot running is an excellent way to help build proper running mechanics, strengthen your feet, hone proper landing technique, and increase balance and proprioception. But it's not an end-all, cure-all solution. It doesn't address key factors such as posture, gravity, or the foot pull. In fact, if you're an endurance athlete who plans to compete in long-distance events, barefoot running can be detrimental to your running mechanics. For example, most barefoot runners lift the knee up using the hip flexors instead of pulling the heel to their butt. Although a knee lift primes the foot for a ball-of-the-foot landing and is ideal for trail running, in which you have to protect your toes from ramming into rocks, roots, and other objects, it's not the most efficient way to run. In addition to taking more energy—lifting your leg with your hip flexors turns off the hamstrings—the knee lift increases your chances of heel-striking should you decide to put on a pair of shoes to run. My recommendation is to run barefoot to strengthen the ligaments, tendons, and muscles of the foot, but still focus on the mechanics presented in this chapter.

THE PERFECT SHOE

Although modern shoes cause faulty mechanics, such as pushing off the ground and heel striking, they still serve a very important purpose. They

protect the bottoms of the feet from glass, jagged rocks, other sharp objects, and the unforgiving surface that asphalt presents. Unless you have ginormous calluses on the bottoms of your feet from years of barefoot running, I suggest that you wear shoes when you run.

However, it's important that you choose a shoe that protects your feet but doesn't try to overcompensate with excess padding or support. A minimalist zero-differential shoe with a flat sole is your best bet. If possible, avoid shoes that try to cover up mechanical issues that should be addressed through skill training. For example, if you land on the outside of your foot—commonly referred to as an underpronation—you shouldn't buy a shoe with cushioning to dampen your impact. Instead, focus on landing with a neutral foot and incorporating barefoot-running drills.

It's important to mention that if you're in a shoe that has a lot of support, or you use arch supports or orthotics, don't jump straight into a zero-differential shoe. This can cause more harm than good. It takes time for your bones, muscles, and joints to adjust to the demand and increased range of motion. If you're in a shoe with a 10 mm heel lift, drop down to one with a 7 mm differential. After a couple of months, drop to 5 mm and then to 3 mm, until you get to zero. Be patient with the progression, keep the volume and intensity low, and listen to your body. It may take up to a year for your joints and tissues to make the adjustment. Once you develop the appropriate neuromuscular patterning to support the foot the way it was intended to be supported, you can reap all of the benefits of barefoot running while still protecting the bottoms of your feet.

INSIDER PERFORMANCE TIPS

PROGRESS SLOWLY

If you're new to this system of running, you may experience soreness and pain, which can ultimately lead to injury. To avoid this, I suggest that you progress slowly. Start out doing short, low-intensity runs, with an emphasis on skill development. It will take time for your body to adapt to the new technique, especially your calves, ankles, and feet, which are probably severely underdeveloped thanks to traditional running mechanics. To develop these muscles, incorporate jump-rope drills into your training and barefoot exercises. Don't push the envelop by throwing yourself into 400-meter intervals at high intensity. Instead, start out doing 50 or 100 meters and gradually work up to longer distances. Use the time to focus on skill and position. If you're patient and progress slowly, your body will adapt to the new motor pattern, you will recover faster, and you will be more efficient.

FOCUS ON QUICK FEET (CADENCE)

A faster stride will reduce the amount of time you spend on the ground and decrease ground-reaction force. This not only reduces the impact of your body hitting the ground—you're not coming down with as much force because of the lower foot pull—but also increases efficiency and thus keeps you going longer. For some runners, this shifted focus also improves other factors, like faster foot pull and ball-of-the-foot landing. Ninety steps per minute per leg is the lowest possible cadence without compromising muscle elasticity.

BE AS QUIET AS POSSIBLE

There's a saying: "You never hear a barefoot runner coming." That's

To maximize muscle elasticity and reduce muscular contraction, always land on the ball of your foot, no matter what. However, it's important to remember not to stay on the ball of your foot forever. Unless you're in an all-out sprint, your heel should kiss the ground to avoid damaging your Achilles tendon, calf muscles, and foot.

FILM

You have no idea what your running mechanics look like unless you go to the video. Having someone shoot a video of you running, riding, swimming, or even weightlifting gives you the ability to see and understand the mistakes you're making. This is an eye-opening experience for most athletes, who may think or feel as if they are moving perfectly. Video doesn't lie. It checks your ego, and misconceptions, at the door. It sends you back to the drawing board.

To get an accurate reading on how you run, get a friend to film you running for about 10 meters. (You can also use a treadmill.) Do it a couple of times at varying speeds. You may find that you run without fault at slow speeds, but quickly lose it when you ramp up the intensity. It's also helpful to shoot when you're fresh and also when you're fatigued to see where you start to unravel. For example, you can film yourself at the beginning of a 5K, interval workout, or CrossFit WOD, and then at the end. This will give you an idea of what is structurally weak and what mechanic you revert to when stress and fatigue set in. I recommend that you use video to monitor your technique and progression as often as possible. Nothing provides more of a reality check than seeing yourself in action.

RUN UPHILL

Running uphill is a great training practice if you're struggling to grasp lean and landing mechanics. In order to progress up an incline you have to lean forward and strike with the ball of your foot. It's impossible to run up a hill while remaining perpendicular to the ground and landing on the heel of your foot. Not only that, but running uphill forces you to slow down the movement, which helps you understand the mechanics of landing under your GCM to move forward.

VARY TERRAIN

After you've developed the proper running mechanics, it's important for you to constantly vary the terrain you run on—you don't want to limit yourself by doing only your sport-specific interval or distance training on a track or flat road. Obviously, if you're training for an event on asphalt, it makes sense to train on asphalt. If you're training for a trail event, it makes sense to train on a single-track trail. However, to ensure that you're prepared for any scenario, it's a good idea to mix it up by running on single-track, fire roads, asphalt, concrete, grass, dirt, sand, and tracks. This keeps you fresh and engaged by forcing you to adapt to new situations, grades, and obstacles and builds awareness, proprioception, balance, coordination, agility, and control.

RUNNING ON A TREADMILL

because a barefoot runner lands on the ball of the foot with a bent knee. Muscle elasticity is utilized with each stride and the runner lands as softly as possible to reduce the impact on his foot and leg. The result: absolute silence in his approach. Poor running mechanics can often be heard as well as seen. If you're landing with a loud clunk, you're probably landing with your heel or midfoot and not using muscle elasticity. Sometimes trying to run as quietly as possible will yield a soft, fast, and efficient stride.

MIND THE CHECKLIST

Midline stabilization is always the first thing to go when you set off on a run. For that reason, you must be careful to remember each step in the posture checklist. Make sure your midline is stable, maintain a neutral head posture, and keep your arms bent at 90 degrees with your shoulders externally rotated. Even if your mechanics are not up to par, simply maintaining the integrity of your posture will help reduce the onset of fatigue and keep injuries at bay.

LEAN FROM YOUR POINT OF SUPPORT

The only way to initiate forward movement using the accelerating force of gravity is to fall forward from the ankles with a stable body. A lot of athletes make the mistake of leaning with their chest and breaking forward at the hips. This not only compromises the integrity of the midline but also works against gravity.

LAND UNDER YOUR GCM

It's important that you land as close as possible to the vertical projection of the body's GCM. This not only allows you to maintain the forward momentum of your fall, but also helps to avoid excessive impact on the body's support system.

PULL WITH YOUR HAMSTRINGS

Always engage the hamstrings to execute the foot pull as you alternate your feet and shift supports. In addition to saving energy, pulling your foot up using the power of your hamstrings makes it easier to position your foot under your GCM to maintain forward motion. If you engage the hip flexors by pulling your knee up, you shut off your posterior chain, creating quad burn, and increase the risk of landing in front of your body, which, as you already know, is a recipe for disaster. It's important to note that the hip flexors are involved, but the hamstrings are the prime movers.

BALL-OF-THE-FOOT LANDING WITH A HEEL KISS

I don't have any issues with treadmills, but you don't want to limit yourself to running on a machine all the time. I like to do intervals once a week on a treadmill because I can accurately quantify distance, time, and energy expenditure (calories), which can be used as diagnostic tools for future workouts. Another benefit for a coach is that a treadmill offers a unique opportunity to correct technique and easily identify movement flaws as the athlete runs. The treadmill can also be helpful when filming from a side profile. It's important to mention that when training on a treadmill you always want to increase the incline to one percent or more, to mimic the physics of how your body reacts to the road: if you run on a treadmill with the incline set at zero percent, because of the belt's speed you don't have to lean or strike accurately, which does little to instill proper running mechanics.

RUNNING IN THE SAND

Running on the beach is an excellent way to build strength in your feet and calves. It does, however, require a slight change in cadence. Unlike running on solid ground, which allows you to bounce off the surface using muscle elasticity, the sand absorbs the weight of your body and restricts your ability to transition to the next step. Running in the sand is like having a flat tire in that you're constantly slowing down with every step. To help offset the traction with the ground, a good strategy is to speed up your cadence using short, quick foot pulls. This will make it easier to float on the surface of the sand as well as save you a ton of energy.

RACE PROGRESSION

If you're new to the sport of running and you're interested in competing in a marathon, it's important for you to start with short distances such as a 5K or 10K and progress accordingly. Use these shorter races as an opportunity to dial in your nutrition and running mechanics and acclimate to the stress brought on by competition. As you get comfortable, increase your distances until you reach your desired goal.

ENVIRONMENT

Each environment requires some adaptability and specific preparation. For example, if you're running a race in the desert, you should know that arid climates suck moisture from your body while leaving you dry, making it difficult to determine the amount of fluid you're actually losing. If you're running at elevation, you need to take into consideration the lack of oxygen and train accordingly. Accounting for morning, evening, and night is also important, as conditions can change rapidly and without warning. The bottom line is that you have be careful to prepare and to subject your body to race conditions so that your body can adapt accordingly.

CLOTHING

Ideally, you want to wear something that you don't need to change. Racing is tough enough as it is. The last thing you need is an annoying rash as

result of chafing, which will distract your focus and ultimately slow you down. Just as you need to adjust and adapt to environmental conditions, it's wise to wear clothing that you know is comfortable and won't cause problems.

UPHILL AND DOWNHILL RUNNING MECHANICS

A lot of people wonder whether running mechanics change based on the grade of the slope. The short answer is no. You still use a fall to dictate motion and speed, pull using the power of your hamstrings, and land on the ball of your foot under your GCM. If you're running downhill, you don't need to fall as far forward as you would when running on flat ground. If you're running uphill, you may need to fall forward more to compensate for the steep grade. To improve your efficiency and reduce your energy expenditure, lower your foot pull and increase your cadence. You also have to remain conscious of how fast you're willing to go and direct your speed with your fall. This is especially important when traveling downhill. If you step outside your ability and you pick up unwanted speed, you have to put the brakes on by stepping in front of your GCM, which can cause problems. The moment you feel excessive pounding, change the degree of your fall and shift supports as fast as possible.

Skill Training

To help you develop the mechanics described in this chapter, I've laid out several skill drills in the forthcoming pages. The goal of these drills is to get you back to a time when your training wasn't plagued with injuries. Running should be fun, not something that takes a terrible toll on your body. By utilizing skill-developing drills, this is a real possibility.

As you will notice, there is a considerable amount of overlap with the drills. The reason I've included so many drills is that people have their "Oh, crap" moments with different exercises—so there's something for everyone. You should stick with the drill that highlights your weaknesses and offers the most gains. For example, if you're having problems with the foot pull, and the wall drill doesn't seem to help, you can try the alternating-foot-pulls drill or the elevated foot pulls. You have options.

HOPS WITH FORWARD FALL

The hops with forward fall is one of the first drills I have my athletes perform because it teaches them how to fall correctly and makes them realize how little falling effort is needed to move forward. To perform this drill, jump up and down from your running stance as if you were jumping rope, and then lean forward from your point of support to initiate your fall. The key is to keep your body in a straight line and move your hips over your feet. As your GCM passes over your pivot point, you begin to fall toward the ground like a tree. Rather than stepping forward to break your fall, hop forward and move your feet under your hips to find equilibrium. Repeat until you've completed 10 to 20 falls. It's important to mention that breaking at the hips as you fall forward compromises midline stability. To get the best results from this drill, focus on keeping your core engaged, maintaining a neutral head position, and falling from your point of support.

Key Points:

- **Fall from your point of support.**
- **Keep your core engaged to keep your spine straight.**

- **Fall forward only as much as is necessary to initiate movement.**

Common Faults:

- **Bending from the hips.**
- **Leaning too far forward.**
- **Stepping out in front of your body to stop the momentum of your lean.**

The Dose:

Perform this drill as needed in the early stages of development. At least 10 to 20 times, or until you can comfortably fall and regain equilibrium without fault.

1. I'm in my running stance.
2. Keeping my back straight, I bend my knees slightly.
3. I extend my legs and jump straight into the air.
4. I land on the balls of my feet with my knees slightly bent to reduce impact.
5. As I land, I fall forward from my point of support to initiate forward motion. Note: Hop up and down a couple times to establish a rhythm before you lean forward.
6. Without breaking my rhythm, I hop up again, but because of the degree of my fall, I jump forward. From here, I will level out by pulling my hips back and repeat the drill until I've completed the desired number of repetitions.

PULLING WALL DRILL

Once you understand how little you have to lean to initiate forward movement, the next step is to learn proper pulling mechanics. In this sequence, I demonstrate the pulling wall drill, which is one of the best drills for teaching and ingraining this aspect of running mechanics. To execute this drill, position your heels about three to five inches away from a wall, establish your running stance, and then pull your ankle toward your butt using your hamstrings. To get the best results, do at least 20 pulls with one leg before switching to the opposite leg. This drill will not only teach you how to pull correctly, but also highlight common faults. You may find that when you start doing this drill, you'll kick your heel into the wall or pull your knee up using the hip flexors. The former fault is a result of trying to push off the ground to propel yourself forward; the latter indicates a late pull, which will happen if you lean too far forward, mistime the pull, and engage the hip flexors to lift the knee up to compensate for the distance lost. Although the knee lift allows you to catch up with your forward momentum, it instills inefficient motor patterns and shuts off the hamstrings, which are way more capable of doing the job.

Key Points:

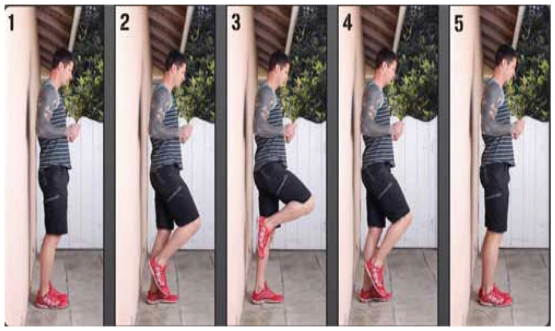
- **Keep the knee of your supporting leg soft.**
- **Pull your ankle up to knee level.**
- **Maintain a neutral—i.e., relaxed—foot.**
- **Use the power of your hamstring to pull the foot to your butt.**

Common Faults:

- **Kicking the heel into the wall.**
- **Pulling the knee up using the hip flexors.**
- **Flexing the foot.**

The Dose:

At least 20 pulls per leg before moving on to the next drill. You should perform this drill until you have embodied proper pulling mechanics. Once proficient, you can incorporate this exercise into your warm-ups before sport-specific training. To increase the demand of this drill, you can hook a resistance band to your ankle and pull against the tension.



1. I'm in my running stance. Notice that my heels are about three inches from the wall.
2. Keeping my midline stabilized, my spine straight, and my left knee slightly flexed, I pull my right foot toward my butt using the power of my hamstrings.

3. I pull my right foot up to my left knee. Notice that my right foot is relaxed and in line with my supporting leg.
4. Keeping my right foot in a neutral position and in line with my left leg, I ease my foot to the ground.
5. I place my right foot next to my left foot. After completing 20 pulls with my right foot, I will switch legs and repeat the drill on the left side.

RUNNING WALL DRILL

Once you understand how to fall and the fundamental mechanics of the foot pull, the next step is to combine the two principles in the form of a running wall drill. If you look at the photos, you'll notice that I stand a few feet away from the wall, extend my arms out in front of me, and then lean forward with my posture stabilized. With my arms keeping my body positioned at a slight forward angle, I begin to run in place using the same pulling mechanics previously demonstrated. In addition to ingraining proper falling and pulling mechanics, this drill forces you to adjust your pull to the angle your body would be at if you were traveling forward. Once you've done 10 to 20 pulls per leg, turn and take off running alongside the wall, keeping the same lean and pulling mechanics you performed at the wall.

Key Points:

- **Keep your feet positioned directly under your body.**
- **Maintain a stable body as you turn and take off on a run.**

Common Faults:

- **Disengaging the midline as you lean forward into the wall and when you turn to run.**
- **Kicking your heel back or lifting your knee up.**

The Dose:

At least 20 total pulls or until you can complete at least 10 pulls per leg with perfect technique.

I'm in my running stance.
I extend my arms directly out in front of me.
I gently fall forward from my point of support until my hands hit the wall.
Notice the slight angle of my body.

4) Using the power of my hamstrings, I pull my left foot up to my right knee.

5) As I ease my left foot toward the ground, I alternate feet and shift supports by snapping my right foot off the ground.

6) I land on the ball of my left foot.

7) Keeping the same lean, I turn my body counterclockwise and run alongside the wall.

ALTERNATING FOOT PULLS

This drill combines the previous drills into a highly effective skill-training sequence. To perform this drill, begin by hopping back and forth from foot to foot, like a boxer's shuffle. More specifically, you fall forward slightly while alternating your feet and shifting your weight back and forth as if you were going to bust into a light trot or jog. After you develop a rhythm or cadence with your feet, pull your right ankle up to your left knee and then immediately revert back into the forward shuffle. Repeat this 5 to 10 times, then switch legs. After you've completed about 10 pulls with each leg, increase the degree of your lean and run it out as you did in the previous drill. In addition to developing coordination, and ingraining proper leaning and pulling mechanics, this drill teaches you how to absorb and rebound using muscle elasticity.

Key Points:

- **Shuffle back and forth from foot to foot and develop a strong rhythm before executing the foot pull.**
- **After one pull, revert back to a light trot and regain a consistent rhythm before executing your next pull.**
- **Absorb the shock of your shuffle using the ball of your foot and allow your heel to kiss the ground to maximize muscle elasticity.**

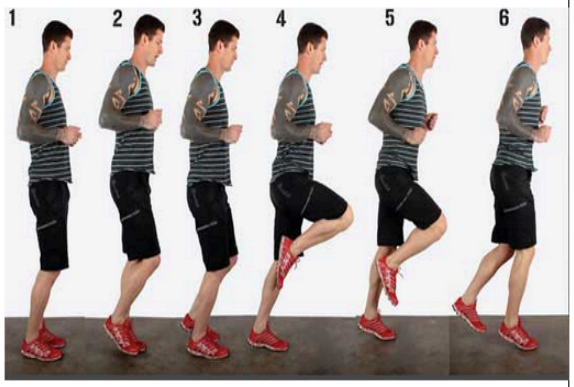
Common Faults:

- **Breaking at the midline and bending from the hips.**
- **Hopping with both feet instead of shuffling back and forth.**
- **Landing with a flat foot.**
- **Performing an incorrect pull by either pushing off the ground or lifting the knee.**

The Dose:

At least five pulls with one leg before switching legs, ten total pulls before transitioning into the run. You should repeat this process until you

develop the necessary coordination and technique.



1. I'm in a proper running stance with my knees slightly bent.
2. To start the shuffle, I fall slightly forward and momentarily shift my weight onto my right leg and pull my left foot slightly off the ground.
3. I continue to shuffle forward by shifting my weight onto my right leg.
4. As I transfer my weight to my left foot, I pull my right foot up toward my butt using the power of my hamstrings.
5. Without shifting supports, I extend my right foot toward the ground. Note: You don't want to extend your right leg out in front of your body. Rather, keep it under your GCM and allow the momentum of your fall to carry you forward.
6. I land on the ball of my right foot. From here, I will resume a shuffle, regain a consistent rhythm, and execute another pull with my right leg.

STABLE-ARM DRILL

Runners often master the fall and the pull relatively quickly but immediately forget the most important aspect of proper running mechanics, which is to maintain a stable posture. To test your stability, interlock you hands and extend your arms out in front of you. Begin running in place, and after 10 or 20 foot pulls, fall forward slightly while continuing to run. If your midline is stable, your arms will remain locked straight out in front of you (Sequence A). If your core is not engaged, your arms will swing from side to side, compromising your balance and making it very difficult to run (Sequence B). After you've experimented with the previous drills and you feel comfortable changing supports while in a forward lean, perform the stable-arm drill to see how stable you are. In addition to instilling midline-stabilization mechanics, this drill offers valuable feedback about the level of tension required in running. In other words, the faster you run, the more you'll need to engage your core to maintain balance and maximize energy efficiency.

Key Points:

- **Stabilize your midline, run in place, and then fall forward to initiate forward motion.**
- **Keep your arms positioned along your centerline as you run.**
- **The faster you run, the more you have to stabilize.**

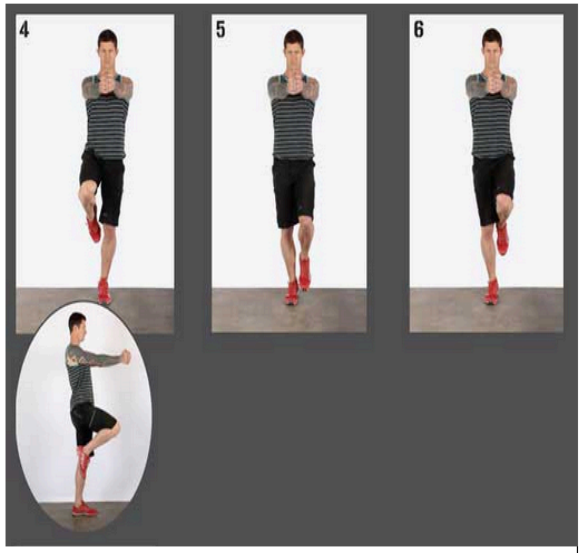
Common Faults:

- **Swinging your arms back and forth as a result of weak midline stabilization.**

The Dose:

Use this drill as a diagnostic tool to test midline stabilization.

Sequence A: Stable-Arm Drill with Engaged Midline



1. I'm standing in a neutral posture.
2. I interlock my fingers in front of my body.
3. Keeping my arms straight, I raise them to chest level.
4. Without falling forward, I pull my right foot off the ground using the power of my hamstrings.
5. I drop my right foot and begin to elevate my left foot.
6. Keeping my midline engaged, I run in place by alternating my feet and shifting supports. Notice that my arms remain locked in line with the center of my body.

Sequence B: Stable-Arm Drill with Midline Disengaged

1. I've interlocked my fingers and positioned my arms out in front of me at chest level. Note that my midline is disengaged.
2. As I pull my left foot off the ground to run in place, my arms swing toward my right side to counterbalance my weight.
3. With my midline disengaged, I'm unable to stabilize myself as I alternate my feet and shift supports. As a result, my arms swing to the left side of my body.

COP DRILL

Just like the stable arm drill, the cop drill is another tool for testing midline stabilization and ingraining proper falling mechanics. To perform this drill, interlock your hands behind your back as if they were handcuffed. Although having your hands pinned behind your back is awkward, it allows you to increase your focus on stabilization, the fall, and the shifting of supports. The key to performing this drill correctly is to lead the fall with your hips. A lot of athletes make the mistake of initiating the fall with the chest while bending forward at the hips. Not only does this sacrifice a stable midline, but it also compromises balance. Another common fault is to overextend (Sequence B). If you're unable to comfortably lock your hands behind your back without overextending, you probably need to work on shoulder mobility. In such a situation, you may want to focus on the hops with forward lean or the alternating foot pulls drill.

Key Points:

- **Keep your shoulders externally rotated (pulled back) and your spine neutral.**
- **Focus on shifting your GCM (hips) over your balance point (ankles).**
- **Change supports the moment your hips pass over your ankles.**

Common Faults:

- **Leaning forward with your chest and bending at the hips.**
- **Overextending as you assume the handcuff position.**
- **Stepping forward with your foot to brace your fall and stop the momentum.**

The Dose:

Perform this drill until you develop the proper falling mechanics. I usually suggest falling and then running a few meters, leveling out, and then repeating the process until the athlete feels comfortable with the fall.

1. I'm standing in a neutral posture.
2. I interlock my hands behind my back as if I were being handcuffed.
3. Keeping my midline engaged to avoid overextending my back, I externally rotate my shoulders and straighten my arms.
4. I pull my left foot off the ground using the power of my hamstrings.
5. I fall forward with straight posture to initiate forward motion.

Common Fault: Flexion

My shoulders are internally rotated and my upper back is rounded forward. This will cause me to lead with my chest as I lean forward, resulting in a break in the midline.

Common Fault: Overextension

I overextend as I try to straighten my arms and pull my shoulders back into the correct position. This fault is common with athletes who overemphasize this step or lack shoulder mobility. If faced with the former, simply correct the technique by straightening your posture. If faced with the latter, see the mobility chapter.

JUMP ROPE DRILL

The jump rope drill is one of the best exercises for developing rhythm, coordination, and muscle elasticity. To perform this drill correctly, run in place, using proper running mechanics, as you jump rope. If you're new to jumping rope or you're unable to perform this exercise because of a lack of coordination and timing, focus on developing the rhythm and skill necessary by simply hopping up and down. In the meantime, use the other drills in this section to develop proper running mechanics. Once you're able to sequence together multiple repetitions without disruption, start piecing in the running mechanics by pulling your ankle to the opposite knee while shifting supports. The goal is to get the jump rope to successfully pass under your legs as you shift supports. At first the passes will seem choppy and slow, but with a little patience and a lot of practice you'll develop the coordination, timing, and rhythm to run in place just as if you were performing the wall drill.

Once you can run in place without fault, the next step is to add forward motion. All the same principles apply. You want to maintain a stable midline, pull your ankle to your knee, and shift supports as the rope passes under your feet. But now you add a slight fall and begin running forward. If you're pulling correctly, you'll progress forward without restriction. However, if you start to push off the ground, break at the hips, or your foot lands out in front of you, the jump rope will catch your feet as it circles under you, putting you back at square one. To reduce the frequency of this frustrating yet all too common scenario, focus on the mechanics and maintain a consistent cadence. Although the jump rope drill can be extremely disheartening, especially when first starting out, it's an excellent way to teach proper running mechanics and serves as an invaluable tool to correct movement faults.

Key Points:

- **Learn how to run in place as you jump rope before adding forward motion.**
- **Focus on passing the rope under your feet as you shift supports while maintaining a consistent rhythm. Time, practice, patience, and technique are your keys to success.**
- **When adding forward motion, fall forward from the hips and use correct pulling mechanics.**

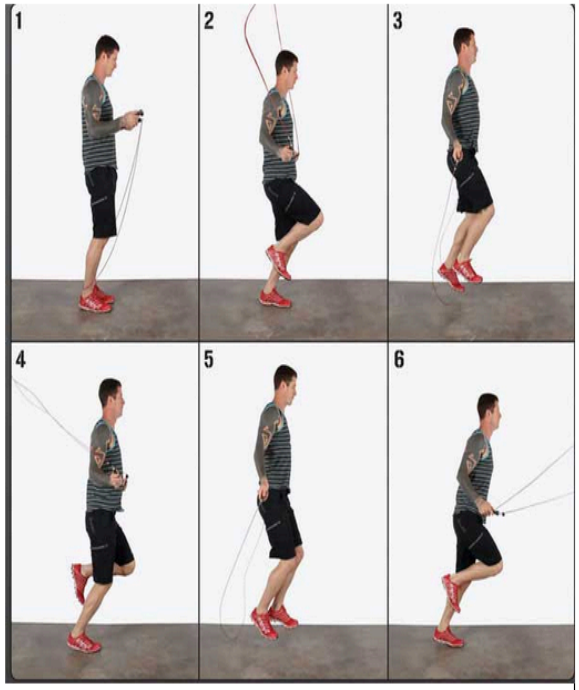
Common Faults:

- **It's common for athletes, especially when starting out, to stall with each shift of supports, resulting in a choppy cadence.**

- **When running in place, athletes will elevate the knee instead of pulling ankle to knee.**
- **Breaking at the midline, pushing off the ground, or landing out in front of the body while running forward.**

The Dose:

Spend as much time as possible on this drill until you master running in place and can run forward without pause or disruption. Once proficient, you can incorporate this drill into your warm-ups, as a skill-training exercise, or to tune up your rhythm and timing.



1. I'm standing in a neutral posture with the jump rope positioned behind my feet.
2. As I swing the jump rope over my head, I draw my right heel toward my butt using proper pulling mechanics.
3. I shift supports and alternate my feet as the jump rope passes under me.
4. I catch my body with my right foot and pull my left foot up.
5. I shift supports again as the rope passes under my feet.

6. I alternate my feet and catch myself for the second time. Having successfully run in place and developed a rhythm, I add a slight fall to initiate forward motion.

ELEVATED FOOT PULL DRILL

As I mentioned in the introduction to this chapter, it's important to experiment with as many drills as possible until you find the exercise that clicks. The elevated foot pull drill is another skill-training exercise that ingrains proper pulling mechanics, as well as builds muscles elasticity, strength, and pulling speed. If you get awesome results from this particular drill, stick with it and implement it anytime you're working on your pulling mechanics. While it's good to play around with all of the drills outlined in this chapter, you have to focus on what has the greatest impact on your skill development.

Key Points:

- **To absorb impact and maximize muscle elasticity, be sure to land on the ball of the foot with a soft knee.**
- **Pull your heel up to your butt.**
- **Focus on speed and efficiency of movement.**

Common Faults:

- **Landing with a flat foot and straight leg.**
- **Executing an inefficient pull by lifting the knee up to your chest instead of drawing your heel up to your butt.**
- **Flexing the foot as you pull.**

The Dose:

When incorporating this drill into your skill-training exercises you should perform 10 to 20 repetitions with each leg. Because this is a drill that improves pulling speed and conditions the leg for the repeated impact of running, this is a good one to incorporate into your warm-up whenever possible.

1) I've got my right foot positioned on the edge of a 12-inch box. 2) I extend my right leg and stand upright. 3) Keeping a slight bend in my right leg, I pull my left foot up to my right knee. 4) I jump off the box and pull my right foot toward my butt as if I were shifting supports. Note: You want to pull your right foot up as fast as possible using the power of your hamstrings. 5) As I pull my right foot up, I extend my left leg to find the ground. 6) I land on the ball of my left foot and keep my left leg bent to absorb the impact of my drop.

PIVOTED FOOT PULLS

Like the elevated foot pulls, pivoted foot pulls help teach the proper pulling mechanics, improve muscle elasticity and speed, and build the musculature in the hamstrings. To get the best results from this drill, string together multiple pulls with the supporting leg as fast as possible: the quicker you can pull your foot off the ground as it lands, the better. When done correctly, this drill teaches you how to land on the ball of your foot, react with the ground using muscle elasticity, and pull using the power of your hamstrings.

Key Points:

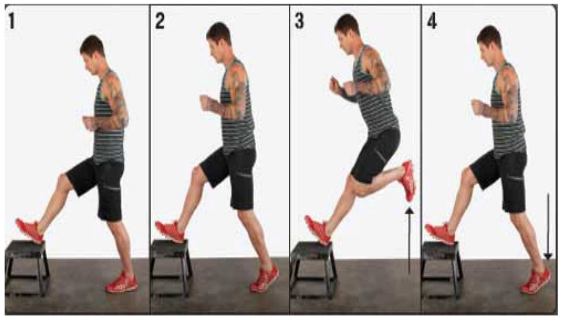
- **Execute a full range of motion by pulling your heel up to your butt.**
- **To avoid injury and maximize muscle elasticity, land on the ball of your foot with a soft knee.**
- **Immediately transition into your next pull without hesitation; the less time you spend on the ground the better.**

Common Faults:

- **Landing with a flat foot or straight leg.**
- **Stalling between repetitions.**

The Dose:

Perform 10 to 20 pulls with each leg, and include this skill-training exercise in your warm-up routine whenever possible.



1) I've assumed my running stance and positioned my right heel on the edge of 12-inch box. It's important to notice that my right leg is bent slightly and that my supporting leg is positioned directly under my hips. 2) Keeping my posture straight, I shift my weight slightly forward and rise up on the ball of my left foot. 3) I pull my left heel up to my butt using the power of my hamstrings. 4) I land on the ball of my left foot and absorb the shock of my body weight by bending my knee. The moment my foot hits the ground, I'll snap it right back up as quickly as possible, and repeat this process until I've completed the set amount of repetitions.

CARIOCA

The carioca drill is a lateral-movement exercise that has several benefits. For one, it teaches you how to fall laterally with your body weight, using the forces of gravity to your advantage. Secondly, because landing with the heel is impossible to manage because of the nature of this exercise, it instills proper striking mechanics and builds the muscles of your lower leg, which is essential for those who are not used to running on the ball of the foot. (It also develops the lateral muscles of the legs and hips, which are usually underdeveloped in runners who have neglected strength-and-conditioning training.) Thirdly, the carioca drill helps to develop body and space awareness—that is, coordination. Lastly, it's an excellent warm-up for the muscles and joints and prepares your body for other dynamic movements. If you've played a team sport, chances are you've performed this drill at the beginning of practice, with very good reason.

Key Points:

- **When initiating motion, fall laterally from the hips, shifting your GCM over your balance point, just as you would when running forward. The key is not to bend at the hips.**
- **Keep your feet directly under your GCM as you move.**

Common Faults:

- **Avoid flexing at the hips and leaning with your chest.**
- **Don't overexaggerate upper-body movement by twisting your shoulders back and forth or swinging your arms from side to side. Instead, keep your arms bent and close to your body as if you were running.**
- **Avoid stepping in front of your body. Just as in running, this will make you push off the ground, compromising your mechanics and slowing you down.**

The Dose:

Perform this drill at the beginning of a strength-and-conditioning workout or as a warm-up for sport-specific interval training. To balance the drill, it's important that you execute this exercise on both sides of your body. For example, do the carioca to the left for 10 meters and then to the right for the same distance.

1. I've assumed the correct running stance.
2. Keeping my body straight, I lean to my left, shifting my GCM over my left foot. As I transfer my weight onto my left leg, I begin to cross my right leg in front of my left leg.
3. Using the momentum of my fall to initiate lateral motion, I cross my right foot over my left foot to catch my fall.
4. The moment I plant my left foot on the ground, I swing my left foot behind my right leg.
5. Still falling to the left with my posture intact to maintain momentum, I plant my left foot on the ground directly under my GCM.
6. Keeping my midline engaged to avoid exaggerated twisting of the upper body, I maneuver my right foot behind my left leg.
7. I plant my right foot on the ground directly under my hips to catch my fall.
8. Continuing to use my upper-body fall to move laterally, I land on the ball of my left foot and prepare to repeat the sequence.

PARTNER BAND DRILL

The partner band drill offers two key benefits. It teaches proper falling mechanics and adds resistance to a run, which helps develop speed and explosiveness. With the band momentarily supporting your weight, you can slowly lean forward without having to shift supports to catch your fall (Sequence A, second photo). Although falling forward in such a manner is awkward and seemingly unnatural, it allows you to experience the proper falling mechanics in slow motion. The band also highlights common faults associated with the fall, which include breaking at the hips, pushing off the ground, and stepping out in front of the body (Sequence B). To avoid these tendencies, work on falling forward with a slight lean. After a momentary pause, start shifting supports as if you were going to burst into a light run. Your partner should offer just enough resistance to hold you upright and allow you to keep moving forward. As you get more comfortable with the falling mechanics, you can use the band to add resistance to short-interval sprints. However, it's important to keep technique as your primary focus. If adding speed compromises your running form, slow down and decrease the intensity.

Key Points:

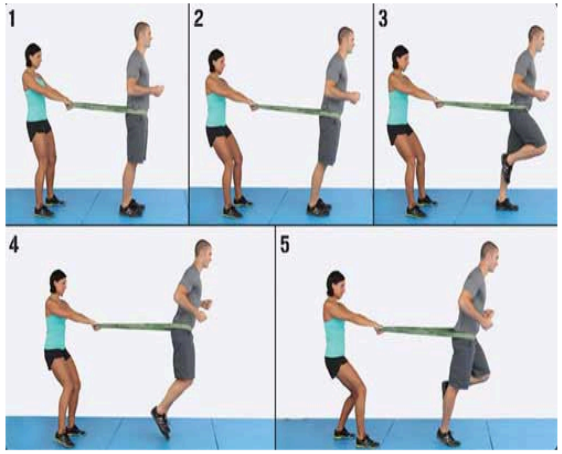
- **Execute a slight forward lean before you initiate a pull and begin shifting supports.**
- **Because the band is pulling back on your hips, you have to stabilize your core more than when executing a free or unrestrained run.**

Common Faults:

- **When executing the fall, avoid leaning with your chest and bending at the waist.**
- **Don't push off the ground or step out in front of your body to stop your fall.**
- **Compromising technique as a result of increasing intensity.**

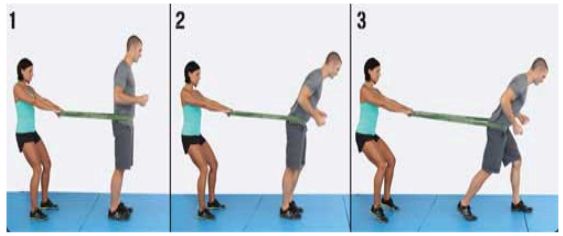
The Dose:

To get the best results, set a distance that's 10 to 20 meters. The idea is to keep the distance short to maintain speed and explosiveness. As a rule, the distance should be one at which you can maintain speed and intensity without compromising form. The instant you start to slow down or mechanics break down, stop and shorten the distance.



1. Glen is in his running stance. The resistance band is wrapped around his hips, and Katie is creating tension in the band by leaning slightly backward.
2. Glen slowly leans forward from his point of support.
3. As Glen leans forward, he pulls his left foot up.
4. As Glen shift supports, Katie continues to lean back to maintain resistance.
5. Glen accelerates forward using proper running mechanics. To slow his progression, Katie continues to create resistance on the band by keeping her weight back. Note: Katie is not trying to keep Glen in one place. Instead, she shuffles forward as he progress forward while maintaining consistent tension on the band.

Common Fault: Pushing Off



1. Glen is in his running stance.
2. Glen leans forward, breaking at the hips.
3. Glen pushes off his right leg and steps his left foot out in front of his body.

PARTNER FALLING DRILL

Learning how to fall correctly is the most difficult obstacle to conquer when you start recognizing that running is a skill. Although using the forces of gravity to help you move is easy enough to comprehend, your instincts tell you differently. Falling while you shift supports just doesn't click when

first learning the skill. In order to rewire your brain and develop the correct instinctive reaction, you must spend time drilling techniques such as the ones demonstrated below. Not only will they instill the correct falling mechanics, they'll also test your reaction.

To perform the following drills correctly, have your partner support your body in a slight lean as you shift supports and run in place. Without telling you, your partner will let go of your hips (Sequence A) or quickly step outside your running path (Sequence B). This will generate one of two reactions. Either you will instinctively step out in front of your body to catch your fall, or you will continue to shift supports and progress forward using the correct running mechanics. If you experience the former, you should start over and repeat the drill until you can carry out the exercise without doing so. If you experience the latter, congratulations, you've successfully reverse-engineered the "I'm going to fall flat on my face if I don't put something out in front of me" instinct.

Key Points:

- **The focus of this drill is to take your partner by surprise, so if you're supporting his weight, don't present a "tell" that signifies your release of pressure.**
- **Lean forward only slightly, just enough to initiate movement. If you lean too far forward, not only is it difficult for your partner to keep you upright, but it also makes it difficult to shift supports fast enough.**

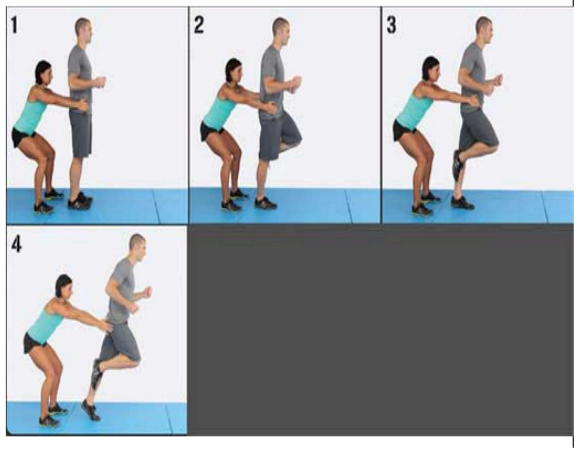
Common Faults:

- **Breaking in any fashion, pushing off the ground, or stepping out in front of the body to stop your fall.**
- **Avoid an exaggerated lean. Remember, the farther you lean, the faster you have to shift supports.**

The Dose:

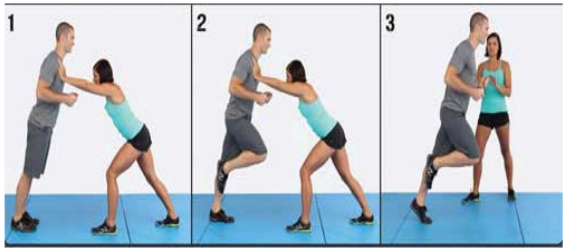
If you're having trouble with the fall, meaning you instinctively step out in front of your body to counterbalance your weight, you should perform this drill as often as possible, or until you successfully reverse engineer that instinct. If you're already proficient with the fall, executing this drill from time to time to test your reactions is recommended.

Sequence A: Partner Falling Drill with Rear Stabilization



1. Glen is in his running stance with a slight forward lean. Katie is holding his hips to prevent him from falling forward.
2. Glen begins running in place by pulling his left foot up.
3. Glen alternates his feet by shifting supports.
4. Without saying anything, Katie releases her grip on Glen's hips and he accelerates forward using correct running mechanics.

Sequence B: Partner Falling Drill with Front Stabilization



1. Glen is in his running stance with a slight forward lean. Katie is holding his hips to prevent him from falling forward.
2. Glen begins running in place.
3. Without telling him, Katie quickly steps out of his path and he accelerates forward using correct running mechanics.