GET FIT STAY FIT
NEWSOLE running

Injury-Free Running

Become a More Efficient and Faster Runner

ALL CONTENT PROVIDED BY

About the Natural Running Center

Launched in July 2011, the Natural Running Center serves as an educational online destination and resource for runners interested in the healthy benefits of natural, minimalist, and barefoot running. The web site embraces the "less is more" philosophy when it comes to all aspects of footwear -- shoe reviews, training, safely transitioning to minimalism, and much more.

The advice and recommendations offered by the NRC comes from the world's top running scientists, clinicians, and coaches -- many of whom sit on the NRC advisory board. Better running form also means injury-free running.

This booklet was designed to help all runners understand the basics of natural running. We wish to share this information in an accessible way the average runner can understand. The essential core message of the Natural Running Center is that we want every runner to be able to make an healthy, injury-free adaptation to more efficient running mechanics.

-- Natural Running Center co-founders

Executive Director Mark Cucuzzella, M.D.
Editorial and Creative Director Bill Katovsky
Web Director and Shoe Review Editor Nick Pang

Contributor Bios

Mark Cucuzzella, M.D.

A long-time advocate of healthy running, Mark Cucuzzella, M.D, who is a Professor of Family Medicine at West Virginia University School of Medicine and a Lieutenant Colonel in the Air Force Reserves, opened the nation's first minimalist shoe store, Two Rivers Treads, in Shepherdstown, West Virginia, in 2010. He is the executive director of the Natural Running Center. At age 44, Mark ran a 2:37 at the 2011 Boston Marathon, and less than six months later, won the Air Force Marathon outright in 2:38.

Jay Dicharry

Jay Dicharry, MPT, CSCS, is the Director of the SPEED Performance Clinic and the Motion Analysis Lab Coordinator at the University of Virginia. Jay is a founding board member and presenter at the annual University of Virginia's Running Medicine conference and has been published in numerous professional journals. He teaches both undergraduate students and Physical Medicine and Rehabilitation Residents at UVA, and lectures nationwide on running and cycling mechanics. Jay's research and treatment interests lie in the biomechanics and treatment of athletes and footwear. Jay is a Health and Physical Therapist Advisor to the Natural Running Center.

Dr. Steve Gangemi, aka Sock Doc

Dr. Steve Gangemi practices holistic health care in Chapel Hill, North Carolina. He uses various methods which bring together functional neurology, biochemistry, acupressure meridian therapies, applied kinesiology, and dietary and lifestyle-modification methods to get a person healthy again. Gangemi has a doctorate degree in chiropractic and bachelor degree in nutrition. His popular alter-ego, the Sock Doc, discusses natural injury prevention and treatment for all athletes at sock-doc.com. Dr. Gangemi is a

Health, Fitness and Injury Prevention Advisor to the Natural Running Center.

Bill Katovsky

A two-time Hawaii Ironman finisher and founder of Tri-Athlete magazine, Bill Katovsky is the author and editor of several health and fitness books, including "Return to Fitness: Getting Back in Shape after Injury, Illness, or Prolonged Inactivity." He is the editorial and creative director of the Natural Running Center. He also helms the popular blog Zero Drop. He doesn't run with a watch because he doesn't want to know how slow he's going. "At my age, early 50s, slow is the new fast," he says.

Dr. Casey Kerrigan

Dr. Casey Kerrigan, a Harvard Medical School graduate known by her academic peers for her groundbreaking peer-reviewed published research on gait (walking and running) and the effects of footwear, left her perfectly good job at the University of Virginia (UVA), where she was tenured professor and chair of the department of physical medicine and rehabilitation (PM&R), professor of mechanical and aerospace engineering, and professor of sports medicine, to make OESH footwear (oeshshoes.com) that uses an innovative technology in which the midsole provides compression and release. Dr. Casey Kerrigan is a Science Advisor to the Natural Running Center.

Dr. Ray McClanahan

Dr. Ray McClanahan is a podiatric physician with over 15 years experience in Portland, Oregon. He specializes in sports medicine and preventative foot care. At his medical clinic, NW Foot & Ankle Clinic, he has been treating and educating patients for over a decade.. His emphasis is on sports medicine, preventative and conservative options as well as education on proper footwear. An active runner and athlete, McClanahan finished 14th in the U.S. National Men's Cross-Country Championships in 1999, and had a

near-Olympic Trials qualifying 5,000 meter mark of 13:56 in 2000. He is also the creator of Correct Toes spacer, which spreads the toes to their natural and correct position. Dr. Ray McClanahan is a Health Advisor to the Natural Running Center.

Dr. Phil Maffetone

Dr. Philip Maffetone is an internationally recognized researcher, educator, clinician and author in the field of food, exercise, sports medicine, and biofeedback. During his 35-year career, which included 20 years in private practice, Dr. Maffetone has been a respected pioneer in the field of complementary medicine, bringing the latest advances to healthcare professionals around the world. He was named coach of the year by Triathlete Magazine. Maffetone is the author of more than a dozen books, including "The Big Book of Endurance Training and Racing" and "The Big Book of Health and Fitness". He currently lives in southern Arizona and is also an accomplished songwriter and musician who has worked with Rick Rubin and the late Johnny Cash. Dr. Maffetone is a Health and Fitness Advisor to the Natural Running Center.

Nicholas Pang

Nick Pang is a self-described web technologist living with his family just north of Silicon Valley. For twenty-five years, Nick was a serious runner before he got injured in traditional running shoes. He then saw the light two years ago in minimal shoes. He gradually retooled his gait and form, and began to run injury-free. Based on his own experiences, in the summer of 2010, he created the Minimalist Running Shoes website that quickly became an important destination for anyone looking for shoe reviews in this rapidly expanding sector of the footwear market. He is the web director and shoe review editor of the Natural Running Center.

Table of Contents

About the Natural Running Center...ii
Contributor Bios...iii
Introduction to "Injury-Free Running"...viii

FOOT & FOOTWEAR BASICS

Why Does the Modern Foot Look the Way It Does?...12
How Do I Know When A Running Shoe Fits Properly?...14
What is Pronation and Supination?...16
What is Arch Support?...19
What is Minimalism?...25
What is a Barefoot-Style Shoe?...27
What is a Minimalist Shoe?...28
What is a Neutral/Transition Shoe?...29
Should Heavier Runners Use Thickly Cushioned Shoes?...30
What Are the Most Common Running Injuries?...32

RUNNING BASICS

Making the Transition to Minimalist Running Shoes...42
Stabilizing Yourself in Mid-stance -- the Essential Task for Healthy Running...44
What is Proprioception?...46
What is Elastic Recoil?...48
What is Running Cadence?...51
What is Barefoot Therapy?...53
How Does Diet Affect Running?...60
Keeping Stress at Bay...66

Introduction to “Injury-Free Running”

A man’s errors are his portals of discovery” — James Joyce

Twice in the past two years, my small town of Shepherdstown, West Virginia, was honored to host and gain wisdom from the best-selling author of "Born to Run." Christopher McDougall and I share a common discovery of better fitness and health through natural running. In addition to owning a minimalist shoe store, I'm also a family physician in a town of 3,000. Chris and I are both in our 40s, and had trashed our feet and legs along the way, the result of a lifelong addiction to running.

Chris’s phenomenal book follows several narrative threads, but it is also his own personal story of “why does my foot hurt?” He discussed the regular trips to the doctors, shoe stores, and orthotic makers. With each escalation in care there was more pain, that is, until he found a different route in the remote Copper Canyon of Mexico where the Tarahumara Indians run in flat-sole tire-tread sandals happily into their 80’s. He also met barefoot runners during his research for the book. He eventually arrived at the conclusion that most conventional running shoes are the cause of running injuries.

I began running barefoot on the beach as a pre-teen and easily covered distances of 10 or more miles. My personal path of pain began in high school and then into a college and post-collegiate running career. I had successes that were often tempered by injury, setbacks, surgery. I had acquired a closet full of arch supports, orthotics, various shoe types. This was always in search of the holy grail of pain- free running.

I pushed through the pain in pursuit of the Olympic Marathon Trials 2:22 standard and came within two minutes on two occasions. When I hit 34 years of age, my first toe joints were fused with arthritis, and I was forced to have surgical procedures to reduce the pain. The prognosis looked bleak for a future in running.

And a lot like Chris's own trip to Copper Canyon, my journey of discovery began afar: while watching Kenyan runners go barefoot. I applied this natural way of running to my own jogging. I learned how to run softly. Seven months after surgery and with a new efficient and painless running stride, I ran a 2:28 for third place in the 2000 Marine Corps Marathon, only four minutes shy of my best time ever for the distance.

A decade has passed and the learning I gained about natural running only became deeper and broader. You might say that I was being "home-schooled" on all aspects of movement and how the foot interacts with the ground. For example, the Tarahumara Indians run in a style reflective of how we all ran as children; they land lightly on their mid-foot (not the heel), have a slight forward lean, and are completely relaxed and happy. Also, the best shoe was less shoe.

My self-enlightenment about footwear and running was not as immediate as Chris, who experienced it by cultural immersion. Chris and I both agree that it is not about the shoes, but more about understanding how your body stands and moves, improving strength and function.

Ten years after the foot surgery and being told not to run, I feel that I'm finally putting all the pieces of the puzzle together. I finished the Boston marathon in 2011 in 2:37:00, practically smiling the whole way. Several months later, I won the Air Force Marathon outright; and back running the day after the race. I love light and flat shoes for road races, trails, casual, and at work to get me secretly close to barefoot at my day job as a physician.

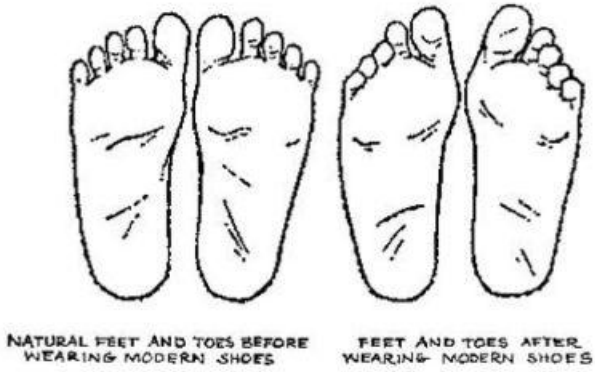
We all have to follow our own path of what works or doesn't work. Our bodies and past running histories are different. With this booklet, you will have a practical way to make injury-free running a permanent fixture in your own life.

Dr. Mark Cucuzzella
Shepherdstown, West Virginia

1

FOOT & FOOTWEAR BASICS

Why Does the Modern Foot Look the Way It Does?



You were born with perfect feet. So what happened along the way? The human foot is designed such that the toes are spread and extended. This allows for optimal balance and stride. In societies where mainly flip-flops or sandals are used, foot integrity is maintained through life and foot problems are avoided. In industrialized societies however, the foot's natural shape changes over time. The toes become elevated and pinched together, resulting in weakened flexor muscles combined with overly tight extensors. Subsequently, natural gait and balance are compromised. The main culprit is rigid footwear. The vast majority of footwear in the industrialized world elevates the heel above the forefoot (ball of foot), bends the toes upward (known as toe spring), and squeezes the toes together. Over time, this deforms the foot, leading to a host of foot

problems, gait abnormalities, and musculoskeletal pathologies.

The long-held conventional podiatric view is that the feet are inherently misshaped, and they need to be corrected with the use of orthotics or surgeries. Where these methods fail, pain is to be managed by anti-inflammatory drugs. But the best way to treat most foot problems is by allowing the foot to function exactly as nature intended. Only by returning the feet to their natural shape eliminates existing foot problems and prevents new ones from arising.

-- by Dr. Ray McClanahan

How Do I Know When A Running Shoe Fits Properly?

Understanding proper running shoe fit is the first step towards pain-free running and injury prevention. That doesn't mean you should waste your time trying on or investigating those expensive, super-comfortable, padded, and built-up running shoes that keep being thrown our way each year by profit-hungry running shoe companies. If you haven't already liberated yourself and your feet from the "more-is-better" marketing hype, it's not too late. So here are some tips for finding the proper shoe fit:

1. Never assume that you'll take the same size as your previous shoe, even if it's the same type or model.
2. Always try on both shoes. First, try on the size you think would fit best then walk on a hard floor. Even if that size feels fine, try on a half-size larger. If that one feels the same, or even better, try on another half-size larger. Many people don't realize that a larger shoe may actually feel and fit better.
3. Continue trying on larger half-sizes until you find the shoes that are obviously too large. You know especially by the heel—it will start coming off when you walk. Then go back to the previous half-size—more often that's the pair that best matches your feet. There should

be at least a half-inch between your longest toe and the front of the shoe for most shoes.

4. You may also need to try different widths to get the best fit, although many shoes don't come in different widths. The ball of your foot should fit comfortably into the widest part of the shoe without causing the shoe to bulge.
5. Use comfort as the main criteria. Don't let anyone say you have to break them in before they feel good. The best shoes for you are the ones that feel good right away. While many salespeople are aware of how to find the right shoe size, many are not.
6. If the difference between your two feet is less than a half-size, fit the larger foot. If you have a significant difference of more than a half-size between your two feet, it may be best to wear two different-size shoes. How you accomplish this is up to you.

--by Dr. Phil Maffetone

What is Pronation and Supination?

During walking and running, pronation and supination normally occur in the foot. Pronation is important for optimal movement and shock absorption. During foot strike, many changes take place—the foot begins to roll inward, everting slightly, and the arch flattens. This is called pronation. It is a normal action—one that occurs in every step in every healthy foot. The purpose of this is to loosen the foot so it can adapt to the surface, especially on uneven terrain.

Following pronation, as the foot continues through its gait, supination occurs. This results in the foot turning slightly outward then changing from a flexible foot to becoming rigid so it can propel the foot and push off from the ground. During this phase the foot inverts slightly, and the arches become higher, thus enabling the foot to properly roll over the big toe.

A number of factors can disrupt a person's normal gait. The two most common reasons are muscle imbalance and wearing stiff, over-supported shoes. Sometimes, areas above the foot, such as the pelvis or spine, can abnormally influence foot function. For example, too little or too much hip rotation can cause the foot to land in an abnormal position. In addition, injury, pain, and other problems that

affect blood flow, cause inflammation, or disturb muscle function in the foot can abnormally alter the gait.

Most shoes change the gait by causing the stride length to become abnormally longer. This causes an abnormal heel strike—hitting the ground farther back on the heel. It's especially a problem during running, as the longer stride places more shock through the foot and into the knee, and occurs despite shoe cushioning or what is commonly called a "heel crash pad." Barefoot movement does not cause the same stress.

The notion that some people are "pronators" while others are "supinators" is a gross oversimplification that fitness magazines, shoe stores, and footwear manufacturers foist upon the public in an attempt to sell shoes. It's mostly all marketing hype. Everyone pronates and supinates. The reason some people excessively pronate or supinate is more often from wearing over-supported shoes, which cause muscle imbalance. This is especially a problem in children whose feet need to properly develop without shoes.

More importantly, an attempt to "help" a poorly functioning foot with a particular type of shoe or orthotic insert is an example of treating symptoms; most cases of foot dysfunction are usually due to muscle imbalance.

Keeping the foot in a rigid, immobile position can actually promote foot imbalance by not allowing the body to naturally correct the problem.

--by Dr. Phil Maffetone

What is Arch Support?

Since much of the current treatment for foot and ankle disorders is centered on supporting the arch, we thought it would be helpful to discuss what arch support really means and discuss whether it is necessary or desired in the active foot.

In order to understand the treatment of rendering an arch support, one must understand the architectural principle of an arch, and liken that principle to the multitude of arches that naturally occur in the human foot. When you study the structure of the foot and the shapes of the bones of the foot, you quickly realize that most of the weight-bearing bones of the foot, are indeed arches themselves by being shaped to have support ends at either end of the bone and an open space or boney arch in between the support ends of the bones. For the purposes of the current discussion, we will concentrate on what might be considered one of the primary arches of the foot, sometimes called the medial (inside of the foot) longitudinal arch, the arch that spans between the rearfoot or heel bone and the forefoot or ball of the foot and toes.

Webster's dictionary defines an arch as – "a curved structure that supports the weight of material over an open space" .

Said another way, an arch is a structure that is able to support weight over an open space, by providing support on either end of that open space.

Applying this logical definition to the arches of the foot necessitates support on either end of the arch, and is exactly the opposite of the type of "arch support" that is available to consumers, either over the counter (i.e. Dr. Scholl's or similar product), or from their healthcare professional (footbed, arch support, orthotic). These products attempt to "support" the arch, not by supporting the ends of the foot arch, but rather by lifting up under the open space of the foot arch. This does not make sense.

True support of the arches of the foot would suggest that the ends of the arches, on either end of the foot's open space are the structures to be supported. This would mean that the heel and the forefoot joints (metatarsophalangeal joints and interphalangeal joints) are the structures that should be supported, and not the structures in between the ends of the arch.

As was mentioned above, current commercially available "arch supports" (which by the way are packaged under a number of names – arch support, footbed, orthotic, etc.)

push up under the open space of the foot arch and not up under the ends. Many people feel a positive influence on their posture and walking comfort when wearing the current type of arch support, but this is not because they have a problem foot, but rather, because nearly all footwear that is available to today's consumer expects the wearer to function well while walking on a ramp (the heel is elevated higher than the forefoot) with their toes bunched together (from tapering toeboxes) and the toes held above the supporting surface by footwear industry standard toespring, which is the elevation of the ends of the toes above the ball of the foot (the metatarsophalangeal joints).

But wait, didn't we just confirm that in order for the arch of the foot to be supported, we need to support the ends, and not the middle, or open space? Indeed we did, and as you can see from the description above, current footwear available to consumers is improperly positioning the support ends of the arch, by elevating the heel, which is one end of the arch, and unnaturally pinching the toes and holding them above the ball of the foot (metatarsophalangeal joints), which is the other end of the foot arch.

True support of the foot arch would then necessitate getting the heel bone (calcaneus) flat on the ground to provide

support for the rearfoot support end, as well as getting the toes flat on the ground as well, so that the toes can help the ball of the foot to provide support for the other end of the foot arch in the forefoot.

Individuals who grow up barefoot, naturally have the support they need for both ends of their foot arch, and this is likely part of the reason why their foot arches function perfectly throughout their lifetimes, and their feet do not break down, unlike 80% of Americans who by nature of their habitual shoe wearing and compromised arches, will suffer some form of foot problem at some point in their lives.

This is not to suggest that we should all ditch our shoes and begin walking around barefoot, but it does suggest that our shoes are made improperly and are the cause of the arch problems and the associated deformities that many Americans experience.

Although there is scientific evidence that spending time barefoot is exactly what our weak arches need, the reason why it would not be a good idea for most Americans, is because much of our immediate environment is not compatible with our thin, moist skin and weak arches. We live in a world of cement and asphalt and multitudes of

sharp materials, such as glass, that can become imbedded into our skin. Interestingly, the skin of the feet becomes thickened and resistant with prolonged exposure to hard objects such as gravel, cement and asphalt. Unfortunately, most Americans will never experience this hypertrophying and strengthening of the skin and arches of the foot, which is taken for granted in many developing countries, where all out sprinting over sharp rocks causes neither pain, nor injury.

What is suggested and recommended is that we make shoes that meet the need for protection of the skin of the feet, and that shoe manufacturers do not presuppose that the fashionable design features of heel elevation, tapering toeboxes, and toespring, are without significant deforming consequences.

In conclusion, the most likely reason for needing arch support, is because today's footwear removes the structural integrity of the foot arch by altering the support ends in favor of supporting the open end, which is no longer an arch support, but an open space support.

Pushing up in the open space of the foot has the significant long term consequence of weakening of the muscles that span the open space of the arch, which are called the

intrinsic muscles of the foot, as well as the numerous muscles in your lower leg which send tendons into their final insertions, many of which are in the ends of the toes.

--by Dr. Ray McLanahan

What is Minimalism?

It's to be expected that with any new footwear trend, a lack of consensus among manufacturers can often muddy the waters for runners. Minimalist shoes are a prime example of this happening. Nothing is to stop a company from marketing a shoe as minimalist, when in fact, it might appear anything but when compared to other brands.

Clarification is clearly needed. Running Times magazine smartly wrote about the subject: "Many traditional training shoes put the foot 22-24mm off the ground in the heel and 10-15mm off the ground in the forefoot, and the difference between the two -- typically 12-14mm in traditional training shoes -- creates a forward-leaning slope, designed to reduce stress on the Achilles. Minimalist shoes trend toward being much more level (a 2-10mm slope) with the assumption that the runner will land on the midfoot and use the natural cushioning of the arch, thus the built-up heel only adds weight and gets in the way of an efficient stride."

Several criteria should determine whether a minimalist running shoe fits this particular bill of goods of natural-style running:

1. An absence of a thick, rigid, overbuilt and unresponsive heel-crash pad that is found in a majority of conventional running shoes.
2. The use of lightweight material for the shoes' upper part.
3. A flexible sole so your foot bends with the shoe, no matter the running surface-- dirt, asphalt, grass, rocky trails. You want the foot to feel the ground.
4. There's not much heel-to-toe height differential, also known as the drop (going barefoot is "zero drop.")
5. The shoe is so lightweight that you might want to take it to the post office where they have an electronic scale for readings in ounces.
6. The footbed is relatively flat and contains little cushioning support.

But "minimalism" is not only about the shoe; it's also a philosophy underlying natural movement. Running is a natural extension or movement of the body, rather than an unnatural act that requires excess shoe padding and heel support to perform safely. So remember: the beefier the shoe, the more a runner's natural stride is inhibited. You want to free the foot to develop naturally. So look for the least amount of shoe you can safely wear now. Then you should gradually work toward reducing the amount of shoe necessary through strengthening the foot and improving your stride.

What is a Barefoot-Style Shoe?

- Your feet “feel” the ground
- Thinnest layer of protection between foot and ground
- Heel and toes are level
- Land on the midfoot/forefoot
- Lightweight

What is a Minimalist Shoe?

- Some cushiony comfort
- Little to no heel-to-toe area drop
- Enhanced ground feel with feet
- Soft, flexible shoe moves with feet
- Ideal for all surfaces– road, trail, track

What is a Neutral/Transition Shoe?

- Similar protection to most running shoes but without elevated heel
- Little to no heel-to-toe area drop
- Foot is in natural position
- Encourages midfoot/forefoot landing
- Often an ideal "gateway" shoe for transitioning runners to minimalist/barefoot style, who do not wish to alter volume or speed of training

Should Heavier Runners Use Thickly Cushioned Shoes?

The answer is no. Being overweight increases the risk for knee osteoarthritis so most certainly for a heavy runner, consideration of the forces through the knee joint should be given the highest priority. I think a heavier Clydesdale-type runner should stay clear of any cushioned shoe from the start. Because, indeed, although the idea that a traditional running shoe increases forces through the knees is counterintuitive, that is exactly what we found in the gait laboratory. But the increased forces we found were not at impact. The peak forces that are associated with knee osteoarthritis always occur later in the stance phase when the foot is fully planted – in midstance.

This is the case regardless of running form or whether or not someone is wearing shoes – minimal or otherwise. It is at this point in the gait cycle, when the foot is fully planted, and the foot and the lower leg are absorbing and releasing the body weight in preparation for the next step, that joint torques (which relate to joint forces), and really all stresses and strains related to common injuries, are the highest. This is the point when runners are at risk for osteoarthritis, and virtually every other major injury, including stress fractures.

A cushioned shoe does not increase joint torques at impact. But what cushioning does do, which is harmful, is make the joints work harder, later, in midstance. Despite all the so-called advances in foam, gel and air-filled bladder technologies, the typical midsole compresses and releases out of sync with the rise and fall of the body weight. By working out of sync, a cushioned midsole makes the joints (and all injury prone areas for that matter) have to work harder, which we see by way of the greater joint torques.

My recommendation: the heavy runner should run in a shoe with no cushioning.

--by Dr. Casey Kerrigan, Founder www.oeshshoes.com

What Are the Most Common Running Injuries?

Plantar Fasciitis

Plantar fasciitis is a type of foot pain that occurs in the heel and sometimes in or around the arch of the foot as your plantar fascia is the thick connective tissue on the bottom of your foot. Symptoms are usually worse in the morning, and tend to ease off or go away as you walk throughout the day. The pain can be sharp over one specific point, or more diffuse throughout the fascia (sheath of muscle) of the foot. Today this is treated conventionally with "night splints" to help stretch the fascia, and reduce muscle contraction. It is not a very comfortable way to sleep and the therapy is about as beneficial and primitive as a caveman making a square wheel. As with most pain, anti-inflammatories are prescribed as are orthotics, which only support the dysfunction and weaken foot muscles. Here‘s why you really get it, and really fix it.

Plantar fasciitis occurs most often from the fatigue of the tibialis posterior muscle. This muscle is behind your lower leg bone and supports the main arch of your foot. Problems arise from another injury somewhere else in the body that is affecting the foot, lower leg muscle imbalance, and/or

from too much stress in one's life. Pretty much if you have plantar fasciitis you are under more stress than you can handle – whether that be from overtraining (too much anaerobic activity, insufficient rest, or lack of an aerobic base), working too hard, dietary stress (too much sugar, not enough protein or nutrient-dense foods), emotional stress, or other physical trauma/stress – anywhere in the body, not just in the foot. Even a poor fitting pair of shoes can cause this problem. The imbalance in the muscles causes the plantar fascia to tighten and spasm as it tries to support the foot. Addressing the reason for the muscle imbalances will address the plantar fasciitis problem, and the reason is not because you need to stretch it more, or didn't stretch it enough. Often treatment involves dietary modifications, (sugar and caffeine reduction are common), nutrient supplementation such as natural anti-inflammatories, (healthy fats from coconut, eggs, and fish oil), exercise and training adjustments (more aerobic, less anaerobic, more rest), and local muscle therapies.

Treating Plantar Fasciitis:

- Rub out any muscle trigger points behind the shin bone all the way down to the Achilles tendon
- Strengthen your foot muscles by walking barefoot as much as possible and trying to pick up small objects (like marbles) by crunching your toes

- Wear minimalist-type shoes with a wide toe box, low to zero-drop, and little support.
- You may need to ease into these if you've been in thick-heeled supportive shoes for a long time
- Do not stretch your calves, since this will only lengthen the injured muscle.

Iliotibial band (ITB) Frictional Syndrome (ITBS)

If you've had Iliotibial band (ITB) Frictional syndrome, then you know how much it hurts, and how it feels like it's never going to go away. It's one of those pains in your knee or the outside of your leg where you go out for a run, and have to limp home. It's like a knife digging into the side of your leg or knee. The ITB is an extension of a short muscle on the side of your hip called the tensor fascia lata (TFL) as well as your gluteus maximus muscle, (that's your behind). The ITB extends from the TFL and glut max down to the outside of your knee.

Pain occurs anywhere along the ITB, usually at the insertion (by the knee) or somewhere in the middle. You'll have pain running, walking [usually down] stairs, and anytime you try to bend your leg, especially after keeping it straight for a while. Waking up in the morning will be like an ice-pick in your leg. If you've ever had ITBS, you

probably went through a whole slew of treatments and still had it for 3 to 6 months; that is very common and no fun. Medical treatment is cortisone shots and NSAIDs for inflammation and if those don't help, then surgery is recommended to cut and release the band. That sounds like fishing, but much more miserable because someone would actually be cutting into a thick sheath of tendon, leaving the leg much less stable than what it was before going under the knife. ITBS occurs typically from the following reasons.

Often there is an actual weakness of the TFL or glute max itself. A major part of the ITB is made up of the glute max – the major leg extensor powerhouse muscle you use to jump, climb, squat, run, ride your bike, and even just to get out of a chair. This weakness could be from a structural imbalance or an injury somewhere (anywhere in the body) creating a gait disturbance. One or both of those muscles could have fatigued from wearing the wrong type of shoes or orthotics, or even from an old injury that is still haunting you, but you don‘t know it because the pain is gone, but your body has compensated. Often injuries of the ITB can be traced back to older injuries of an opposite-side upper body limb. That means a left shoulder or elbow injury from the past could be still affecting your gait and the reason for your current right leg ITBS.

ITBS can also occur from an imbalance between the inside and the outside of the leg. The muscles that support the inside of the knee are related to the adrenal glands. These are the sartorius, gracilis, as well as one of your hamstring muscles on the inside of the back of the leg that wraps around to the inner lower knee. If there is an adrenal involvement from overtraining and/or too much life stress, these muscles will fatigue, causing an over-firing of the muscles that support the outside of the leg/knee, which as you now know, is the glute max and TFL. Or the muscles on the inside of the leg could be working too hard so the outer leg muscles – the TFL (as well as the gluteus medius and minimus) – are pulled inward, essentially torquing the leg. Treating the injury with this understanding usually corrects it very quickly, often within a couple weeks, if not sooner.

Shin Splints

There are two types of shin splints – anterior (front of the leg), and posterior (back of the leg). In either case, the shin splints occur from a muscle imbalance between the two. If the tibialis anterior (front muscle) is neurologically inhibited (weak), the muscle will easily fatigue when walking or running, causing pain and therefore the "splints." But the weakness can also cause the muscle on the opposite side, the tibialis posterior, to work extra hard

to support the foot, so this can cause shin splints in the back of the leg. It's vice-versa if the muscle in the back of the shin is weak causing the front to work harder.

Shin splints are an adrenal gland issue most of the time – which means there is too much physical, dietary, or emotional stress the body cannot adapt to. Overtraining can result in shin splints. Sometimes the injury can be from something directly going on within the muscles or involved joints (knee/foot/ankle). Often the same stress will cause either shin splints or plantar fasciitis in a person; no rhyme or reason to it – maybe (un)lucky enough to get both.

Gait imbalances are very often seen in athletes as they wear the wrong types of footwear, often over-supportive and motion-control shoes that don‘t allow their foot muscles to behave naturally. Thick-heeled running shoes are perhaps the biggest culprit for shin splints as the body no longer absorbs shock properly when heel-striking rather than landing midfoot. Orthotics can also be the cause of shin splints – or later prescribed for the problem only to further alter body mechanics and cause a gait dysfunction. The foot, ankle, and lower leg muscles, tendons, and ligaments fatigue and muscle compensation begins when orthotics and non-minimalist shoes are worn. Some muscles work

too hard to compensate, while others don‘t work enough, so the pain begins.

Don‘t stretch those tender shins or calves, it won‘t help heal the injury. Rather, look for tender muscle points ("trigger points") throughout the muscles and rub them out to help relieve the pain and heal the tissues. Ice will rarely help, other than to numb the pain; keep your bagged veggies in the freezer and off your legs.

Achilles Tendonitis

Achilles Tendonitis is a pain in the Achilles tendon often where it attaches to the heel bone. Another name this injury goes by is Achilles tendinopathy as there is question to whether there is actually inflammation (the "itis") in the injury. Retrocalcaneal bursitis is sometimes diagnosed too, signifying that the bursa sac under the Achilles is inflamed. There are names like heel spur, bone spur, and my favorite – the "pump bump" --when there is an obvious swelling on the back of the heel. Call it what you like, there‘s a problem in the lower leg.

The Achilles is the tendon attachment of the two calf muscles – the gastrocnemius and the soleus. These muscles provide your power when running (especially uphill) and

jumping. They are very susceptible to stress as their function is closely related to the adrenal gland organs and cortisol (stress hormone) production. This is why if you're exercising too much, too often, and too hard, you'll most likely injure your foot or calf muscles resulting in names like Achilles tendonitis, plantar fasciitis, or shin splints. But remember, it's more important to diagnose why you have a problem rather than exactly what you have. So whether you're told you have tendonitis, bursitis, or a good ol' pump bump, it means your calf muscle(s) aren't working well and you're biting off more than you can chew.

As with any injury, there is some local therapy that needs to take place as well as a resolution to why the injury occurred in the first place. Are you wearing the wrong type of shoes? – too high of a heel? – too much support? These types of shoes will weaken your feet and can result in an Achilles problem. Think minimalist footwear and stay barefoot as much as you can to strengthen your feet, lower legs, and entire body. Orthotics? – not a good idea either. They support the foot and lower leg dysfunction. Look for tender spots (trigger points) throughout the entire calf area, rather than in the actually painful Achilles, and rub them out.

Excess anaerobic training will soon stress the adrenal glands too much and often result in an injury. Lack of

adequate rest will result in a similar problem. And too much emotional stress can result in injury too. Do you work 60 or more hours a week and are under a lot of stress? Also the nutritional component is often of utmost importance. Hydrogenated fats, refined sugars, MSG, and other processed foods can all wreak havoc on your health and cause so much stress you'll end up with an injury. Nutritional problems often set the stage for physical injuries.

Remember, Achilles tendonitis is an injury that is telling you that you've been overtraining.

--by Dr. Steve Gangemi (aka Sock Doc)

2

RUNNING BASICS

Making the Transition to Minimalist Running Shoes

There isn't a set formula that can be applied to all situations. The most important question to ask is whether your body is prepared to set your goal as running in a barefoot-style or minimalist shoe rather than a set amount of mileage per week.

If you as a runner are strong and well-balanced in a single leg stance, have an anatomically correct foot, nice flexible heel cords, and a good gait, then you are ready to roll pretty quick and do not need much transition. The opposite is true for someone who fails all these parameters. They need lots of supplemental work and need to get in a flat shoe all day.

Walking barefoot and in thin and flat street shoes is very helpful for the running transition.

A transition over a week or two is possible if one already has strong feet, is committed to form training and understanding structural issues, and is able to ease in with slow running and body awareness. The only way to really learn good form is to chuck the traditional shoes and do some running and drills in bare feet.

There are lots of common sense gradual progressions but no clear science. Here are a few suggestions:

- Add a mile every day or two until you are doing all running in minimalist shoes
- Add 5 minutes every day or two in minimalist shoes
- Add 10% a week in minimalist shoes

Dial in really good form early on and in 3 weeks you will have neuromuscular changes that are hard wired. Work on getting your cadence closer to 180 steps per minute. As with fixing a swim stroke or golf swing, try to correct it immediately. Listen to your body, work on strengthening the core and practicing mobility exercises to support barefoot technique. Progress gradually. Remember, you are trying to rewire a mechanical movement to a new “natural”. It takes time and commitment.

If you have a specific pain you need to listen to your body, ask "why?", and figure it out.

--by Mark Cucuzzella, M.D.

Stabilizing Yourself in Mid-stance -- the Essential Task for Healthy Running

A runner will typically average 1,200 steps a mile on one foot. And the gravity force on the body structure is 2.5 times the body weight with each step in the mid-stance phase of gait, no matter if you are running in perfect Kenyan style or in the heel-strike "jogging" pattern.

Stability, balance, and strength on one foot is even more critical when transitioning to more minimal shoes which do not control the foot. So how do we get better at this? First, try this simple test used by running form guru Jay Dicharry of University of Virginia's Center for Endurance Sport.

The test: Stand on a flat surface with your hands on your hips and your weight on one foot. Get a friend to watch you as you hold that position for 30 seconds. Have them see if you can maintain that with all your toes on the ground, and without raising the inside of the foot. Test the other leg. Then take a break, and do it again with your eyes closed.

If the inside of your foot and big toe come up off the ground, you use your trunk a lot to maintain balance, or you fall, that suggests that you don't have good control of the muscles in your feet (yet), and need to do some work before you remove your shoes.

"The easy thing is that if you fail the test, the test becomes the exercise," says Dicharry. “Do it as often as you can--while you're brushing your teeth, while you're barbecuing, while you're drinking a beer. When that gets easy, do it with your eyes closed. It's better to do it 20 times a day for 30 seconds than for 5 minutes once a week."

Ditch the Chair and Get a Stand-up Desk

Another very functional way to improve your stability and body balance is to get a stand-up desk. Many of us spend hours a day sitting in front of a computer at work and at home. Why not stand while doing your work or answering emails? Take your shoes off when you do this for even greater benefit. There is growing medical evidence that the massive amount of time one spends sitting is negative for one’s overall health, so yet another reason to get out of the chair. --**Mark Cucuzzella, M.D.**

What is Proprioception?

Proprioception is defined as the perception or sensing of your limbs in space (orientation) during movement of the body. Specifically in running, proprioception allows your mind to learn, with each step, from the effect of each movement and then adjust your limbs accordingly for future movements. Proprioception comes from the Latin word proprius, meaning "one's own" and perception. It's proprioception that allows the brain to adjust the posture and gait to uneven ground, or limp when the blister on the big toe begins to hurt. The foot automatically senses information about ground contact with each and every step. With this data, your brain responds accordingly. That blister might force you to adjust your gait to a limp to alleviate the foot pain. It's also why the tiniest pebble lodged inside a shoe or sock will cause discomfort until you stop, remove the shoe or sock, and get rid of the nuisance once and for all. As the foot's nerve endings send important information—regarding its movement, tension, pressure—to the spinal cord and brain, it allows the whole body to respond to foot-sense.

But many types of ill-fitting running shoes, and those that are over-supported, too much cushioning, and rigid tread and heel, can put stress on the foot's delicate structures, including muscles, bones, ligaments, joints, and even the

skin. In addition, shoes that produce a noticeable height difference between the heel and front of the foot can be an unnatural stressor, especially on the knees. Going barefoot means that there is the same height front and back, or “zero drop,” but a shoe with a thicker heel causes the front of the foot to drop further down. Many conventional running shoes have a drop over 12 millimeters, or half-inch to an inch. Some have much more.

So don’t be seduced by the shock-absorbing material of the shoe’s sole. The thicker the tread, the harder it is for the brain and foot to properly communicate with the body. In other words, the soles of the feet can’t stay in "contact" with the ground. You want that earth-to-foot rapport. While an over-developed shoe bottom might be protecting your foot from rocks and tree roots if you are running on a trail, there’s still a lack of foot-sense, which, in turn, restricts proprioception. This can throw off a stride and cause further biomechanical stress, because the brain is also less aware of where the foot is landing—and how to make minute adjustments.

--by Dr. Phil Maffetone

What is Elastic Recoil?

A key difference between walking and proper (mid- and forefoot) running is how the foot muscles work, and, in particular, the energy used for propulsion. The walking body acts more like an inverted pendulum, swinging along step-by-step, literally vaulting over stiff legs with locked knees. Muscles use the body's metabolic energy created by conversion of carbohydrates and fat.

Things are quite different with running. This action or "elastic recoil" is sometimes referred to as an "impulsive" and "springy" gait, rebounding along on compliant legs and unlocked knees. Instead of using all the body's energy, the leg and foot have a built-in "return energy" system for a significant amount of energy. This relies on the Achilles and other tendons to recycle impact energy. (Don't confuse this with claims made that some running shoes have a "return energy" system, they don't—it's simply marketing hype.)

In running, the body has an effective muscle work-minimizing strategy—many of the foot muscles don't technically push you off the ground like during walking. Instead, the muscles provide an isometric-type tension to stabilize the tendons and help in the function of the unique mechanism that takes impact energy, sometimes referred to as "elastic energy" associated with gravity and impact, and

uses it for propelling the body forward. In particular, the large springy Achilles tendon on the back of the heel that runs up the leg and attaches into the large calf muscles (the gastrocnemius and soleus) plays a key role in recycling energy for propulsion. This tendon must function with sufficient tension to help in the return energy process, and the muscles it attaches to, also important postural supports, require a certain level of tautness, even at rest. (Trying to "loosen" these muscles and tendons through stretching, aggressive massage or other therapy may be counter-productive, impairing the natural springy gait. Excessive tightness of the Achilles certainly can induce poor function as well—think balance.)

Those with shorter, more compact Achilles tendons, unlike taller runners who also have longer heel bones attached to the Achilles, generally have a more efficient spring mechanism—one reason why shorter runners typically can run faster, especially in sprinting, although there are exceptions. Carl Lewis and Usain Bolt, past and present Olympic champions, respectively, are taller than average. Bolt's height advantage worked against him in the start, but then he would later cover more ground using fewer strides than his competitors.

Here's how the body's natural gait uses recycled energy or elastic recoil for propulsion. As a runner's foot hits the ground, impact energy is stored in the muscles and tendons, and 95 percent of this energy is then used to spring the body forward like a pogo stick. This mechanism provides about 50 percent of the leg and foot energy for propulsion (the other 50 percent comes from muscle contraction). If this process isn't working well, such as if you land on your heels, are wearing bad shoes, or have muscle imbalances, the impact energy is dissipated or lost, and you must make up for the problem by contracting more muscles for propulsion which requires the use of more energy. Not only is this mechanically inefficient but it will slow you down, due to the higher cost of energy.

--by Dr. Phil Maffetone

What is Running Cadence?

Humans move in an incredibly similar fashion regarding cadence or tempo. It may be hard to believe, but most of us all run about 180 steps per minute. Anyone who is healthy normally walks at a basic pace of about 120 steps per minute. (The exception is walking or running on a treadmill, which poses a particular stress due to its unnatural circumstance—the brain senses the body movement but the body remains in one place. In this case there's a wider variation in tempo.)

These numbers—180 and 120—are approximate and are typical. Virtually all runners have a range of tempo between about 150 and 190 steps a minute whether jogging, running a marathon, or sprinting. This allows one's brain some leeway to adjust one's pace and body mechanics as necessary. Muscle imbalance, fatigue, caffeine, time of day, the weather and other factors can affect one's running efficiency for a given workout, and the brain will sense these factors and make appropriate changes such as slightly slowing our tempo, or speeding it up.

It's more than the brain, the rest of the head is important too, not only influencing tempo but gait. The eyes (a part of the brain) play a role, as does the inner ear, which contains a tiny "otolith" on each side. These contribute to collecting

information about body movement and balance. In addition, various muscles around the neck and those of the jaw joint (which connect directly to the brain as opposed to all other muscles which first connect to the spinal cord) continually send messages to the brain about body movement, and help the eyes and ears do their work. All this feedback, combined with the sensory input coming from the feet, spine, pelvis and elsewhere, helps the brain better adapt to changes during a run. Most of these adjustments are subtle and barely noticeable. The result is the most efficient run possible. In order to do this, the brain may decide 176 is a good tempo, at least for the first 20 or so minutes, then it may change to 182, and so on.

-by Dr. Phil Maffetone

What is Barefoot Therapy?

Of the dozens of therapies I used throughout my 35-plus year career of treating physical injuries, from acupuncture and biofeedback to manipulation and exercise, being barefoot is one of the most powerful, easiest to apply, and quickest to get results.

Barefoot therapy has helped many people rehabilitate their feet—it's necessary because wearing almost all shoes, whether for sports, leisure, work, or night on the town, can damage a foot's delicate muscles, nerves, and bones. But being barefoot allows the most natural of foot movements; it trains the feet to function better, and helps support the ankle, calf, knee, hip, back, and all structures up to the head. The result is that many aches and pains—including what some would consider chronic injuries like that bad hip or shoulder—get better.

But one cannot abruptly make the change to being barefoot after years of wearing dangerous footwear: those thick, over-supported shoes that ruin your feet have also weakened your foot muscles. Whether you're wearing common running shoes with thick soles, high heels or most other footwear, weaning off them must be done at a pace that pleases your muscles—the weakest part of the average foot and the area most in need of rehabilitation.

Here are ten barefoot steps you can take to dramatically change your ailing physical body.

1. Take off your shoes. Don't put them on in the morning, unless you're going right outdoors; and when coming home, taken them off before walking into your house. Spend more time standing, walking and otherwise being barefoot at home, in your office, and other indoor locations. It's best without socks, but a thin pair would be acceptable. Walk on the bare floor, carpeted areas, and wherever your feet take you. This provides different types of foot stimulation to help muscles work better—the first step in rehabilitating your feet. And it's significant for the many people whose addiction to shoes is damaging the body. Do this for a couple of weeks before the next step, spending as much time as is comfortable each day.

2. Now, take the plunge and venture outdoors in your bare feet. This will provide additional foot stimulation over the comforts of home. Stick with smooth surfaces—your driveway, sidewalk, and porch. Do this for at least 10 minutes. The different environment—the feel of new materials by your bare

feet, including temperature changes—provides added foot stimulation. Do this in conjunction with the first step. A week or so of this additional activity and you're ready to move on.

3. Now venture off to uneven natural ground. Walking on grass, dirt, and sand, will provide greater motivation for your feet to function better, helping the structures above be more stable. Start with just a few minutes if you're sensitive, but with three weeks of barefoot training, you'll be ready for this big step: Work up to a short walk of about 10 to 15 minutes.

4. Most people will have to wear shoes for various activities—work, running, shopping, social occasions. During this rehab period, there are two important things to do with your shoes. First, start wearing thinner, simple footwear, and avoid using orthotic or insole liners.

5. Almost everyone can take these first four steps. It will help improve the body's mechanics from toe to head. But many people need more foot stimulus for additional rehabilitation. Being barefoot will do this eventually, but you can speed the process. Here's one way: a foot massage. A professional massage is

always great, but you can treat your own feet daily at home, either by yourself or trading treatments with others. Even a five-minute massage for each foot can work wonders. Start with the feet relaxed, clean, and dry. A small amount of organic coconut oil is a nice option. Slowly and gently rub the foot all over using both hands, working up the leg where key foot muscles originate. Use firm pressure, but it should not be painful. Do this daily or as often as possible.

6. A key feature of optimal foot function is that it helps balance the whole body during walking, climbing stairs, jogging or running, and all other movements. Over time, wearing shoes can significantly diminish this balance mechanism. Being barefoot is helpful, but here's a way to speed the process. You should be able to easily balance on one bare foot for thirty seconds or more. If you can't perform this action, it's probably due to foot dysfunction, typically associated with muscle imbalance. Start with attempting to balance on one foot for as long as you can, even if just for a few seconds; next, try the other foot. Balancing on each foot can gradually improve the communication between feet and brain promoting better balance throughout the body. Here's a way to incorporate this therapeutic activity

into a regular routine: After a shower or bath—hold one foot up to dry it while standing on the other. Be sure to get each of your toes, and keep your foot relaxed. Then switch feet. Here's another good routine: Each day when putting on your shoes, do it standing, holding your foot above your knee to put on the shoe and tie it, then do the same with the other.

7. If you spend a lot of time on your feet during the day, especially if you must wear shoes, you often get home with tired, sore, sweaty and warm feet. Cool them. A cold footbath can work wonders, even after a hot shower. It improves circulation, tones muscles and overall improves foot function, and helps them recover from the day. Use a large enough bucket or foot tub that fits your feet without jamming your toes. Place your feet in cold water so they are completely submerged above the ankle. Add a small amount of ice to prevent the water from getting warm, but do not fill the tub with ice as this can freeze the foot, risking damage to nerves, blood vessels and muscles. Keep your foot immersed for five to twenty minutes. A deeper bath can also cool the leg muscles. A cold footbath can do much more than an icepack placed only on the area of

discomfort. Take a footbath while answering email, catching up on phone calls, or use it as a time to relax and listen to music.

8. Sometimes, the use of a hot footbath can be therapeutic, not to mention comforting. Moist heat works better than a heating pad because it penetrates into the foot better. Use the same size footbath as mentioned above, and fill with hot water—not scalding—but most people can tolerate temperatures of around 90 to 100 degrees Fahrenheit. Adding Epsom salt (magnesium salt) is also soothing. Beware: Heat can have unwanted side effects. Do not use heat if you have an acute injury, especially one that's inflamed, swollen, or bruised, and avoid heat with any skin disorder, diabetes, circulatory problem, or an open wound. When in doubt about using heat, avoid it.

9. For many people, here's one more step: turn your outdoor barefoot walk into an easy jog or run, expanding your walk as described in the third step. There are many ways to describe this process, but like other natural activities, your body already knows how to do it. Whether you begin on blacktop, smooth dirt or other areas that are comfortable, as you

naturally thicken the skin on the bottoms of your feet, you may be able to run anywhere barefoot. Use this barefoot time as a warm up for your longer run in flat shoes, a cool down, or keep it as a separate therapy. Many people take this as a launching pad for regular barefoot running, whether as a 30-to-45-minute workout or even running in races.

10. This final step is most important, and for everyone. Once you've weaned off bad shoes, rehabbed your feet, and restored good foot function, be careful to avoid returning to old unhealthy habits by wearing bad shoes. It's that simple.

Rehabilitating your feet with barefoot therapy, and riding your body of improper footwear will bring renewed physical function. It can quickly bring back the spring and vigor in your step, prevent injuries, and help maintain overall physical activity for years to come.

-by Dr. Phil Maffetone

How Does Diet Affect Running?

One of the most common questions I have been asked is, — Sock Doc, I 'm running in minimalist shoes (or barefoot), but I 'm still injured – why? ‖ This question tells me one thing – runners think that if you get out of your over-supportive, cushioned running shoes and orthotics then magically your injuries disappear. Unfortunately this is not always the case because running in minimalist type shoes and/or barefoot will not necessarily keep you injury-free. Proper footwear (or going barefoot) is only part of the injury-free prescription.

Running in minimalist shoes and being barefoot clearly helps the entire body. Improvements in nervous system function, muscular function and balance, proprioception, and overall health can be seen in those who keep their feet close to the ground and out of motion-altering footwear. But injuries are often not just because what you've got on your feet isn't right for you; more important for most athletes is the rest of the regimen – diet, training, and overall stress. All these factors determine whether you will get injured, (or come down with an illness), or not. Many athletes also forget that training itself is a two-part equation: working out plus rest.

Diet is perhaps the most important factor. What you eat and drink plays a major role in how your body is able to function during the day at work, at home, and while training. It also has a lot to do with how well you rest (sleep). For example, a diet high in omega 6 vegetable oils such as corn, safflower, and soy oils as well as partially hydrogenated fats will creep up your inflammation levels, resulting in muscles working harder than what they would have to otherwise to function normally and recover.

Significant stress is placed on the cardiovascular system too with diets high in inflammatory fats and obviously every runner wants an optimum cardio system. A high-carbohydrate diet, especially refined sugars like high fructose corn syrup, white sugar and flour, and yes, even agave, will contribute to the inflammation and even increase insulin levels over time. Eventually your tissues will become resistant to the insulin and blood-glucose handling problems will result. You may bonk or under-perform in a race because of this, or have mood swings and general body aches due to the carbohydrate sensitivity. Overall your diet will influence your entire body, including your joints, tendons, ligaments, and especially how your muscles function. Your body ultimately becomes out-of-balance; you get torqued or twisted a little, so to speak, as postural changes affect your gait, balance, and function.

Nervous system function is closely related to the diet and what follows are muscular imbalances because of the nervous system‘s response to the diet. Your calf may work harder than what it used to on one leg because of the gait imbalance, or your hamstring may work more because your quad isn‘t functioning correctly due to the gait and joint disturbances caused by the dietary imbalances; these nutritional dysfunctions affect your nervous system that, in turn, affect the muscles. In fact, addressing dietary imbalances is how I have been able to successfully treat patients when others only look at the injury itself, not where it came from.

Nutrients have a role here too, but they are typically much more individualized than overall dietary recommendations. Nutrient deficiencies and imbalances will have specific reflections on physical structure. A good example is a muscle cramp. Although a cramp can be due to a local muscle or tendon problem, it is often from a dietary problem (dehydration) or a nutrient imbalance or deficiency (sodium, potassium, magnesium, or calcium), resulting in a physical symptom. Cramping alters muscle function, not just in the muscle that is experiencing the cramp, but in other synergistic muscles and those affected by gait. Eventually this can lead to an injury to a muscle,

tendon, ligament, or bone, and perhaps a direct injury from the cramp itself.

Training and racing also play a major role in injuries, perhaps as much as diet. If you're training too anaerobically, then you're likely to get injured. Racing too much will have a similar outcome. The reason athletes get injured when they overtrain is partly due to the imbalance caused between training and recovery, and in part due to nutritional considerations. High-intensity and long-duration workouts require a certain amount of recovery, and which is different for everybody to some extent. Without enough rest your body won't recoup for the next workout. Muscles, tendons, and ligaments are affected directly from the workouts, but they are also affected by hormonal changes and nutritional considerations.

For example, it is well known that high- intensity workouts and even aerobic workouts lasting over a few hours will increase an athlete's stress hormone cortisol. This increased cortisol level will affect blood-sugar levels and that will affect various muscular functions as well as gait.

Consider the endurance athlete (perhaps yourself) following a long race, such as the marathon. Even if you're one hundred percent pain-free, most likely your posture

has changed afterward – a hip may be higher on one side or a shoulder rotated on the other side. These imbalances probably weren't there before the race.

A lot of these imbalances have to do with hormonal and nutritional changes in your body resulting in physical imbalances. Additionally, hormones such as cortisol have to be broken down by the liver and that requires nutrients such as antioxidants, vitamins, minerals, and sulfur amino acids such as L-Cysteine. Sulfur is a major component of cartilage. Think about what may happen to your joints if you're training too hard and your body is constantly making a lot of cortisol. Your joints will suffer. And high cortisol levels are a major reason for insomnia and waking up in the middle of the night. This impaired rest will further impact athletic performance and health as the recovery will not be available to offset the desired training.

So you can see the various ways nutrition and training (working out + rest) can impact the body in more than one way, and often result in an injury if imbalances occur.

Stress isn't just about working out too much either. If you're stressed out at work, stuck in front of a computer, have a long work commute, and have family stresses on top of that your body will perceive that as if you're training

hard all day long. Cortisol levels will elevate, beneficial sex hormones like testosterone and progesterone will plummet, and muscular imbalances will occur just as they do with overtraining and with dietary and nutritional imbalances. The end result is often the same in all three cases – an injury shows up, despite what you‘re wearing for footwear.

Yes, proper footwear is important, but if I could only choose only one thing to change in an athlete, it would be either his or her diet or training. So eating healthy, training properly, modifying your lifestyle, reducing stress, and strengthening your entire body by wearing minimalist footwear (or going barefoot) have their respective impacts– but on an individualized basis. If you don't pay attention to each one and keep them in balance or let one factor falter, then your body will let you know, with pain.

-by Dr. Steve Gangemi (aka Sock Doc).

Keeping Stress at Bay

Running, as we all know, is a great way to reduce stress, blow off steam, feel rejuvenated and energized. Yet running can also can increase the amount of stress in one's life. To understand the reason why, let's initially shift our attention to little furry rodents.

Research scientists love tormenting lab rats which are starved, shocked, bullied, and even water-boarded. Their torture is encouraged under the rational aegis of science—to find out how stress affects the brain. Because rats provide a fairly reliable indicator of human behavior, scientists use them to examine how stress affects overall health, including blood pressure, immune system, and depression.

In 2009, scientists at the University of Minho in Portugal discovered that chronically stressed rats acted rather un-ratlike. They'd continually press a bar for food pellets even when they had no intention of eating. The rats were stuck in a habit-forming groove of futile, non-productive behavior. It's as if their stressed brains were unable to make intelligent decisions like, "Hey, no food, so why don't I do something else with my time?"

Speaking with the New York Times, Robert Sapolsky, a neurobiologist at Stanford University School of Medicine, called the Portuguese study "a great model for understanding why we end up in a rut, and then dig ourselves deeper and deeper into that rut. We're lousy at recognizing when our normal coping mechanisms aren't working. Our response is usually to do it five times more, instead of thinking, maybe it's time to try something new."

Stress had an important evolutionary role in keeping our ancestors alive. Survival in the forest or on the savanna demanded quick action when danger lurked. Stress hormones like cortisol and adrenaline would suddenly flood into the bloodstream, causing the heart to beat faster, which increased blood flow to the muscles. But after the danger passed, the "flight or fight" hormones would settle down and the body would return to its normal physiological state.

But in today's modern world, stress receptors often get stuck open in a locked position. Since the body can't function all the time like this, stress hormone production is ultimately affected. Natural defense mechanisms weaken. The overloaded brain shuts down critical areas such as the hippocampus and prefrontal cortex, which affect learning, memory, and rational thought. A stressed-out person will

end up engaging in harmful, counter-productive behavior, like having three beers after work, or eating junk food when not hungry.

Warning Signs of Overtraining and a Stressed-out Body

- Lack of energy
- Leg soreness, general aches and pains
- Pain in muscles and joints
- Decreased performance times
- Insomnia
- Headaches
- Decreased immunity (increased number of colds and sore throats)
- Moodiness and irritability
- Apathy
- Decreased appetite
- Increased incidence of injuries

Given identical stressful conditions, such as losing a job or breaking up, some people are better able to cope, while others will emotionally fall apart—and remain depressed for a long time. In a 2009 Newsweek cover story titled, "Who Says Stress Is Bad For You?," science reporter Mary Carmichael cited several studies that pointed to genetic differences in determining the individual outcome to stressful situations. But which specific genes are responsible? No one knows. "The science is still young," she writes.

Yet there's good news for the stressed-out population. The Portuguese scientists found that stress-caused behavior is indeed reversible. Once removed from a stressful environment, the rats resumed acting like normal rats. No more pressing the food bar when there wasn't any food. Their brain circuitry had somehow rewired itself.

Make Your Running Less Stressful

I use my running (and deliberately shun the word "training") as the daily reset button. The harder and busier the day is the more I need to do an easy run. This relaxation counters the sometimes toxic levels of stress that comes with being overextended as a family physician and other work commitments. If running were another stress it would not be sustainable, therefore all of my running is relaxed. Often people read schedules developed by elite athletes and they have weekly strenuous sessions. Now if you are an elite athlete and the rest of your day is the relaxing part then you can add frequent stressful workouts. For 99.9 percent of all runners this is not the case. We all have busy and stressful lives and the running must fit into the "yin" of the "yin and yang" circle. -- **Mark Cucuzzella, M.D.**

Carmichael brought up another classic rat study: "Something that should lower stress can actually cause stress if it's done in the wrong spirit. Scientists put two rats in a cage, each of them locked inside a running wheel. The first rat could exercise whenever it liked. The second rat was forced to run whenever its counterpart did. Exercise, like meditation, usually tamps down stress and encourages neuron growth. The second rat, however, lost brain cells. It

was doing something that should have been good for its brain, but it lacked one crucial factor: control. It could not determine its own 'workout' schedule, so it didn't perceive it as exercise. Instead, it experienced it as a literal rat race."

So even too much of a good thing like running can turn harmful if it's controlling you rather than vice versa. It's a primary reason why many runners get injured or sick if they overtrain or race too frequently and don't take sufficient time off. The stress switch can't indefinitely remain open. Reaching a weekly quota of miles should be less important than honestly taking into account how you feel getting there. In other words, squeezing in that extra run can be a counterproductive goal if you are feeling tired or worn out. It just adds another layer of stress. Or if the weather is miserable and you are coming off a slight cold, it makes better sense to take a day or two off instead. You won't lose any fitness. And your body will thank you.

--by Bill Katovsky

Personal Notes

http://naturalrunningcenter.com