

The 10 Laws of Injury Prevention

Follow these time-tested principles and you'll spend more time on the roads—and less in rehab

By Amby Burfoot

From the March 2010 issue of Runner's World

In the mid-1970s, Runner's World medical editor George Sheehan, M.D., confirmed that he was hardly the only runner beset by injuries: A poll of the magazine's readers revealed that 60 percent reported chronic problems. "One person in 100 is a motor genius," who doesn't have injuries, concluded the often-sidelined Sheehan. To describe himself and the rest of us, he turned to Ralph Waldo Emerson: "There is a crack in everything God has made." With all the amazing advancements in sports medicine, you'd think that our rates of shinsplints and stress fractures would have dropped since Sheehan's era. But 30 years after running's first Big Boom, we continue to get hurt. A recent runnersworld.com poll revealed that 66 percent of respondents had suffered an injury in 2009.

Still, I figured medical science must have uncovered lots of little-known prevention secrets. So I went searching for them. After reviewing hundreds of published papers, I was surprised to find few answers. Most of the studies are retrospective, looking back. A few are prospective, looking forward. Even then, they're not the gold standard, which are randomized, controlled, double blind experiments. And conflicting results make it difficult to draw meaningful conclusions. I learned, for example, that running injuries can be caused by being female, being male, being old, being young, pronating too much, pronating too little, training too much, and training too little. Studies also indicate that the "wet test" doesn't help shoe selection, old shoes don't offer less cushioning than newer shoes, and leg-length discrepancies don't cause injuries (but too-little sleep does). Oh, here's good news: To get rid of blisters, you should drink less and smoke more.

Clearly, the medical studies wouldn't offer much help. So I switched to Plan B: I interviewed nearly a dozen of the best running-injury experts in the world. They come from the fields of biomechanics, sports podiatry, and physical therapy. Like the medical studies, these experts didn't always agree. But the more I talked with them, the more certain principles began to emerge. From these, I developed the following 10 laws of injury prevention. I can't guarantee that these rules will prevent you from ever getting hurt. But if you incorporate these guidelines into your training, I'm confident you'll be more likely to enjoy a long and healthy running life.

I Know Your Limits

It's easy to get injured; anyone can do it. Just run too much. "I firmly believe that every runner has an injury threshold," says physical therapist and biomechanist Irene Davis, Ph.D., from the University of Delaware's Running Injury Clinic. "Your threshold could be at 10 miles a week, or 100, but once you exceed it, you get injured." Various studies have identified injury-thresholds at 11, 25, and 40 miles per week. Your threshold is waiting for you to discover it.

Of course, your goal is to avoid injury. Runner and sports podiatrist Stephen Pribut, D.P.M., warns runners to beware the "terrible toos"—doing too much, too soon, too fast. Every research paper and every expert agrees that this—"training errors"—is the number one cause of self-inflicted running injuries. The body needs time to adapt from training changes and jumps in mileage or intensity. Muscles and joints need recovery time so they can recover and handle more training demands. If you rush that process, you could break down rather than build up.

Running experts have recognized this problem, and long ago devised an easy-to-use 10-percent rule: Build your weekly training mileage by no more than 10 percent per week. If you run 10 miles the first week, do just 11 miles the second week, 12 miles the third week, and so on.

Yet, there may be times when even a modest 10 percent increase proves too much. Biomechanist Reed Ferber, Ph.D., an assistant professor in the faculty of kinesiology and head of the Running Injury Clinic at the University of Calgary says that he sees a lot of newly injured runners during that third month of marathon training, when a popular 16-week Canadian program pushes the mileage hard. Meanwhile, his clinic's nine-month marathon program for first-timers increases mileage by just three percent per week. "We have a 97 percent success rate getting people through the entire program and to the marathon finish line," Ferber says.

ACTION PLAN

Be the Tortoise, not the Hare. Increase your weekly and monthly running totals gradually. Use the 10-percent rule as a general guideline, but realize that it might be too aggressive for you—especially if you are injury-prone. A five-percent or three-percent increase might be more appropriate. In addition to following a hard-day/easy-day approach, or more likely a hard/easy/easy pattern, many top runners use a system where they scale back their weekly mileage by 20 to 40 percent on a regular basis, maybe once a month. And remember that mileage isn't the only issue. Experts point out that an overly aggressive approach to hill running, intervals, trail running—indeed, any change in your training habits—can produce problems. Keeping a detailed training log can help you gauge your personal training

threshold. Record your weekly mileage and how you feel after your runs. Look for patterns. For instance, you may notice that your knees ache only when you're logging more than 40 miles a week.

Another major bugaboo: You used to run 30 miles a week, you got injured, now you want to get back to your old routine as quickly as possible. Don't. Take your time. The same applies to that upcoming race—if you missed some training time, don't accelerate the pace and distance of your remaining workouts in an effort to "catch up." Instead, adjust your goals as needed.

II Listen to Your Body

This is perhaps the oldest and most-widely-repeated advice for avoiding injuries, and still the best: If you don't run through pain, you can nip injuries in the bud. Most running injuries don't erupt from nowhere and blindsides you. They produce signals—aches, soreness, persistent pain—but it's up to you to not dismiss them and take appropriate (in)action. "Runners can be crazy the way they'll run through pain," Ferber says. "They need to pay more attention to pain and get to the root of what's causing it."

ACTION PLAN

At the first sign of an atypical pain (discomfort that worsens during a run or causes you to alter your gait), take three days off. Substitute light walking, water training, or bicycling if you want. On the fourth day, run half your normal easy-day amount at a much slower pace than usual. If you typically run four miles at nine minutes per mile, do just two miles at 11-minute pace. Success? Excellent. Reward yourself with another day off, and then run three miles at 10-minute pace. If you're pain-free, continue easing back into your normal routine. If not, take another three days off, then repeat the process to see if it works the second time around. If not, you've got two obvious options: Take more time off, and/or schedule an appointment with a sports-medicine specialist.

III Consider Shortening Your Stride

This comes as a bit of a surprise because it's not discussed much in running circles. Nonetheless, more than half the experts I interviewed mentioned it. And a December 2009 study reports that runners who shorten their stride by 10 percent could reduce risk of tibial stress fracture by three to six percent. The basic idea: Overstriding is a common mistake that can lead to decreased efficiency and increased injury risk. If you shorten your stride, you'll land "softer" with each footfall, incurring lower impact forces. "A shorter stride will usually lower the impact force, which should reduce injuries," says biomechanist Alan Hreljac, Ph.D., a retired researcher from California State University-Sacramento.

For the last decade, Davis has been researching runners' abilities to change their stride. Previously, experts believed that your stride was as immutable as your fingerprint, but Davis has used biofeedback equipment to disprove the old view. "We have shown that running and walking gait can be altered in such a way as to reduce pain, improve function, and reduce injury risk," she says.

ACTION PLAN

If you've had frequent running injuries, you might want to experiment running with your normal stride, just slightly shorter—about 10 percent. "This will help reduce your stride so you have more turnover," Davis says. "The number of footstrikes or repetitions trumps having a longer stride because it reduces your impact load." Start with a short distance, like a quarter mile, when making this change. If you have an injury that's related to your gait, see a physical therapist.

IV

Use Strength Training To Balance Your Body

You need something—and what better than muscle?—to keep your body properly aligned while you're running down the road at 450 pounds of crunching, twisting-in, and torquing-out force per stride. According to Ferber, it's particularly important to strengthen the hip muscles. He claims his clinic has cured 92 percent of knee injuries with a hip regimen. "Strengthening the hips is optimal for effective rehabilitation, as opposed to treating the area where the pain is located (e.g., your knee)," he says. "When you strengthen the hips—the abductors, adductors, and gluteus maximus—you increase your leg stability all the way down to the ankle."

ACTION PLAN

You don't want to train for bulging muscles. You need just enough core, hip, and lower-leg strength training to keep your pelvis and lower-extremity joints properly positioned. "Healthy running should be as symmetrical and fluid as possible," says Michael Fredericson, M.D., associate professor of sports medicine at Stanford University School of Medicine. "If you don't have muscle balance, then you lose the symmetry, and that's when you start having problems."

DETAILED EXERCISES AND ADDITIONAL ADVICE

ARTICLE: Hip strengthening exercises to cure foot, ankle, or knee pain:

<http://www.runnersworld.com/article/0,7120,s6-241-286--13410-0,00.html>

VIDEO: Strong abs will improve your form, reduce injuries, and make you faster:

<http://www.runnersworld.com/article/0,7120,s6-238-263-266-13384-0,00.html>

V

RICE Works

When you've got muscle aches or joint pains, there's nothing better than rest, ice, compression, and elevation for immediate treatment. These measures can relieve pain, reduce swelling, and protect damaged tissues, all of which speed healing. The only problem with RICE is that too many runners focus on the "I" while ignoring the "RCE." Ice reduces inflammation, but to ice-and-run, ice-and-run, without giving the tissues enough time to heal, is a little like dieting every day until 6 p.m. and then pigging out. And so Bruce Wilk, an orthopedic rehabilitation specialist in Miami, has added another letter to the acronym, spelling out PRICE. The P stands for "protection," which means don't run until the injury is better.

ACTION PLAN

RICE is most effective when done immediately following an injury. If you twist your ankle or strain your hamstring, plan to take a few days off from running (see Law II). Apply ice—for 10 to 15 minutes at a

time, several times a day. A homemade ice pack—a baggie filled with ice cubes and water—is best. A bag of frozen vegetables is also effective. If you can, elevate the area (easy for foot and ankle injuries, not so much for hip or hamstring issues) to limit swelling. Compression can also further reduce inflammation and can provide pain relief, especially when you first return to running. An ACE bandage is the simplest way to wrap a swollen area, but Amol Saxena, a sports podiatrist in Palo Alto, California, uses a compression dressing with 3M Coban, a self-adherent over-the-counter product. He then uses Kinesio Tex Tape or a Darco Body Armor Walker for when the swelling goes down. "The tape pulls up the skin slightly, allowing more blood to flow to the injured area," he says. He teaches runners, including 2008 Olympic bronze medalist Shalane Flanagan, how to put it on themselves.

DETAILED EXERCISES AND ADDITIONAL ADVICE

ARTICLE: Icing an injury can speed recovery?if you do it right:

<http://www.runnersworld.com/article/0,7120,s6-241-286--13411-0,00.html>

VIDEO: A taping method to combat Achilles tendinitis, ankle sprain, plantar fasciitis, runner's knee, shinsplints: <http://www.runnersworld.com/article/0,7120,s6-241-286--13016-0,00.html>

VI

Run on a Level Surface

Here's another factor that could have a significant impact on running injuries, but has been rarely studied: road camber. No doubt you always run on the left side of the road facing traffic. That's good for safety reasons. But it also gives you a functional leg-length discrepancy, since your left foot hits the road lower on the slope than your right foot. You're also placing your left foot on a slant that tends to limit healthy pronation, and your right foot in a position that encourages overpronation. And you're doing this—running in an unbalanced way—160 to 180 strides a minute for mile after mile, day after day, week after week. Clint Verran, a physical therapist in Lake Orion, Michigan, sees the results of this cambered running in his clinic, where he treats a higher incidence of left-hip injuries in runners than right-hip injuries.

ACTION PLAN

True, it's not easy to escape cambered asphalt. And safety concerns demand that you run on the left side of the road. So now you've already got two strikes against you. To avoid strike three, remember that road camber can cause problems. If you're increasing your mileage, feel an injury coming on, or are returning from injury, try to do some of your training runs on a level surface like a bike path or dirt trail. The local track also provides a firm, essentially flat surface that's great for slow-paced running. (When you do faster interval training on a track, you put unequal torque on your feet and legs due to the need to keep turning left, so be careful if you are injury prone.) Also consider the treadmill. It's hard to imagine a better surface for balanced running. At the very least, a treadmill provides a great surface for beginning runners, runners who are recovering from an injury, and perhaps even marathoners aiming to increase mileage without increasing their injury risk.

VII

Don't Race Or Do Speedwork Too Often

Researchers have found a correlation between injuries and frequent race efforts. This connection might extend to speedwork since intervals also require a near-maximal effort. So if you train fast once or twice a week and then race on the weekend, that's a lot of hard efforts without sufficient rest, particularly if you follow this pattern week after week. Some experts are cautious about recommending regular speed training for certain runners, especially those who get hurt easily. It's fine for those chasing podium placements or age-group awards. But for mid-and back-of-the-packers? "You might get five percent faster, but your injury risk could climb by 25 percent," Verran says. "That's a bad risk-benefit ratio. I think most runners can hit their goals without going harder than tempo pace."

ACTION PLAN

Recognize that races take a heavy toll, so give yourself plenty of recovery time (one day for each mile raced). If you are trying to quicken your pace for a specific goal, add a weekly speedwork session to your training plan, but be judicious about it. Even Olympic gold medalists only do five to 10 percent of their training at 5-K race pace and faster. If you're coming back from an injury or have chronic issues you're fearful of aggravating, consider Verran's advice. Do your faster workouts at tempo pace (5-K pace plus 25 to 35 seconds per mile).

DETAILED EXERCISES AND ADDITIONAL ADVICE

ARTICLE: Here's how to add tempo runs to your weekly mix:

<http://www.runnersworld.com/article/1,7124,s6-238-267--11909-0,00.html>

VIII

Stretch the Back Of Your Legs

Few running practices are as hallowed as stretching. And none have been debated as much in recent years. Studies have failed to reliably show that the addition of stretching to a warmup before activity reduces overuse injuries. "The jury's been out on stretching for about a decade," says Michael Ryan, Ph.D., a post-doctoral fellow at the University of Wisconsin-Madison. "And as far as I can tell, it hasn't come in yet." Yet few experts in the field are ready to abandon stretching. The reasoning: Runners are tight in predictable areas, they get injured in and around these areas, and therefore they should increase flexibility in these areas. The muscle groups at the back of the legs—the hamstrings and calf muscles—stand atop most lists of "best muscles for runners to stretch." Hamstring and hip-flexor flexibility seems to improve knee function (several reports link poor hamstring and hip-flexor flexibility with "larger knee joint loads"), and calf flexibility may keep the Achilles tendon and plantar fascia healthy.

ACTION PLAN

Little evidence indicates that stretching prevents overuse injuries. That said, knee and Achilles problems are among runners' most frequent complaints, and so experts recommend increasing the range of motion of muscles that can strain these areas if there is underlying tightness. Just don't do static stretches (holding an elongated muscle in a fixed position for 30 seconds or longer) before running. However, dynamic stretching can be done as a safe, effective prerun warmup.

DETAILED EXERCISES AND ADDITIONAL ADVICE

VIDEO: Dynamic stretching warms up the specific muscles used for running:

<http://www.runnersworld.com/video/1,8052,s6-6-0-2,00.html?bcpid=2884340001&bclid=1504353735&bctid=64056312001>

ARTICLE: How to stretch your hamstring, not your sciatic nerve:

<http://www.runnersworld.com/article/0,7120,s6-241-287--13058-0,00.html>

ARTICLE: Three calf stretches you should do after every run:

<http://www.runnersworld.com/article/1,7124,s6-241-287--8969-0,00.html>

IX

Cross-Training Provides Active Rest and Recovery

Running is hard on the body, although claims that it creates impact forces up to seven to eight times body weight are exaggerated, according to the experts I consulted. But they acknowledge the forces can reach two to three times body weight with each stride, and even more on downhill. It's no surprise that our muscles, joints, and connective tissues get weary from all this shock-absorbing. So experts agree that most runners benefit from at least one nonrunning day a week, and that injury-prone runners should avoid consecutive days of running. Cross-training offers a great alternative.

ACTION PLAN

Use cross-training activities to supplement your running, improve your muscle balance, and keep you injury-free. Swimming, cycling, elliptical training, and rowing will burn a lot of calories and improve your aerobic fitness, but be careful not to aggravate injury-prone areas (see below).

The Laws of Perpetual Motion: Keep it Safe

Cross-training can help you stay fit when you can't run. But pick wisely, says podiatrist Stephen Pribut. Some activities may exacerbate an injury.

Runner's Knee

Yes, usually okay: Swimming

Sometimes okay; let pain guide you: Stationary Bike, Elliptical

No, usually not okay: Rowing Machine

Iliotibial-Band Syndrome

Yes, usually okay: Swimming

Sometimes okay; let pain guide you: Stationary Bike, Elliptical, Rowing Machine

Calf Strain, Achilles Pain

Yes, usually okay: Swimming, Stationary Bike, Elliptical, Rowing Machine

Plantar Fasciitis

Yes, usually okay: Swimming, Stationary Bike, Elliptical, Rowing Machine

Shinsplints

Yes, usually okay: Swimming

Sometimes okay; let pain guide you: Stationary Bike

No, usually not okay: Elliptical, Rowing Machine

Stress Fracture

Yes, usually okay: Swimming

Sometimes okay; let pain guide you: Stationary Bike

No, usually not okay: Elliptical, Rowing Machine

DETAILED EXERCISES AND ADDITIONAL ADVICE

ARTICLE: Get fit and avoid injuries with endurance cross-training:

<http://www.runnersworld.com/article/1,7124,s6-238-263-266-7421-0,00.html>

ARTICLE: Here's how to stay fit until you can run again:

<http://www.runnersworld.com/article/1,7124,s6-241-286--13412-0,00.html>

X

Get Shoes That Fit

Running shoes have changed a lot over the years. They breathe better, are more likely to come in various widths, and are constructed from superior materials. Most important, there are far more shoes to choose from (racing, training, track, cross-country). There are even minimalist shoes designed to mimic barefoot running (although there's no scientific evidence that forgoing shoes decreases injury risk). This gives you more options. Of course, you still have to figure out which shoe will work best for you—not an easy task. "There's no single best shoe for every runner," says J. D. Denton, who has owned a Fleet Feet running store in Davis, California, for 14 years. Not only that, but it's impossible to say that shoe ABC will eliminate injury XYZ. Denton and his staff are careful to draw a line between giving medical advice and suggesting a top-notch shoe. "We're careful not to say, 'This shoe will cure your plantar fasciitis,'" Denton says. "Shoes aren't designed to cure injuries. Our goal is to make sure you get the shoe that fits and functions best on your feet." Others are less cautious than Denton. They point out that while a given shoe isn't guaranteed to heal a given injury, the right shoe on the right runner can help. Verran says that he has been able to help patients overcome injuries by suggesting a better fit. "It happens all the time," Verran says. "It's a matter of finding the shoe that's right for a certain foot type."

ACTION PLAN

Don't expect shoes to correct an injury resulting from training error or muscular imbalance. However, when you need new shoes (replace them every 300 to 500 miles), go to a specialty store to get expert advice. As a general rule, buy less shoe rather than more shoe (unless you weigh 220 pounds or know you need the Monster Mash model). Studies show that shoes perform best when they fit best. Ask your shoe salesperson: "Why is this the best shoe for me?" If he or she can't provide a sound answer, find another store.

DETAILED EXERCISES AND ADDITIONAL ADVICE

TOOL: Find the best running shoe for you:

<http://www.runnersworld.com/cda/shoelabshoefinder/0,7154,s6-240-325-329-0-0-0-0-0,00.html>