

3 Ways to Prevent Running Injuries

*By Matt Fitzgerald
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As a runner, understanding injuries and injury prevention is critical to your longevity in the sport. A few years ago, Michael Muller, a professor of physical therapy at Washington University, presented a new theory of tissue adaptation to physical stress that provides a helpful conceptual framework for runners seeking to stay healthy without sacrificing performance.

Physical Stress Theory

Physical stress theory, as it is called, is based on the simple premise that body tissues adapt in a predictable way in response to changes in the relative level of physical stress they are exposed to. When tissues are exposed to an accustomed level of stress, they maintain their current structure and function at a state that is often referred to as homeostasis.

When these same tissues are exposed to a slight or gradual increase in stress, they modify their structure and function--after an initial period of breakdown--to become more tolerant of that type of stress. They achieve a new homeostasis at a greater level of durability. For example, a recent animal study found that when rats were exposed to a running program, fingerlike branches of new tissue grew in the attachment between the tendons and muscles of their legs, strengthening these important junctions. But if a stress is increased too quickly or abruptly, the tissues never recover from the initial period of breakdown. They lose their homeostatic balance and progressively degenerate. All running overuse injuries follow this pattern.

On the other hand, if the level of stress is reduced, the tissues adapt in the other direction, finding a new homeostasis at a lower level of durability and function.

The physical stress theory reminds us that running does not only cause overuse injuries--it also protects us against them. When you increase your running volume at a sensible rate and then maintain your mileage at a sensible upper limit, the tissues of your lower body become significantly better able to tolerate the stress of running without losing homeostasis.

Several studies have shown that experienced runners who have been training for several years are significantly less likely to become injured than beginning runners. This may also be the case in part because some of the most injury-prone novice runners quit, leaving less injury-prone runners to become more experienced. But it is also a consequence of the durability-increasing tissue adaptations that more experienced runners have earned.

Another factor is the much greater relative increases in physical stress that beginning runners typically experience relative to veteran runners. The bones, muscles and joint tissues of the person who's going from zero to 20 miles a week in training for his or her first 5K are more likely to lose their homeostatic balance than those of a veteran runner who's working from 40 to 60 miles per week in training to set a 10K PR.

It seems to be a Catch-22: You need to run more to increase the injury resistance of your legs, but the relative increase in physical stress that comes with running more is often greater than the resulting increase in durability, so you wind up getting injured more often.

It may be possible, however, to get the fitness and durability benefits of running more miles without increasing your injury risk as much as high mileage does for the typical runner. Just follow these three guidelines:

Ramp up slowly. As the physical stress theory shows, whether an increase in physical stress makes a tissue stronger or breaks it down is determined by the magnitude of that increase. In running, that translates into the rate at which you increase your weekly mileage. By ramping up very slowly--the often-cited rule is 10 percent per week--you expose your leg tissues to manageable amounts of damage that they can repair and adapt to before the next time you run. When your tissues are given the opportunity to fully restore their prior homeostasis between runs, then you can't get injured--by definition--because an injury is a loss of homeostasis.

Obey your pain. No numerical rule can predict how your body will respond to your training. While in the long run using the 10-percent rule will certainly keep you healthier than you would be if you included abrupt mileage spikes in your training, it still doesn't make any sense to continue increasing your running mileage at a rate of 10 percent per week if you've developed a sore spot that gets a little worse every time you run. You must never ignore pain. When you develop a sore spot, reduce your running just enough to make the pain go away and then begin increasing your mileage cautiously. Sometimes it's necessary to stop running completely for a few days, but that is more than worth it when you consider that the possible consequences of ignoring the pain and continuing to run might be many weeks off with a far more serious injury later.

Be consistent. Research suggests that injuries are more likely to occur during periods of increasing running mileage than they are during periods of steady mileage, even if that steady mileage level is high. According to the physical stress model, simple repetition of a familiar stress is unlikely to cause a loss of homeostasis, and in running that means that you're unlikely to break down by maintaining your mileage at a consistently high level once you've safely brought it up to a high level initially.

Naturally, "high mileage" is relative. As a general rule, avoid letting your weekly mileage dip below 50 percent of your peak weekly mileage. So if your heaviest training week during the year is 50 miles, try to avoid running fewer than 25 miles at any other time of the year, except perhaps during a brief (one- or two-week) off-season break.

This article is adapted from *The Runner's Body*, by Ross Tucker, PhD, Jonathan Dugas, PhD, and Matt Fitzgerald (Rodale, 2009).

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