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Building Fatigue Resistance

How to Build Fatigue Resistance, Which Allows You to Ride at a High Effort for Longer

AN EXPERT- AND SCIENCE- BACKED GUIDE TO FINISHING JUST AS STRONG AS YOU STARTED

By Elizabeth Millard / Published Oct, 3 2023 /Bicycling.com

Introduction

Picture this: You're in the middle of a [century ride](#) that you're sure you've [paced](#) correctly (no going out too fast!), yet a wave of fatigue makes it feel as if you've been sprinting for the past 10 miles. Another one: You're [strength training](#) and despite planning just a 20-minute session, you're already gassed at the end of your first set.

Dealing with this kind of fatigue is common, and it can tank performance or even set you up for [injury](#). For example, slogging through the second half of that [100-mile ride](#) even though you feel wiped out can affect your form. Although there are some quick fixes, like energy gels and [drinks](#) that provide a temporary boost of energy (you need [carbs](#) to fight off fatigue after all!), there's a science-backed approach to making your energy last longer—and that's building fatigue resistance.

This doesn't mean learning to push through the weariness when it comes. Instead, it's a focus on [training](#) in a way that prevents those waves from crashing in the first place. Here's what you need to know.



Trevor Raab

Exactly What Fatigue Resistance Means

Although the terms [fatigue and tiredness](#) tend to get used interchangeably, there's a crucial difference between them, and it's important to know that difference when it comes to developing more fatigue resistance, according to [Sandra Hunter](#), Ph.D., director of the Athletic and Human Performance Research Center at Marquette University.

Overall, tiredness is a temporary condition that affects your body in a general way, she says. For example, if you didn't [sleep](#) well the night before.

There's also a type of fatigue that's considered a symptom of medical conditions. For example, [cancer](#) or multiple sclerosis often involve fatigue as a symptom and side effect of these conditions. This type of fatigue affects several parts of the body, as well as the brain.

When talking about fatigue with an activity like cycling, that falls under a category called exercise-induced fatigue, Hunter says.

"One way to tell if you're dealing with exercise-induced fatigue instead of tiredness is that this fatigue is acute, it can resolve within minutes in some cases, or hours, depending on what's happening on a muscular level," Hunter adds. "You would not have this for days."

In other words, even though you might feel body-wide effects like weakness or heavy legs, exercise-induced fatigue is tied to muscular changes that occur during activity.

“When speaking in terms of muscular capacity during exercise, fatigue is an involuntary decrease in the muscles’ ability to produce force or produce a powerful contraction,” explains Sonia DelBusso, D.P.T., doctor of physical therapy and corrective exercise specialist at Providence Saint John’s Health Center in California. “Fatigue is brought on by accumulation of lactate in the muscles. This influx of lactate causes a physiological inhibition of contraction capacity, leading to a reduction in exercise performance.”

Fatigue resistance tends to be genetically linked to your [muscle fiber type](#), DelBusso adds. Individuals with a higher percentage of slow-twitch fibers tend to experience delayed onset of fatigue, compared to individuals with a higher percentage of fast-twitch fibers, who tend to be more apt with sprint-style cycling.

Although it would be helpful to determine which type of muscle fibers you’re genetically predisposed to relying on during your [workouts](#), in some ways it doesn’t matter where you have that advantage, says DelBusso, because training in strategic ways can be a boon for building both types—and reducing the onset of fatigue as a result.

How do you do that? Experts offer key strategies.

4 Tools to Build Fatigue Resistance

1. Get in the Right Zone

Any cyclist would love to hear that with proper training, it’s possible to become completely fatigue resistant—if that were true, you could ride nonstop every day—so it’s important to keep in mind that there is an upper limit for each individual, says DelBusso. But even modest improvements can make a difference in performance, and that begins with more time in the correct [training zone](#).

“In order to [improve your endurance](#) and delay the onset of fatigue, incorporating [zone 2](#) or low-intensity [training], as well as [interval training](#), is recommended,” she suggests. Cycling in zone 2 means you’re going at a relatively slow pace—one in which you can comfortably carry on a conversation—and training here allows you to ride longer at a decreased workload.

DelBusso says zone 2 training should feel easy—with a [rate of perceived exertion](#), or RPE, of about 5 out of 10 or at about 60 to 70 percent of your max heart rate. For context, there are five heart rate zones for training, with zone 1 as the slowest and easiest pace, and zone 5 representing all-out effort that’s sustainable for only a very short amount of time, like 30 seconds. Zone 2 is just a step up from that low, [recovery](#) activity level.

For those who use power to set training zones, zone 2 hits at about 56 to 75 percent of your [functional threshold power](#) (FTP).

Training with more emphasis on zone 2 allows for the gradual increase in total time spent cycling, DelBusso adds. For those who are training for [longer rides](#), such as [century rides](#), increasing the capacity of total riding time is a crucial factor.

While training in zone 2 will build fatigue-resistant slow-twitch muscle fibers, it also allows for other benefits that stave off [bonking](#) in the later miles of a ride. For example, aerobic workouts have been shown to increase the number of [mitochondria](#)—the powerhouse of our cells that help generate energy for our muscles to use during exercise. The better your [mitochondria function](#), the more energy you'll have for better rides.

While you need this zone 2 training, exercising in different zones is key for better fatigue resistance because you'll build slow-twitch fibers in a lower zone and fast-twitch in a higher zone. "In order to recruit both types of muscle fibers, you have to train with a combination for high and low to become effective," she says. "So these low-intensity workouts are key." (More on that high zone in a minute!)

The ratio of your low- and [high-intensity workouts](#) will depend on factors like your training goals and how close you are to a race, she adds. But in general, the bulk of your fatigue-resistant training should be zone 2—for example, training three or four days a week in that zone and two days a week in a higher zone.

2. Add Intervals

[Interval training](#) can help increase power and contractility of both slow- and fast-twitch muscle fibers, says DelBusso.

According to the [National Institutes of Health](#), efficient muscle contraction is important for several functions in the body, including better joint stability, temperature regulation, and posture. In cycling, contractility improvements can translate into the ability to exert greater force over a shorter period of time. This can make you [faster](#), while also helping you fight fatigue when you pick up the pace.

"The combination of longer and slower [rides], and faster, [sprint workouts](#) can help to train the muscles' adaptability and combat the onset of fatigue," DelBusso explains.

Research points to the best ways to make the most of your [interval sessions](#). For example, a [study](#) published in the journal *Kinesiology* looked at different work-to-rest ratios for high-intensity interval training done with Taekwondo sessions and how that specifically played into fatigue resistance. The ratios assessed: 30 seconds work and 60 seconds rest; 30 seconds work and 120 seconds rest; and 30 seconds work and 240 seconds rest. After 10 sessions over four weeks, the most improvement in fatigue resistance came in the middle group with 120 seconds of rest. This HIIT sweet spot highlights the balance of high-intensity movement with rest periods—in other words, you need time to recover before going hard again.

In terms of why [HIIT training](#) works, a scientific [review](#) in the *International Journal of Environmental Research and Public Health* reports that it's because this type of training produces numerous physiological adaptations that improve exercise capacity—and many of them lead to fatigue resistance. This includes a boost in aerobic endurance, maximal oxygen uptake (a.k.a. [VO2 max](#)), [anaerobic](#) capacity, and metabolic health, the researchers suggest.

Also, training at your [lactate threshold](#) during interval workouts can help you prolong the time it takes for lactate to accumulate, one of the markers of fatigue, which will help you last longer on the road.

3. Mix in Lower-Body Strength Training

Because muscle fatigue can happen most in the [lower body](#) during a ride—especially a long ride—[strength work](#) in these muscles is particularly important for reducing exercise-induced fatigue, Hunter says. In fact, [research](#) in the journal *ERJ Open Research* looking at more than 36,000 participants found that leg strength is a major contributor to exercise capacity, to the point where muscle weakness in the lower body should be assessed in patients who complain of fatigue and exercise intolerance.

Also, [resistance training](#) builds fast-twitch muscles fibers, as well as endurance capacity, muscular strength, and ability to produce force, according to [research](#) in the *Scandinavian Journal of Medicine & Science in Sports*. This all allows you to utilize your legs at a higher capacity on a ride.

What's more: "[Strength training](#) helps you isolate some of the muscles that provide stability, and those are the ones that get the most fatigued during a race, so building them up is helpful," Hunter says. That includes prime movers like the [quadriceps](#) and [hamstrings](#), but also [core muscles](#) and [hip extensors](#), like the glutes.

Hunter's favorite static move is a wall sit, which can fire up multiple stabilizer muscles, and also gives you a sense of progress based on time. For example, you may be able to do a wall sit for only 15 seconds when you start, but then work your way up to a minute and beyond over a series of weeks.

Dynamic strength exercises that can make a difference for fatigue resistance also include [squats](#) and [calf raises](#), as well as bird dog and [bridges](#). "These are useful not just for [building more muscle](#), but they also give you greater body awareness," says Hunter. This can increase [cycling efficiency](#), which is another variable for reducing exercise-induced fatigue.

Basically, your body is similar to a machine, like a car or a home furnace: The more efficiently it runs, the less strain you'll see on the overall system, extending how long it can operate well.

While Hunter says lifting [lighter weights](#) for higher reps will improve your fatigue resistance, you also need to lift for strength and power (heavier weights and lower reps)—particularly if

you already have a strength base and need a greater challenge. Also, some [research](#) suggests that variable resistance devices—like resistance bands, some cable machines, and devices like Tonal, which vary the load throughout a movement—may improve fatigue resistance more than traditional [weight training](#).

4. Focus on Recovery

As always, never skip your [rest days](#). Hunter notes that [recovery](#), when it comes to fatigue resistance, isn't as researched as other aspects of exercise performance, but she believes it should be. "The better recovered you are, the faster you'll be able to come back from exercise-induced fatigue," she says.

Not only does that include having dedicated rest days, but also building recovery periods into your rides and workouts, especially when doing interval training. For example, most HIIT sessions include rest between exercises and sets and even if you're feeling energetic, Hunter advises taking those seriously because shortening the recovery periods could set you up for [overtraining](#) and injury risk.

A research [review](#) in the *International Journal of Sports Physiology and Performance* reports that overtraining syndrome—characterized by an imbalance between training and [recovery](#)—is recognized by effects like decreased performance, more fatigue, and mood disturbances.

Fatigue from overtraining can take several forms, according to the [National Academy of Sports Medicine](#). Not only can you tire faster during a ride or workout due to overtraining, but you may also have a changed perception in your rate of exertion, as well as a lack of feeling refreshed after you do rest. Overtraining can also cause fatigue and low energy to linger throughout the day, leading to a decline in motivation and enthusiasm for exercise.

The bottom line: You can't keep pushing it in your workouts in hopes of improving your fatigue resistance. Without proper rest and recovery, you'll do the opposite.

How to Determine Progress in Fatigue Resistance

In terms of how to determine if you're improving your fatigue resistance, it's likely you don't have access to a research lab that can do occasional muscle biopsies to look at your fast-twitch and slow-twitch fiber percentages, so Hunter suggests an easier, more accessible method: Track how you feel.

"Perceived effort and perceived fatigue shouldn't be underestimated as training tools," she says. "The more you tap into how your body is responding, the greater your body awareness becomes. People like to use their [heart rate](#) to measure effort, but in many cases, using that

awareness can be just as useful.” You could also use a [training log](#) to track how you feel during and after long rides and interval workouts.

If you make it to the end of your hard workouts feeling energized, you know you’ve made some strides toward fighting fatigue.

Okay riders, hope to see you in Claxton for Cruisin’ in the Country.

Until then, make every ride epic.

Darryl