STRENGTH TRAINING FOR TRIATHLETES

THE COMPLETE PROGRAM TO BUILD TRIATHLON POWER, SPEED, AND MUSCULAR ENDURANCE

OVER 75 EXERCISES FOR SWIM, BIKE, RUN

2nd EDITION

PATRICK HAGERMAN, EdD

Before embarking on any strenuous exercise program, including the training described in this book, everyone, particularly anyone with a known heart or blood-pressure problem, should be examined by a physician.

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CHAPTER 1

Strength Training Versus Endurance Training

Triathlon is an endurance sport, plain and simple. So why should you consider strength training a necessary part of a triathlon workout? The short answer is that strength training makes muscles stronger, and stronger muscles can perform longer at higher intensities before they fatigue. To fully understand what is happening during strength training and endurance training you must break down and examine the subtle differences and similarities between the two. This book takes the long route because when you understand how the body works, it's much easier to plan training programs that work to your advantage.

Making the Case for Strength Training

If you ask any triathlete what endurance training is, the most common answer has something to do with swimming, cycling, or running. Technically, endurance training is any type of exercise that is rhythmical, maintains an increased heart rate and oxygen consumption, and uses large muscle groups to propel the body. It is also referred to

as aerobic training because the body relies on a continuous, increased supply of oxygen during the energy-making processes at the cellular level. This supply of oxygen comes from increased respiration, usually the result of taking deeper breaths and breathing more frequently. In addition to increased respiration, the heart must pump more blood to the muscles to deliver the oxygen. So there is an increase in heart rate and respiration that is maintained throughout exercise: That's endurance training.

STRENGTH TRAINING can be any type of training that increases the endurance, size, power, or strength of the specific muscles being used, regardless of what type of exercise is being done.

Ask the same triathlete what strength training is, and the answer usually involves some sort of weight lifting. In the most literal sense, strength training can be any type of training that increases the endurance, size, power, or strength of the specific muscles being used, regardless of what type of exercise is being done or whether someone is actually "pumping iron." Strength training is done in short bouts, with rest periods interspersed throughout the workout; is not rhythmical; and involves many different muscle groups, some large and some small. Strength training is considered anaerobic, or without oxygen. Even though you are breathing and your body is delivering oxygen to the muscles, the processes that provide energy for strength training do not rely on oxygen as the aerobic processes do.

Another difference between strength and endurance training is that strength training does not improve the cardiovascular system to any great extent. Each exercise requires a short burst of effort that doesn't require large increases in blood flow from the heart. During endurance training, as the heart rate rises, the heart is doing more

work, so the heart muscle must be able to keep up the pace. To do this, the cardiac muscle tissue gets stronger, and the heart becomes more efficient at pumping blood. During strength training, significant, sustained increases in heart rate don't occur, and increases in oxygen delivery to the muscles are not needed, so the heart doesn't have to become stronger or more efficient.

The energy systems involved in endurance and strength training also differ in what they use as fuel. Along with delivering oxygen to muscles, the blood carries glucose (blood sugar) to the working muscles, where it is used as energy, stored as glycogen, or stored as fat. During endurance training, a large and steady supply of energy is required over a long period of time, so glucose is broken down to provide that energy and to allow the processes that burn fat stores to continue. You do not store enough glycogen in your muscles to sustain exercise for very long, so more glucose must be delivered by the blood to keep you moving. During strength training, the body must supply energy quickly but not in large amounts, so you use stored adenosine triphosphate and phosphocreatine (ATP-PC), along with the stored glycogen in your muscles. These energy systems provide a quick burst of energy, which is fine because a set of a strength training exercise doesn't take very long, and then you get to rest. Very little glucose or fat stores are used during strength training.

Anatomically, there is a great difference between strength and endurance training, but there are also some areas where the two overlap. Think about how often you lift weights during a triathlon. Other than lifting a cup of water to your mouth, taking your bike off the rack, and maybe picking yourself up off the ground, you don't lift that much—or do you? When you stop thinking of weight as a piece of iron attached to a barbell or machine, you realize that your body is a weight that you must lift and move all the time—and your muscles do the work. When you run, your legs have to push and hold up

your entire body weight. When you swim, your arms help pull your body forward against the resistance of the water; and when you ride, your arms support your upper body as your legs push against the forces of the bike and pedals to propel you forward. In fact, we are continually lifting weight during endurance training and racing. It may not seem like much weight, but over the course of an endurance training session your muscles become fatigued from all that lifting, and your heart gets tired from all that pumping.

If strength training makes our muscles stronger, then it makes sense that swimming, cycling, and running make our muscles stronger, because we are working with the weight of our bodies. The weight is just a mass of muscle and bones rather than iron plates. You have probably experienced your muscles becoming stronger as a result of your swimming, cycling, or running program. If so, then congratulations—you have been doing a form of strength training all along.

You may be tempted to stop here, deciding that endurance training provides all the strength training you care to (or need to) do. After all, if your body weight is the only thing you are lifting during a triathlon, why would you need a training program that uses free weights or machines? But if what you have been doing were good enough to bring you the performances you want, you probably wouldn't be reading this book.

The problem with solely relying on your body weight to increase strength during endurance training is that your weight cannot provide adequate stimulus to bring about significant adaptation—your body is already used to it. To produce improvement in any type of training program, there has to be an overload, and the only way to provide it is to first make your body carry that weight in longer training sessions. But longer training sessions will not improve your performance and speed for shorter distances, so you have to add external weight in a manner the body is not accustomed to; that's how you create the correct stimulus.

To produce improvement in any type of training program, there has to be an OVERLOAD.

Here's an analogy that may better explain this concept. Say you have a really cool muscle car, but it came with a tiny four-cylinder engine, so it doesn't go very fast or have much power. You take it to the repair shop, where the basic engine is replaced with a big, strong V8 engine. Now you can speed along as fast as you like and have plenty of power to pass slower cars. Your body is just like the muscle car. If you keep the same body but change the engine that moves it, so that it's stronger and has more power, then your athletic performances will improve and you will be passing slower competitors. Strength training creates a more powerful engine than if you were to rely on endurance training alone.

Obviously the mechanics of a conventional strength training program using some form of free weights or machines are quite different from those of conventional endurance training used by triathletes (swimming, cycling, and running). However, the type of strength training you do should directly benefit your swimming, cycling, and running. This is called sport-specific strength training. It mimics the movements of the sport, uses the same muscles used in the sport, and is applied in such a way that the intensity promotes the sport. Strength training for triathletes isn't a matter of just going to the gym and using whatever machine you find there; it has to be done in a deliberate and efficient way for you to achieve the desired physiological outcomes.

A physiological outcome is the way the body changes—in this case, how your muscles adapt. Four possible physiological outcomes can be achieved through a strength training program:

Muscular endurance: the ability of a muscle to withstand repeated use over a period of time.

Muscular hypertrophy: an increase in muscle mass, or size.
Muscular power: the ability to move the body quickly through the use of very fast muscular contractions.
Muscular strength: the amount of weight that the muscles can move in a single effort.

It's very important to remember that strength training doesn't necessarily mean you will bulk up. Far too often I hear the excuse, "I don't want to lift weights because it will make my muscles too big." That's just a simplistic generalization of what happens during strength training. Increased size is only one possible outcome, and you don't have to train for hypertrophy if you don't need to. Each of these outcomes has a place in a triathlete's training program. How you achieve each one is covered in Chapter 2. The key is to achieve just the right amount of each outcome at just the right time.

How Strength Training for Triathletes Is Different

Strength training routines can be wildly different depending on the sport they are intended to complement and on an individual athlete's needs. What constitutes a successful sport-specific strength training program for one triathlete may not work as well for another triathlete. It all depends on your level of training, the length of the triathlon you are training for, and your individual needs. But one thing is universally true: Strength training for triathletes should be very different from programs used by bodybuilders, powerlifters, and the general public. Everyone has the same muscles and bones, but everyone uses them in completely different ways. Different training goals, or outcomes, are reached by using different combinations of exercises, sets, repetitions, rest periods, exercise order, weight, and progression plans.

SAID Principle

Specific Adaptations to Imposed Demands is the basis for sport-specific training. This means that your body will adapt in a very specific way based on the demands that you impose on it during training. For example, to make your arms stronger, you have to train your arms, not your legs; or in endurance terms, to become a better swimmer, you have to swim, not run.

For example, a bodybuilder is interested in one thing: size. In their case, the bigger the muscle, the better. Having large, bulging muscles is not what a triathlete wants, because body mass negatively affects endurance efficiency, and larger muscles add a lot of mass but not necessarily a lot of strength. The bigger your muscles are, or the more mass they have, the more strength it takes to move that mass, especially over a long distance. Mass also creates increased frontal resistance in the water and frontal air resistance on land.

However, the triathlete can benefit from larger muscles if that increased size is kept in check and is used properly. If you want to increase the performance of a muscle, sometimes you have to start by increasing its size. After all, you can't make a muscle stronger if you don't have enough muscle to begin with. Once the muscle size is where it needs to be, you can change the emphasis of your strength training to move toward your desired outcome. A muscle that is the right size can be made stronger and more powerful or be given more endurance. So don't immediately rule out using a strength training program that focuses on hypertrophy, because it may be exactly what you need. For example, most of us have a dominant side that includes an arm or leg that is larger and stronger than the other side. Most

The triathlete can BENEFIT from larger muscles if that increased size is kept in check and is used properly.

right-handed people will have larger muscles in their right shoulder compared to their left. People who drive a lot have larger calf muscles in their right leg because of all the "reps" they do pushing the accelerator pedal. Sometimes we need to focus on hypertrophy to even out the body. Additionally, if you have ever suffered a serious injury that required rehabilitation, there is a good chance that one limb is larger than the other. This happens when rehab is focused on the injured limb and neglects the unaffected limb—allowing only one limb to get stronger or larger. On the other hand, long-term rehab, in which both limbs are used, allows the unaffected limb to get stronger or larger while the injured limb progresses more slowly. In each case you have a unilateral deficiency in both size and strength that could be fixed with focused strength training with hypertrophy as the goal.

Athletes who compete in powerlifting and weightlifting are not usually as big as bodybuilders; however, they are very strong for their size. In these sports, success depends on how much you can lift, not on how big you look. Powerlifters who compete in contests for bench press, squat, and deadlift, as well as weightlifters competing in the Olympic lifts—the snatch and the clean and jerk—are usually very strong for their size. (Some of the strongest lifters pound for pound are actually women.) But remember, these heavyweight sports have almost no endurance component, because a competitive lift consists of 1 rep that will last anywhere from 2 to 20 seconds. A triathlete needs compact, strong muscles but requires much more endurance from them.

General fitness programs are likewise not useful for triathletes, mainly because of their wide range of variety and their lack of sport-specific exercises. Training for general fitness is more about

Endurance Efficiency

Endurance efficiency is the amount of energy you use per pound of body weight during aerobic training. The goal for triathletes is to be very efficient by having lean, strong muscles, not large, weak muscles.

working all the different parts of the body in a manner designed to work as many muscles at one time as possible, often using machines that are designed to make the exercise comfortable rather than to mimic a sport's movement. So although most of the exercise programs you find in popular magazines will improve your fitness, they won't do much to improve your triathlon performances. The key is to choose exercises that mimic the sport of triathlon and put them together in a way that works for you.

How Strength Training Leads to Better Performance

You will more than likely boost your race results if you incorporate strength training into your triathlon training, because stronger muscles deliver increased power, speed, lean mass, and muscular endurance. Your race focus, experience level, and current body composition will inform how these benefits contribute to your performance gains.

Muscular Power

The first benefit of strength training is muscular power, or the ability to produce force quickly. In a triathlon this is useful during a short sprint to pass a competitor, uphill cycling, and transitioning into and out of the water. A powerful muscle is able to call upon its anaerobic

When you have more muscle to rely on, it takes LONGER to wear it out.

energy stores to support quick movement. Strength training increases muscular power in two ways: (1) The more muscle you have, the less effort it takes to produce a given amount of power (remember the muscle car analogy), and (2) strength training teaches your muscles to reproduce energy quickly so they can better recover from short bouts of high-intensity movement. Energy production and recovery happen deep down in the muscle fibers, where glycogen, enzymes that increase the speed of muscular contraction, and creatine and phosphocreatine (energy substrates) are all increased because of strength training.

Speed

Second, you can increase your speed through strength training, regardless of what race distance you compete in. This is the result of the selective recruitment of fast-twitch muscle fibers during strength training. During endurance training you mainly use your slow-twitch fibers, which are designed for low power output and long durations. During strength training you have to call upon the fast-twitch muscle fibers for their high power and force output. The downside to fast-twitch fibers is that they fatigue quickly—usually in less than five minutes. When you put out a sudden burst of speed in training or racing, you know that you cannot sustain it for very long before slowing back down to your regular pace. Strength training builds up the ability of the fast-twitch muscle fibers to activate and provide that burst of speed. You will still have to slow back down, but you can obtain a higher-intensity burst of speed (meaning faster) and recover from it faster, which means you can do it again when you need to.

Lean Mass

The third performance benefit of strength training comes from an indirect effect: a reduction in body fat because of an increase in lean mass. Decreasing one's body fat is typically equated with losing fat, but the equation has two sides—you can also increase lean tissue. Endurance training burns a lot of fat, but it doesn't build much lean tissue. Strength training is all about increasing lean tissue. Again, we are not talking about bulking up your muscles, but about making the muscles you have more dense. Increasing muscle density decreases your fat-to-lean ratio, which ultimately improves performance. Fat doesn't assist in movement—it's just along for the ride, which increases the demand on the muscle to move it along. More lean tissue means more muscle to produce movement, which is exactly what you want, because muscle essentially carries itself.

Muscular Endurance

Finally, increasing muscular strength increases muscular endurance. When you have more muscle to rely on, it takes longer to wear it out. If you find that you sometimes reach muscular fatigue before you reach cardiovascular fatigue, then you should increase your muscular strength so that you have more in reserve. Endurance training decreases cardiovascular fatigue; strength training increases muscular endurance, which in turn decreases muscular fatigue.

Considerations for Your Strength Training Plan

Training for Different Distances

Strength training programs for triathletes often employ similar exercises, but differ depending on the race distance you are training for. Performing well in a shorter sprint race calls for more speed and

power than muscular endurance, whereas an Ironman®-distance event requires less speed and power and more muscular endurance. In between those you have the Olympic and half-Iron distances, which require a combination of speed and endurance. So each race distance necessitates a strength training program with different outcomes. The balance of each outcome with the training distance is probably the most important aspect of program design. Just as you wouldn't train like a bodybuilder and expect to perform well in a triathlon, a sprint-distance triathlete can't approach strength training in the same way as a triathlete who competes in Iron-distance events. The distance you strive for will affect the reps, sets, and weights you use (more on this in Chapter 2), as well as how often you can strength train in conjunction with your endurance training schedule. It all has to come together in just the right way for it to work. After an explanation of the specific components, later chapters provide more detailed information on putting together a program for each race distance.

Time Investment

If you have been a triathlete for some time, you know how many hours you need to put into your endurance training. At times it seems as though you're doing endless laps in the pool, thousands of mind-numbing pedal strokes, and long miles on the road. You may be thinking that you don't have time for strength training on top of that—there are only so many hours in a day, after all. Fortunately, strength training doesn't take very much time. In the beginning, if you can spare 30 minutes a day, three days a week, the results will make you want to do more. It's even possible to cut back on your endurance training to make room for strength training and end up with better endurance training sessions. How much time you want to invest is going to depend on your particular goals, but most strength

training programs can be completed in a 30- to 45-minute workout if it is designed efficiently.

If you can spend 90 minutes a week increasing your body's ability to perform during all those other hours you train, won't it be worth it? Of course it will! Once you find the right combination of muscle density and efficiency, your leg turnover will become faster, your strokes more powerful, and your spinning quicker—all without a mindful increase in effort. That's the beauty of strength training: Not only do you feel stronger, but everything else improves as a result. And this happens very quickly. Your body will begin responding to a strength training program within the first couple of weeks, though you might not see anything different in the mirror right away because initially the changes will be happening on the inside.

Once you find the RIGHT COMBINATION of muscle density and efficiency, your leg turnover will become faster, your strokes more powerful, and your spinning quicker—all without a mindful increase in effort.

Fitting strength training into your busy life and training schedule can still be a challenge. While the *when* of strength training is one of those questions that science has not equivocally answered, you'll find out soon enough that if you strength train immediately before you do any endurance training, your muscles will be fatigued and your endurance training will suffer. Likewise, if you do your endurance training before you hit the weights, you'll find that you can't lift as much or with as much power. Fatigue is always going to be an issue. The solution is to split up your training sessions so they are at different times on the same day or on different days. This will be covered more in Chapter 2.

It is also possible to do too much strength training. The additional strain that strength training adds to your entire program can be too much if you don't ease into it and back off on your endurance training at the same time. Overtraining will set back your performance, extend the time it takes you to recover from injuries, and just plain slow you down. Nothing is worse than a muscle that won't heal because you pushed it too far. A proper strength training program must be put together with your entire training regimen in mind and without pushing your body too far. This book provides some guidelines to get you started in the right direction, but ultimately you need to listen to how your body responds and let it guide you toward the proper balance of strength and endurance training for you.

Intensity

Probably the most important component of your strength training program is the intensity, which is a combination of the weights you use, how much you rest between sets, and the length of a workout. To properly produce the efficiency you want, and to push the muscular endurance levels upward, the intensity has to be set so that you are constantly moving from one exercise to another, with enough rest between each set of an exercise to allow for some energy recuperation but not so much that you cool down before you start up again. The best way to do this is to group exercises together in repeating series called circuits. This is an advanced version of the circuit training programs that were popular during the 1980s but with more scientific rationale to make it effective.

Intensity is not just about how much weight you can lift. In fact, in many exercises the weight is just your body weight or a few extra pounds. How much weight you can move isn't the key to intensity; it's putting the right amount of resistance in the right place during the right movement. It all has to fit in with triathlon movements and

INTENSITY changes during a triathlon, and it changes during a strength training session.

the muscles used in some specific way. Intensity changes during a triathlon, and it changes during a strength training session. As you learn the components of a good program and see how to put together an individualized program, you will learn how intensity can be manipulated to your benefit.

The Principle of Specificity at Work

Specificity is one of the most important concepts behind strength training for sports. As mentioned previously, sport strength training has to be designed to mimic the sport you are training for. The movements you produce during the swim, bike, and run can be mimicked in a weight room with a little creativity. Unfortunately, equipment manufacturers haven't produced a lot of triathlon-specific exercise machines, so many of the exercises in this book require some imagination, but they simulate the bigger movements involved in our sport. For example, a squat will definitely make your legs stronger, but when in a triathlon are you pushing off with both feet at the same time? Never! However, during cycling you extend the hip, knee, and ankle of one leg at a time, over and over. So all you have to do is develop an exercise that allows you to mimic this one-leg squat to create a sport-specific exercise for cycling. Keep this in mind as you flip through the book and try the exercises in Part III; they may still look unfamiliar, but you'll know why they work.

At the same time, an exercise that is not exactly sport specific can have a positive benefit for your sport. For example, football players spend a lot of time working on their bench press strength. If you think about a football game, if a player is lying on their back

and pushing up, they are probably trying to get another player off of them—meaning the play is over. So the bench press isn't exactly a sport-specific exercise for football. Or is it? If you can picture the same bench press position, but standing, you can see how a football player who is standing up and pushing against another player is very sport specific. What does this have to do with triathlon? The point is that some exercises have a carryover effect that has little to do with the position you are in during the exercise. As mentioned earlier, a one-leg squat simulates the movement you use in cycling. However, if doing a one-leg squat is too difficult, then a two-leg squat is your solution. You will still get a strength benefit, and you will work both legs at the same time. It's not exactly a sport-specific movement, but it will improve your strength for cycling and maybe you will eventually be able to successfully complete the more sport-specific movement.

About the Author

Dr. Patrick Hagerman, EdD, FNSCA, CSCS, NSCA-CPT, has established himself as an authority on the topic of strength training through his experience as a professor of exercise and sports science, a coach, and a personal trainer. Starting as a collegiate strength and conditioning coach, Hagerman went on to coach for USA Weightlifting and USA Triathlon and to serve on the USA Triathlon Coaching Commission.

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STRONGER MUSCLES LAST LONGER

Stronger triathletes bring more power, speed, lean mass, and muscular endurance to race day. While time is a precious commodity for every triathlete, every bit of time spent strength training pays off. Add strength training to your triathlon preparation and become a stronger, faster, more resilient athlete.

Strength Training for Triathletes helps you line up a strength program focused on your individual needs. Whether you want to increase endurance on the swim, find more power on the bike, or fight fatigue on the run, the sport-specific exercises featured in this book make it easy to target your training for improved performance in any or all of the three events. Every exercise is clearly explained and fully illustrated, taking the guesswork out of good technique.

TRIATHLON'S BEST-SELLING BOOK ON STRENGTH TRAINING

Many triathletes overlook strength training until race times begin to atrophy or muscular imbalances and weaknesses turn into setbacks. A personalized strength program is the answer. If you have your sights set on racing faster and farther in the season ahead, strength training will get you there.

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