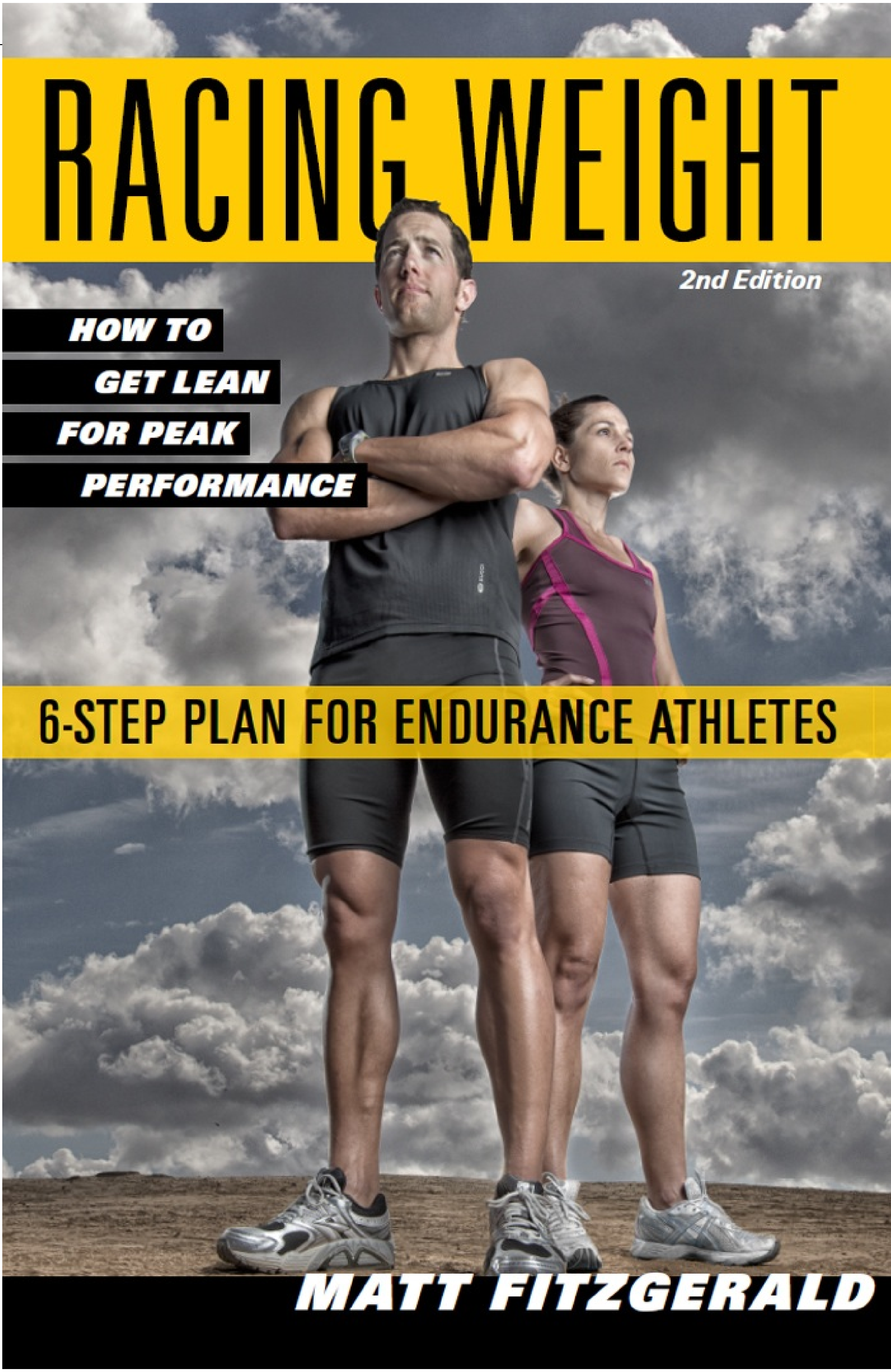
RACING WEIGHT
2nd Edition
HOW TO
GET LEAN
FOR PEAK
PERFORMANCE
6-STEP PLAN FOR ENDURANCE ATHLETES
MATT FITZGERALD

2nd Edition

# RACING WEIGHT

## HOW TO GET LEAN FOR PEAK PERFORMANCE

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# CONTENTS

# PREFAC
## TO THE SECOND EDITIO

The premise of this book is simple: Weight management is as important for endurance athletes as it for nonathletes, yet the goal and the best methods of weight management are different for those wh race than they are for those who don’t.

As a sports nutritionist and journalist I have written a great deal about weight management f both athletes and nonathletes. I must confess that I find it more rewarding to coach athletes towa getting leaner. The secret to weight loss for the overweight nonathlete is motivation. Most people wh are really motivated to lose weight are bound to succeed. As they say, “Where there’s a will, there’s way.” Dieters seldom fail for lack of knowledge. As a weight-management coach of nonathletes, I ca only educate; the motivation to succeed has to come from within each individual. If that were eas obesity wouldn’t be so prevalent today.

Endurance athletes are different. The motivation to perform better is intrinsic to members of th group. Cyclists, Nordic skiers, rowers, runners, swimmers, and triathletes are willing to do what takes to improve, whether it’s train harder, take recovery more seriously, work on their mental gam —or lose excess body fat.

After the first edition of *Racing Weight* was published in November 2009, I started to receiv feedback from athletes who had read it and had implemented the program. It has been gratifying to se the great number of positive results. Most of the athletes who have shared their success stories wi me have thanked me for having addressed the longstanding need for a weight-management progra designed especially for endurance athletes. I am always quick to point out to these folks that it is *th* who deserve the credit for their results. Yes, I have provided some useful information, but th motivation is theirs, and it makes all the difference.

There are other sorts of feedback that I have received from *Racing Weight* readers as we questions, points of confusion, a few criticisms, and a correction or two. The book was not perfec And any program that is based on the best practices of elite athletes and is supported by curre science will begin to show its age as best practices evolve and science advances. It’s not as if the mo successful endurance athletes have started doing anything radically new for weight management or if the scientific underpinnings of the Racing Weight program have been completely inverted, but ove time we reshape these ideas in subtle but important ways.

For example, a colleague of mine, Robert Portman, PhD, who is one of the world’s leading spor nutrition researchers, recently made a compelling case in favor of concentrating carbohydrate intak in the early part of the day and protein intake late in the day. A small but growing number of athlete are now practicing this method with good results. Therefore I have chosen to incorporate it into th “nutrient timing” step of the Racing Weight system.

Quite apart from the evolution of athletic best practices and science, my thinking on trainin nutrition, and weight management has continued to evolve through my experience as an athlete ar coach. ~~Where necessary, I have refined some of the tools presented in *Racing Weight*. The secon~~ edition of the book has been a welcome opportunity to address the questions and suggestions of th first edition's readers, to update the program with the latest research, and to make the changes ar additions that would make the program even more effective for motivated athletes.

The biggest change is that, whereas the original Racing Weight program comprised five steps, th revised program adds a sixth step: self-monitoring. Research has shown that self-monitoring practic and the behavioral modifications that surround them are the strongest predictors of successful lon term weight-loss maintenance in the general population. In this regard, endurance athletes are not s different from non-athletes. Readers of the first edition will recall that the book contained a chapt titled "Monitoring Your Progress." However, the monitoring practices described therein wer extrinsic to the program. By integrating self-monitoring into the Racing Weight method, you will, hope, be able to tap this advantage in your effort to reach your racing weight.

Readers familiar with the first edition will notice other changes. I added Chapter 3, "Dieting v Performance Weight Management," as a general overview of the Racing Weight program. In it, explore exactly which weight-management methods athletes can and cannot successfully borrow fro nonathletic dieters. Chapter 10, "The Racing Weight Journey," provides additional guidance on how t put into practice the six steps of the Racing Weight program.

Less conspicuous but no less important than these structural changes are some new tools that hav been added to the chapters that outline the six steps. These tools are intended to make the program simple and easy to practice as it can possibly be.

MATT FITZGERAI

How would your performance change if you were at your optimal body weight? Imagine what would feel like to set out on a run weighing 10 pounds less than you do right now. How much would affect your efficiency, your endurance, or, more simply, your self-image? When was the last time yo saw a marked improvement in your fitness? Do a few extra pounds stand between you and a fast race? Chances are that it was your quest for optimal body weight that led you to pick up *Racin Weight*.

You are not alone in this quest. Several years ago I assisted exercise scientists from Montana Sta University in conducting a survey of endurance athletes concerning their attitudes about their bod weight and their weight-management practices. More than three thousand cyclists, runners, triathlete and other endurance athletes responded. Most were serious competitive athletes who trained at lea one hour a day, five days a week. The results of the survey, which were presented at a meeting of th Society for Behavioral Medicine in Montreal, Canada and published in the *Annals of Behavior Medicine* (Ciccolo et al. 2009), were quite interesting.

Seventy-four percent of respondents labeled themselves as “concerned” or “very concerned” abo their body weight. Fifty-four percent said that they were dissatisfied with their body weight. The figures are almost identical to those that come from surveys of the general population, despite the fa that the general population is quite a bit heavier than most of the people who took the Montana Sta survey.

While striking on one level, these findings did not surprise me. That’s because, as a spor nutritionist and endurance sports expert, I am accustomed to communicating with and helpin endurance athletes who are concerned about and dissatisfied with their body weight. As a runner an triathlete myself, I share their concern and, at times, their dissatisfaction.

The nature of the endurance athlete’s concern and dissatisfaction is somewhat different from th nonathlete’s, however. The nonathlete is typically motivated to shed excess body fat by a desire t look better and, perhaps also, by a desire to improve his or her health. Endurance athletes care abo looking good and being healthy too, but they are equally concerned about their sports performanc and they know that excess body fat is the enemy of performance in every endurance sport. F example, a runner weighing 160 pounds has to muster about 6.5 percent more energy to run the sam pace as a runner weighing 150 pounds.

Whereas two-thirds of American adults in the general population are overweight, most of th athletes who took the Montana State survey had body-mass indices that fell within the healthy rang Yet more than half of these endurance athletes reported being heavier than the weight they conside optimal for peak performance in their sport—hence their dissatisfaction. Do these men and wome suffer from a distorted body image? By and large, no. They simply have different standards for the bodies, and they struggle to attain them just as nonathletes struggle to meet their own, more relaxe standards. You probably know exactly what I'm talking about.

~~As much as most athletes appreciate the importance of a lean body composition to enduran~~ performance, I believe that many athletes nevertheless underestimate its impact. They general assume that while excess body fat may be the greatest performance limiter for athletes who are tru overweight, athletes who are already lean are more likely to be held back by fitness factors such aerobic capacity. In fact, leanness is as important to performance as any fitness factor at every level endurance sports, right up to the very top. This was shown in a study involving two dozen elite ma and female distance runners from Ethiopia (Beis et al. 2011). All of these runners had very low boc fat levels and very fast race times, but the leanest ones had the fastest times. Even though tl differences in body fat were small, these differences predicted the variation in their race times as we as differences in aerobic capacity ($VO_2$max).

My own appreciation for the importance of body weight to running performance in particular w heightened by an experience I had in 2008. Darwin Fogt, a Los Angeles–based physical therapist, ha invited me to stop by his facility to try out his Alter-G antigravity treadmill. I had been dying to ste onto one of these machines since I first heard about them a couple of years earlier, so I readi accepted his offer.

The Alter-G allows the user to walk or run at the equivalent of as little as 20 percent of his or her body weight by increasing the air pressure within an airtight tent that seals around the user's waist and thereby lifts the runner. Many elite runners, including three-time Olympian Dathan Ritzenhein, use it to train through injuries that prevent them from running on their full body weight. Others, such as Ritzenhein's Nike teammate Galen Rupp, use it to increase their running volume without increasing their risk of injury.

A 160-LB.
runner expends
6.5%
MORE ENERGY
THAN A
150-LB.
runner at
the same pace.

My epiphany came when Fogt zipped me into his Alter-G, increased the belt speed to my normal jogging pace, and then reduced my effective body weight to 90 percent. Instantly I felt as if I had become 10 percent fitter. Scooting along at a 7:00/mile pace wa utterly effortless. It was not a feeling of gross artificial assistance, like running on the moon. Rather, felt like normal running, only so much better.

I was so impressed by the experience that I later used an Alter-G as a tool for helping oth athletes to better appreciate the impact of body weight changes on performance capacity. Many these athletes were shocked by how heavy they felt at their full body weight after experiencing 90 80 percent of it. What had felt normal minutes earlier now felt like trying to run while wearing stuffed backpack. It was a very effective teaching tool that probably motivated more than a fe athletes to step up their efforts to get leaner.

Unfortunately, endurance athletes seldom choose the best methods to pursue their optimal racir weight. Despite their awareness of the body weight–performance connection, their hard training, ar their efforts to eat carefully, a majority of the athletes in the survey I described said they we currently above their optimal racing weight.

Why do so many endurance athletes struggle to reach and maintain their racing weight? F largely the same reasons that nonathletes struggle to avoid becoming overweight. Our mode lifestyle is different from that of our early ancestors in two important ways that promote excessi weight gain: We have easy access to cheap, high-calorie foods, and we are much less active.

ENDURANCE ATHLETES SELDOM CHOOSE THE BEST METHODS TO PURSUE THEIR

Our early ancestors lived on wild plants, nuts, seeds, and the occasional piece of fish or meat-mostly low-calorie foods and usually just enough of them to supply the energy required to get mo food. Today we still have the option to eat like hunter-gatherers, and some nutrition authorities ur people to do so, but it's not a realistic solution for most of us. We have come to prefer the taste c high-calorie foods such as cheeseburgers (which did not exist until a little more than a century ago) low-calorie foods such as vegetables, and we feel compelled to eat what's put in front of us eve though the portions have never been larger and the promotion of food has never been so ubiquitous.

What's more, early humans had to work much harder and burn a lot of calories for every mea foraging through woods and fields or stalking game for hours, whereas today we just sidle up to a fas food drive-thru window or press "Start" on the microwave oven. But endurance athletes do have o major advantage over the greater population—we are hardly sedentary. But even most enduran athletes spend more time sitting around than our hunter-gatherer ancestors did, and we are no le plagued by the overabundance of cheap, high-calorie processed foods than our sedentary counterparts

So if the weight concerns of endurance athletes and nonathletes share a common cause, is the solution also the same? The answer to this question is "yes and no." Certainly, a balanced, natural di is the most effective means to manage weight for endurance athletes and non-athletes alike. Howeve the weight management goals of endurance athletes are somewhat different from those of nonathlete and some of the challenges that endurance athletes face on the path toward an optimal performan weight (rather than toward the basic "healthy body weight" that most nonathletes pursue) are als different. For example, low-carbohydrate diets are an effective weight-loss strategy for nonathlete but for endurance athletes they are a recipe for disaster because they starve the muscles of the prima fuel they need for endurance performance. Endurance athletes generally require their own speci approach to weight management.

Following weight-loss diets that are intended for nonathletes is but one of many mistakes th endurance athletes make in pursuing their optimal racing weight. Relying on supplements, which a marginally helpful at best and dangerous at worst, is another. In 2008, for example, world champio cyclist Marta Bastianelli of Italy was banned from competition after one of her blood samples teste positive for an illegal diet drug. Bastianelli admitted that she had taken the drug after receivin pressure to lose weight from her coaches. More dangerous still is the mistake of disordered eatin (usually chronic moderate undereating), which is especially common among collegiate fema runners. In a 2007 study nearly one in five female cross-country runners reported past eating disorde and nearly one in four showed evidence of continued inadequate nutrient intake (Thompson 2007 Forcing yourself to go hungry as a means to attain optimal racing weight always backfires in the lo run because it deprives your body of the energy needed to absorb hard training.

Not every endurance athlete goes about weight management the wrong way. By definition, t weight-management practices of the highest-performing athletes are the right way to pursue optim racing weight. This is an important point. The purpose of weight management for the enduran athlete is better performance. The bathroom scale alone cannot determine whether a particular dieta habit or training pattern is effective. The stopwatch is the final arbiter. One of the great things abo the competitive nature of endurance sports is that it proves what works and what doesn't. If you wa to know the most effective way to train for endurance performance, you can do no better than to stu the general training patterns that are shared by the best athletes. Similarly, if you want to know th right way to manage your weight as an endurance athlete, your best bet is to study the common dieta and weight-management practices of the highest performers.

~~This isn't a diet book. I wrote this book because I saw a need for a focused, comprehensive~~, ar reliable guide to weight management for endurance sports. It is my belief that such a resource can b truly reliable only if its guidelines are based on the weight-management practices of the best athlete The Racing Weight system is not some theory of performance weight management that I created b applying creativity to scientific evidence. In this book I've simply presented a description of wh works best for endurance athletes in the real world. Furthermore, *Racing Weight* is not dietary shtic that I developed for the sake of having a distinctive brand. My contribution is limited to formalizin this description to some degree by developing tools such as the Diet Quality Score (DQS), which yo will learn about in Chapter 4. My work puts me in the happy position of observing what the mo successful athletes do, and my service is to pass along what I learn.

There are six specific practices that have stood out to me as the keys to the weight-manageme success of top athletes and that I believe every other athlete should emulate. Four of them are dietar one is behavioral, and the last is training related. All six are habits that I have observed over and ov again among the most successful athletes in my eighteen years as an endurance sports journalis coach, and nutritionist. Together these six practices comprise the six steps of the Racing Weigh system. Here's a quick synopsis of the plan:

STEP 1 **IMPROVE YOUR DIET QUALITY.** Step 1 in my Racing Weight plan is improvin your diet quality, or the amount of nutrition you get from each calorie in your die Increasing the nutrition-per-calorie ratio of your diet will enable you to get all th nutrients you need for maximum performance from fewer total calories, thus enabling you to becom leaner. An effective way to improve your diet quality is to grade or score the quality of your curren diet and continue to score your diet quality as you make efforts to improve it. Nutrition scientists hav come up with various ways of measuring diet quality. Most of these approaches are a bit too comple to be useful to the average endurance athlete, so I created a simplified diet-quality scoring system th you will find very easy to work with and that will help you nourish your body for health and enduran performance. In Chapter 4, I will give you all of the information you need to track and improve yo DQS.

STEP 2 **MANAGE YOUR APPETITE.** It goes without saying that in order to attain an maintain their optimal racing weight, athletes must control the amount of food they ea But athletes must not go about controlling their food intake by eating less than required to satisfy their hunger. Not only is this psychologically untenable, but it is also certain wreak havoc on training performance because physical hunger is closely tied to an athlete's re energy needs. Most athletes, however, eat more than is required to meet their needs and satisfy the hunger. Our modern "food environment" is set up to all but ensure that we overeat without eve realizing it.

Fortunately, there are various proven tricks and techniques that you can use to regain control your appetite and your personal food environment so that you neither overeat nor go hungry. I wi share these guidelines with you in Chapter 5.

## STEP 3

**BALANCE YOUR ENERGY SOURCES.** There are three main sources of energy f the human body: carbohydrate, fat, and protein. Many weight-loss diets have been base on the idea that to lose weight, a dieter has to maintain the perfect balance of these thre "macronutrients" in daily eating. That none of these diets can agree on the magical macronutrie ratio is not the only evidence that it does not exist.

The best evidence suggests that individuals can balance their energy sources in a variety different ways with equal success. But for endurance athletes, doing so is a little different becau macronutrient balance also has a major impact on training performance and many athletes do n consume enough carbohydrate in particular to maximize that performance. Any measure that boos your training performance will also tend to make you leaner. In Chapter 6 I will show you how ensure that you get the right amount of carbohydrate to maximize your training performance and g leaner.

## STEP 4

**MONITOR YOURSELF.** The most common weight-management practices shared b dieters who have lost large amounts of weight and kept the weight off are not dieta patterns such as low fat intake but self-monitoring practices such as weighing and foo journaling. Such practices help dieters maintain a high level of awareness of their weight status and strong commitment to their weight-management goals. Endurance athletes can benefit equally fro self-monitoring but need to practice it somewhat differently, monitoring performance as well as die weight, and body composition. In Chapter 7 I will present a set of self-monitoring tools designe specifically to help endurance athletes achieve their weight-management goals.

## STEP 5

**TIME YOUR NUTRITION.** When you eat affects your body as much as what you ea The timing of your food intake has a big impact on what's known as energy partitionin or what becomes of the calories you consume. There are three main destinations of foo calories in your body: muscle, fat cells, and energy. If you want to become leaner, you need to shi the balance of energy partitioning so that more calories are incorporated into your muscles, few calories are stored in your fat tissues, and more calories are used to supply your body's immediate ar short-term energy needs. This shift will lead to more metabolism-boosting lean tissue and less healt jeopardizing fat tissue.

Interestingly, you can often achieve this objective with little or no reduction in the total number calories that enter your body. We're really talking about redirecting calories once they've entere your body, not about decreasing the number of calories that enter your body in the first place. Th practice of nutrient timing, or consuming the right nutrients at the right times throughout the day, wi enable you to partition your energy more effectively and achieve your racing weight. In Chapter 8 will show you how to practice nutrient timing the way many top endurance athletes do.

## STEP 6

**TRAIN RIGHT.** Despite an increasingly popular belief to the contrary, exercise is th most powerful factor in successful weight management. More than 90 percent of peop who succeed in losing large amounts of weight and keeping the weight off exerci regularly. One of the reasons so many people are overweight is that most of them do not exerci regularly.

~~Endurance athletes by definition have ticked the exercise box of the weight-management checklis~~ But that doesn't mean that every endurance athlete trains optimally for weight management, and fact most do not. To begin with, weight management should not be the primary objective of a endurance athlete's training. Performance enhancement should be the primary goal. But these tw objectives go hand in hand. If you train optimally to improve your performance, you will also get th best possible weight-management results.

THE MOST COMMON TRAINING MISTAKE ENDURANCE ATHLETES MAKE IS INSUFFICIENT INTENSITY VARIATION.

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By far the most common training mistake in all endurance sports is insufficient intensity variatio —specifically a tendency to do almost all training at moderate intensity. However, the best resul come from a program in which roughly 80 percent of training is easy, 10 percent is moderate, and 1 percent is hard. In Chapter 9 I will show you how to avoid the most common training mistake as we as other training mistakes, such as insufficient strength training, that limit improvement performance and body composition.

Part I presents important material that will prepare you to get the most out of the program. In Chapt 1 ("Get Leaner, Go Faster")I will define optimal racing weight in endurance sports generally and the individual endurance disciplines. In Chapter 2 ("How Much Should You Weigh?") I will help yo set a personal racing weight goal. Chapter 3 ("Dieting vs. Performance Weight Management" explains the important differences between the nonathlete's goal of losing weight to look better and b healthier and your goal of attaining your optimal racing weight.

Chapter 4 ("Improving Your Diet Quality"), Chapter 5 ("Managing Your Appetite"), Chapter ("Balancing Your Energy Sources"), Chapter 7 ("Monitoring Yourself"), Chapter 8 ("Nutrie Timing"), and Chapter 9 ("Training for Racing Weight") present the six steps of the Racing Weig system and make up Part II of the book.

Part III provides resources that will help you put the Racing Weight plan into practice. Chapter 1 ("The Racing Weight Journey") ties together the six steps of the Racing Weight program and provide concrete guidelines for implementing the system in the short term and over the long haul. The ne chapter, 11 ("Racing Weight Foods"), presents 26 foods that make ideal dietary staples on the Racin Weight plan. Chapter 12 ("What the Pros Eat") presents sample food journals from elite athletes several different endurance sports. These examples are not to be copied exactly, as there are importa differences between the caloric needs of world-class endurance athletes and those of most amateur but they do provide some practical ideas and inspiration. In Chapter 13 ("Racing Weight and You") offer guidelines for special populations such as younger and older endurance athletes.

It takes a certain amount of trust to alter your diet and other lifestyle habits according to anoth person's advice. My hope is that you find in these pages plenty of reason to put your trust in m program. I am confident that you will, because all of the methods I prescribe are practiced widely b the most successful endurance athletes and are supported by solid scientific evidence. There are als thousands of athletes like you who have already applied the complete Racing Weight system wi great results. I know that your trust and commitment will be similarly rewarded. So let's get started!

# PART I

# GET LEANER, GO FASTER

Each sport favors a particular body type. The principle of “form follows function” determines th particular physique that tends to perform best in a given sport or in a given position or role within sport. Certain anthropometric characteristics are advantages in relation to a sport’s specific demand other characteristics are liabilities. The most successful basketball players are tall because the 1 foot-high basket favors height. The most successful football linebackers are massive because their jo is either to be immovable (offensive linemen) or to move the immovable (defensive linemen). Tenn players typically have average builds because their sport requires a combination of qualities- quickness, power, leverage, balance, and stamina—that favors no extremes of size or shape.

Endurance sports, of course, tend to favor two related characteristics: low body weight and lea body composition (or a low body-fat level). This is the case because endurance racing demands th ability to move economically so that a high work rate (or speed) can be sustained for a long time and low body weight and lean body composition contribute to movement efficiency.

The advantages of being light and lean for endurance performance are so obvious that they hard needed to be scientifically proven, but exercise scientists have gone out and proven them anyway, an the proof is interesting. In a 1986 study Peter Bale and his colleagues at England’s Brighto Polytechnic University compared a host of anthropometric measurements in a group of 60 ma runners (Bale, Bradbury, and Colley 1986). The subjects were divided into three groups of 20 based o their best 10K race times. The average weight of the men in the “average” group was 152 pound compared to 145 pounds in the good group and 141 pounds in the elite group. Body compositio measurements followed a similar pattern. Average body-fat percentages were 12.1, 10.7, and 8.0 in th average, good, and elite groups, respectively.

WEIGHT AND BODY-FAT PERCENTAGE ARE MORE STRONGLY CORRELATED WITH FINISH TIMES THAN ARE TRAINING VARIABLES.

It bears noting that even the runners making up the average group were somewhat lighter an significantly leaner than the average nonrunner. The sport selects for naturally lighter and lean individuals because they generally find greater initial success. The selection pressure continues with the sport right up to the top level. While most world-class runners have similar body weights (wi women being lighter than men, naturally), research has shown that within the population of worl class runners, those with the lowest body-fat percentages tend to have the fastest race times.

~~Studies involving other types of endurance athletes have yielded similar findings. In 2011~~ Swi researchers compared anthropometric variables against Ironman® swim, bike, and run split times in group of 184 age-group triathletes (Knechtle et al. 2011). Body weight was found to have statistically moderate effect on total race time, while body-fat percentage had a large effect on tot race time and a moderate effect (bordering on large) on swim, bike, and run splits. Both body weig and body-fat percentage were more strongly correlated with split times and total race time than a training variables such as average weekly training time.

Interestingly, extra body weight and body fat affected running performance more negatively tha swimming or cycling performance in these subjects. The reason is that body weight increases th energy cost of overcoming gravity, and an athlete must overcome gravity with every stride whe running but only while going uphill when cycling and not at all when swimming. It’s no accident th climbing specialists in cycling are typically lighter than other cyclists. Spanish researchers discovere in a 1999 study that, whereas performance in a flat time trial was best predicted by a rider’s maximu power output, performance in an uphill time trial was best predicted by power-weight ratio. The be performers in the uphill time trial tended to be a little less powerful but significantly lighter than th best performers in the flat time trial.

If the major drawback of extra body weight is its effect on the cost of overcoming gravity, the why are the best swimmers and the best cyclists who aren’t climbing specialists never very larg There are a few known reasons and probably a few unknown reasons. One is that body weight do also increase the energy cost of cycling on level ground and of swimming.

The amount of energy required to accelerate on a bike is a function of body weight, which giv smaller riders an advantage on criterium courses and other technical courses. Larger riders usual have a larger frontal area as well, making them less aerodynamic. Larger swimmers are le hydrodynamic for much the same reason. While being tall gives a swimmer an advantage of leverag being broad increases water resistance. This is why the classic swimmer’s build is rangy rather tha big.

Body weight in the limbs especially increases the energy cost of moving the limbs themselve reducing what’s known as mechanical efficiency. It takes more energy for a cyclist with big legs t turn the pedals and more energy for a swimmer with massive arms to pull and recover.

BODY WEIGHT INCREASES THE ENERGY COST OF OVERCOMING GRAVITY.

Body weight has additional disadvantages that have nothing to do with energy cost. One of th most crucial underpinnings of endurance performance is the ability to deliver oxygen to the workin muscles at a high rate. Because large athletes have bigger hearts and lungs and more blood volum capillaries, and so forth, they are able to consume oxygen at higher rates than smaller athletes, b smaller athletes are able to consume more oxygen relative to their size, which is what really matter The physiological machinery of oxygen consumption just doesn’t scale well to increasing body mass

It’s the same with heat dissipation. The ability to transfer to the environment excess he generated through muscle contractions is an important performance factor in all forms of lon distance racing. This ability is partly a function of the ratio of body surface area to body volume. Th ratio is smaller in bigger athletes, and this is yet another reason that the most successful athletes hav low body weights.

The effects of body fat on endurance performance overlap to some degree with those of boc weight. ~~Body fat has mass, of course, so the less body fat an athlete has, the less he or she weig~~ relative to athletes of similar proportions. A certain amount of body fat is required for good healt but any more is just dead weight. Excess muscle is in fact even more detrimental than excess f because it is far more dense, which is why we’re as unlikely to see a muscle-bound Tour de Franc winner as an obese one. But what constitutes excess muscle is very different from what constitut excess body fat since muscle is the engine of movement whereas body fat makes no contribution endurance performance beyond providing energy and even the skinniest runner carries enough boc fat to fuel 24 hours of continuous exercise.

BODY FAT IS A METABOLICALLY ACTIVE ORGAN THAT AFFECTS EXERCISE METABOLISM.

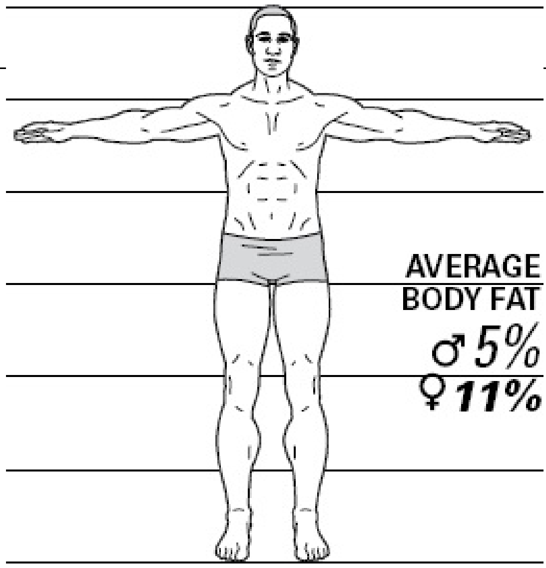
Body fat is far from inert, actually. It is a metabolically active organ that affects exercis metabolism in important ways that are not yet fully understood. One thing we do know is that athlet with larger amounts of body fat burn less fat and more carbohydrate at submaximal exerci intensities. This is not a good thing because the exercise intensity at which the body shifts fro burning more fat than carbs to burning more carbs than fat is a strong predictor of enduran performance. If you’re an open-water swimmer, for example, the faster you’re swimming when yo hit this “crossover point,” the better you’re likely to do in races. Gaining fitness moves this crossov point upward, but losing body fat does too, independent of gains in fitness.

Finally, like excess weight or musculature, excess body fat impedes heat dissipation. It’s easier t stay cool on a long ride on a hot summer day if you’re very lean. After all, the primary function c body fat is to insulate.

## THE RIGHT BODY FOR THE JOB

While it pays to be light and lean in all endurance sports, there is thankfully no single, ideal body typ for any specific endurance sport. The variety you see in the physiques of world-class cyclists, runner and other endurance athletes can be surprising. For example, the winner of the 1997 Tour de Franc Jan Ullrich, stood 6 feet tall and raced at 162 pounds. The winner of the 1998 Tour, Marco Pantar was 5 inches shorter and more than 30 pounds lighter. Nevertheless, there are certain parameters c body size, proportion, and composition that are characteristic of successful athletes in each enduran sport.

### THE CROSS-COUNTRY SKIER’S BODY

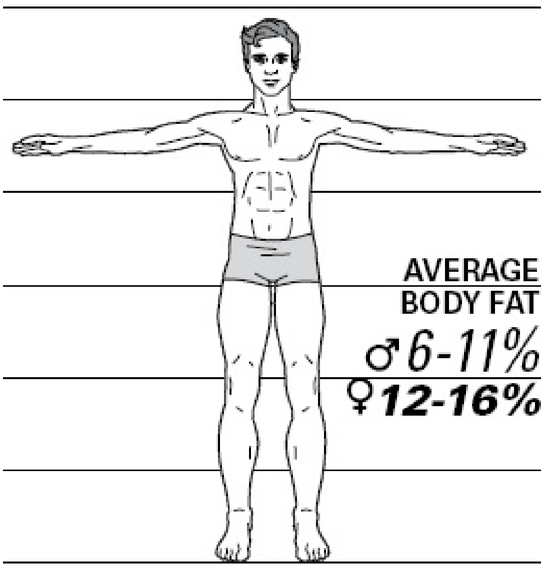



Elite-level cross-country skiers are typically average to slightly above average in height. The averag height of male Olympic cross-country skiers is 5 feet 10 inches, and that of their female counterpar is 5 feet 7 inches. Height provides a mechanical advantage for poling, which is important to th generation of forward thrust in cross-country skiing. However, with height comes mass, and mass the enemy of performance in cross-country skiing because it increases gravitational and friction resistance. That's why you don't see as many 6-foot-5 athletes on the competitive ski trails as you c on, say, the volleyball court.

The typical elite-level cross-country skier is light, but not as light as elites in cycling and runnin The average female Olympic cross-country skier weighs 141 pounds, and the average male weighs 16 pounds. The relative heaviness of cross-country skiers compared to some other types of enduran athletes is due to their need for greater upper-body strength, and with strength comes muscle mas Former U.S. champion Kris Freeman is typically proportioned for an elite male cross-country skie He stands 5 feet 11 inches and weighs 170 pounds.

While they may be slightly bigger than other endurance athletes, cross-country skiers are amon the leanest athletes in any sport. The average male Olympian has just 5 percent body fat and th average female only 11 percent.

## THE CYCLIST'S BODY



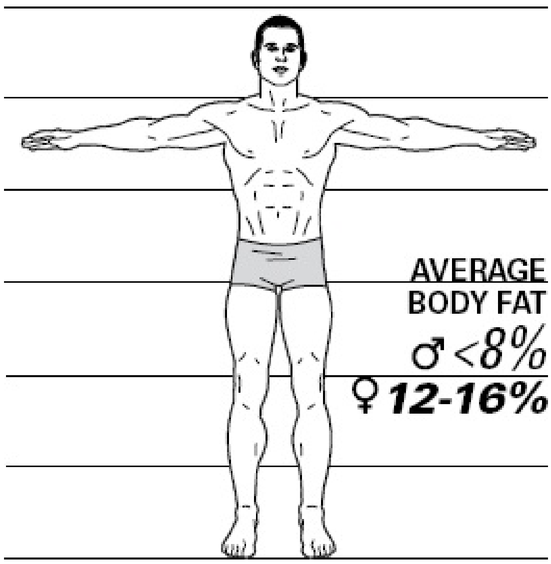
There is more than one body type in cycling. The typical physique varies by specialty. Climbers ter to ~~be short of stature and very light. At 5 feet 7 inches and 130 pounds, Marco Pantani~~ was n unusually tiny for a climbing specialist. *Domestiques* and time-trial specialists are typically bigg than climbers. Whereas power-to-weight ratio is the critical variable in climbing, in time trialing it raw, sustainable power output that matters most. Virtually every road-cycling course has som elevation change, though, so it's best not to be too heavy. American David Zabriskie, a seven-tim U.S. time-trial champion, has a typical time-trialist build at 6 feet and 147 pounds. Sprinters need have the ability to sustain high levels of power output over long distances so that they can arrive at th finishing stretch at the head of the peloton, but once there they need the capacity to churn out massiv wattage numbers in a short, all-out effort. Sprinters therefore have the most massive legs in cyclin and are bigger generally than other cyclists. Sweden's Magnus Backstedt, a Tour de France sprin stage winner, raced at 210 pounds.

Overall, though, cyclists in all specializations have similar body types. They have twiggy upp bodies like those of runners but with far more muscular legs. Cyclists have greater leg musculari because the legs do essentially all of the work in cycling, whereas running is a whole-body activity. I addition, the body gets a lot of "free energy" from ground impact in running, whereas in cycling th leg muscles must provide all of the energy for forward motion except when one is riding downhill.

A very low body-fat percentage is another hallmark of successful cyclists. The range of body-f percentage among male riders in the European peloton is 6 to 11 percent, with an 8 percent averag The range among elite female cyclists is a very low 12 to 16 percent.

The physical demands of cross-country mountain biking (as distinct from downhill mountain bik racing, which is not an endurance sport) are very similar to those of hilly and mountainous courses road cycling. Thus, the body type of the cross-country mountain biker is the same as that of th climbing specialist in road cycling: very light and lean. Indeed, the top cross-country mountain bike and the top climbers in road cycling not only have the same bodies but also are sometimes the ve same athletes at different points in their careers. The classic case is that of Australian Cadel Evan who went on to win the 2011 Tour de France on the strength of his climbing after winning a worl championship as a mountain biker.

## THE ROWER'S BODY



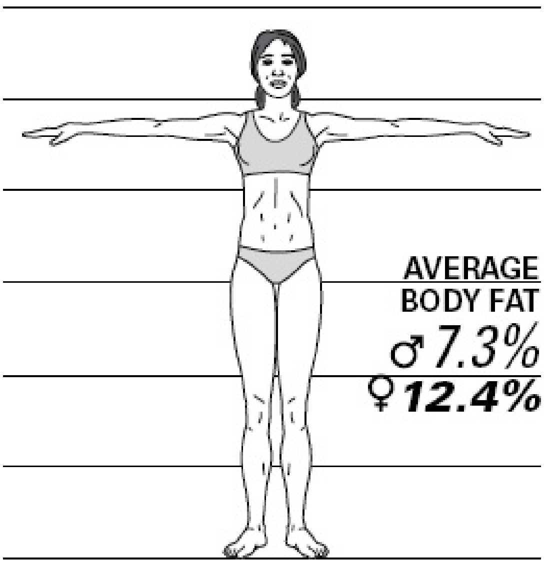

Rowing is the only endurance sport in which body mass is an actual advantage. Larger rowers hav more muscle mass with which to apply force to the oars, which in turn apply force to the wate ~~propelling the boat forward. Of course, more muscle means more power in every endurance sport~~, b unlike in other endurance sports, that mass comes at no cost in rowing, because there is r gravitational resistance to be overcome and the extra body weight has very little effect on friction resistance between the boat and the water. Indeed, size is such an advantage in rowing that larg rowers and smaller rowers compete in separate divisions.

Steve Redgrave had a typical, male world-class rower’s build. At 6 feet 5 inches, and 225 pound Redgrave won five rowing gold medals in five Olympics for Great Britain. Anna Cummins is onl slightly above average in size for a champion female rower. A member of the U.S. women’s eigh team that won gold in Beijing, Cummins stands 6 feet tall and weighs 170 pounds.

Yet you won’t find any 300-pound elite rowers, and there are three reasons for this. First, rowing as much a technique sport as it is a pure power sport. Beyond a certain point, muscle mass gets in th way of technique. You could say that you don’t see any rowers with arms like bodybuilders for th same reason you don’t see any Major League pitchers with such arms. Pitching a baseball is a pow action, but it also requires a whiplike arm motion that is inhibited by excess mass. Second, rowing also an aerobic sport, and many of the muscle characteristics that support aerobic metabolism canc out those that support muscle growth. Top rowers are born with aerobically powerful muscles, an they further develop aerobic muscle characteristics in training, thus limiting their muscle-mass gair Finally, rowing training consumes a lot of calories, keeping the athlete’s body-fat percentage low, an a human being can become only so heavy with a body composition as lean as that of the typical eli rower.

How lean are top rowers? There is a difference between heavyweight and lightweight rowers average body-fat percentage. Lightweight rowers tend to be leaner in part because of their speci efforts to make weight. Studies have shown average body-fat percentages in the range of 12 to 1 percent for female lightweights and below 8 percent for male lightweights. The averages are slight higher among heavyweights.

## THE RUNNER’S BODY



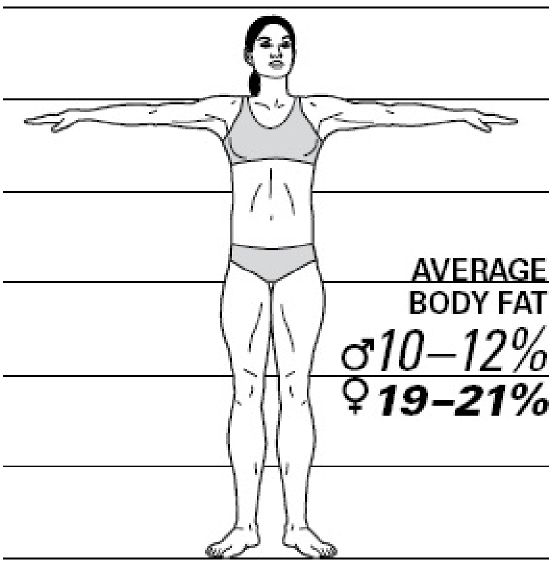

Top distance runners are notoriously light and skinny. Former marathon world-record holder Hai Gebrselassie of Ethiopia weighs a scant 117 pounds. Women’s 5,000 meters world-record holde Tirunesh Dibaba, also Ethiopian, weighs 97 pounds. And it’s all muscle. Exercise physiologis

William McArdle, of the City College of New York, and Frank Katch, of the University o ~~Massachusetts (McArdle, Katch, and Katch 2005), among many others, have compiled~~ bod composition data on elite athletes in a wide variety of sports across a number of studies. They foun an average body-fat percentage among elite, male marathon runners of just 7.3 percent, which is low than in any other sport, and an average body-fat percentage among female distance runners of 12 percent, which is lower than for every sport except bodybuilding and (of all things) the mode pentathlon.

Body weight is the bane of the distance runner because the runner must move his or her bod against gravity—that is, upward—with every stride. A study by researchers at the University o Georgia (Cureton and Sparling 1980) found that a body-weight increase of 5 percent reduc performance by 5 percent in a 12-minute test run.

While you certainly already knew that distance runners are lean and light, you might not hav known that elite female runners are average to above average in height (women's marathon worl record holder Paula Radcliffe is 5 feet 8 inches), whereas men are shorter than average. Furthermor both male and female elites have narrow hips and smaller-than-average feet, and they carry disproportionate amount of their lower body mass in the upper thighs and less in their lower thig and shins. All of these features promote running economy.

## THE SWIMMER'S BODY

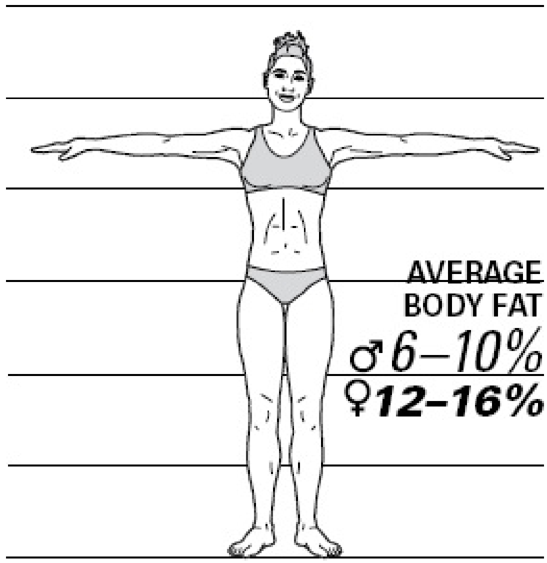



Swimming is not a natural human activity, so it is no surprise that the typical elite swimmer's bod has some unusual characteristics. Successful swimmers are typically tall—often very tall—wi unusually long torsos and arms that enable them to slip through the water efficiently and take lon strokes. They also have large feet and loose ankles, which add power to the kick. Many eli swimmers are double-jointed in their elbows, knees, and ankles, an anomaly that helps them app more body-surface area against the water over a greater joint range of motion and thereby produc greater forward impulse.

Swimmers carry more fat than other endurance athletes, although they are still significantly lean than nonathletes. Fat is more buoyant than muscle, and buoyancy reduces water resistance, so a litt extra "insulation" is beneficial to the swimmer as long as it is evenly distributed on the body. Th typical male, elite swimmer has 10 to 12 percent body fat, and the typical female has approximate 19 to 21 percent.

An interesting question is whether body-fat percentages are somewhat higher in swimmers than other endurance athletes because athletes with more body fat tend to excel in swimming, or becau swim training does not reduce body-fat levels as much as other aerobic activities, or becau swimmers eat more than other endurance athletes. The notion that athletes with more natural fat exc in swimming is contradicted by the many examples of top swimmers, such as Barb Lindquist, wh have become triathletes and become leaner. (Lindquist qualified for the 1988 U.S. Olympic Trials i swimming and represented the United States in the 2004 Olympic Triathlon.) But a study b researchers at the University of Florida (White et al. 2005) found that volunteers ate 44 percent mo after swimming in cool versus warm water. This finding suggests that the extra layer of insulation th swimmers carry is an adaptive response to frequent exposure to cold water, mediated through th appetite. If so, it's a beautiful example of the body's deep intelligence and how the body naturall changes its form and composition to meet the specific demands placed upon it.

## THE TRIATHLETE'S BODY




As you might expect, the triathlete's body is a hybrid of the swimmer's, cyclist's, and runner's bodie Pro triathletes tend to be tall, but not as tall as pure swimmers, and there are plenty of short triathletes who do quite well. (At 5 feet 4 inches, Australian Greg Welch is one of only two athlete ever to win the ITU Triathlon World Championship, the Duathlon World Championship, and th Ironman World Championship.) Furthermore, the combination of run training and bike training resul in legs that are more muscular than those of pure runners and less muscular than those of pu cyclists.

Interestingly, while most champion triathletes have national-class ability in each of the thre triathlon disciplines, virtually none has truly world-class ability in any one of the three. A handful o Olympic-caliber swimmers have crossed over to become dominant triathletes, but nobody that I kno of has ever transitioned between the highest level of running or cycling and triathlon, in eith direction. Of course, there's Lance Armstrong, who was already a competitive pro triathlete at age 1 (though hampered by a relatively weak run) before he became one of the best cyclists of all time. seems that past a certain point, the body becomes less suited to the other two disciplines as it becom better suited to any single one of them. Triathlon demands its own special body type that is distin from that of the swimmer, cyclist, and runner.

One thing that triathletes do have in common with all other endurance athletes is a lean bod composition. Average body-fat levels in male and female pros are 6 to 10 percent and 12 to 1 percent, respectively.

## THE IMPORTANCE OF BEING LEAN

This review of the body types of endurance athletes makes a convincing argument that a low body-f percentage is the only anthropometric characteristic common to elite athletes in all endurance sport Not only are top-level athletes quite lean, but also body composition is an excellent predictor performance at all levels of these sports. For example, in one study (Hecht et al. 2007) researche found that the average body-fat percentage among age-group (i.e., nonelite) participants in an Ironma triathlon was 17 percent for males and 27 percent for females. These values are lower than average f the general population, but much higher than the values seen in the pros. And sure enough, when th researchers matched body-fat percentages against finishing times, they found that the men and wome with the leanest bodies were also the fastest.

Why is a low body-fat percentage so closely associated with better performance in all enduran sports? It’s simple. Body fat makes only a minimal positive contribution to endurance performance b providing an energy source. But fat is not the limiting fuel source in any race; carbohydrates ar What’s more, any excess body fat beyond the essential level required for basic health worse endurance performance. Therefore, one of the natural adaptations that the intelligent body makes response to intensive endurance training is loss of body fat. Specifically, training increases f metabolism more than it increases appetite. As a result, food intake is insufficient to replace all of th body fat lost during and between workouts, and the athlete becomes leaner. Performance improves a body fat is lost because of gains in efficiency. The runner has less gravitational resistance overcome, the swimmer is more hydrodynamic, and so forth. Also, as body-fat levels go dow aerobic capacity goes up, because muscle has less competition from fat tissue for oxygen and fue Excess body fat is also known to increase thermoregulatory strain during exercise, so by shedding fa athletes can go faster without overheating. Endurance athletes who are genetically lean and wh become leaner more readily in response to training tend to perform better than their competitors wh are not so genetically blessed.

## WHAT YOU CAN DO

You cannot change your height, the width of your hips, the length of your feet, or any of several othe anthropometric variables affecting endurance performance that I have discussed in this chapter. Yo can’t change your genetic potential for leanness, either. But you can reduce your body-fat percentag (and thereby adjust your weight) to the level that is optimal for performance in your chosen enduran sport given your unchangeable genetic constraints.

If endurance training automatically pushes body composition toward the optimal level of leannes and if you are not just beginning as an endurance athlete, then why haven’t you reached your optim racing weight and body-fat percentage already? The answer, as I suggested in the Introduction, is th the modern lifestyle, with its high-calorie processed foods and all-day sitting, tends to counteract th effects of training. In addition, certain common training errors keep many athletes above their optim racing weight and limit their performance.

In effect, your training and the rest of your lifestyle are sending your body mixed messages. Erro aside, your training is telling your body, “Let’s get leaner,” while at the same time your diet (

certain features of your diet) and your inactivity outside of workouts are telling your body, “Let fatt~~en up!” Your body is very intelligent, and it is perfectly capable of “getting the message~~” an becoming a lean, mean racing machine if you are willing to bring your overall lifestyle into line wi that goal. In Part II we will begin to do just that. First, however, let’s determine your optimal racin weight, set an initial racing weight goal, and establish a mind-set for long-term success—measur that in themselves will help you get leaner by enhancing your focus, awareness, and motivation.

TWO

# HOW MUCH SHOULD YOU WEIGH?

Imagine yourself devoting the next few months to getting in great shape. You train consistently an progressively, pushing hard enough to reach beyond previous limits, yet remaining cautious enough avoid injuries and overtraining. Your diet is managed with equal care. You load up on wholesom foods and keep indulgences to a minimum, providing your body with abundant fuel and raw materia for repair and maintenance but without excess. The whole process culminates in a big race in whic you achieve a breakthrough performance.

If you weighed yourself on the day of this race, the scale would almost certainly display a differe number than your current weight—probably a smaller number. This number represents your *optim performance weight—that* is, the weight that is associated with your highest athletic performanc level. (In reality, it may take you longer than one training cycle—a period of training typically lastin 12 to 24 weeks and culminating in a peak race—to reach your optimal performance weight. But for th purposes of this example, let's assume that you are within one training cycle of your optim performance weight.)

As we saw in the previous chapter, body weight affects performance in every endurance spor Therefore, as you train and fuel your body toward peak performance, your body adjusts its mass (ar composition) to accommodate the demands you're making on it. This change is as significant as an other of the many adaptations that your body makes to accommodate your demand for high performance, including growth of the heart muscle, greater blood vessel elasticity, and increase muscle glycogen fuel storage.

The process is not as straightforward as simple weight loss, however. Suppose that after your b race you allow yourself to get out of shape and gain some weight. A couple of months pass, and– predictably enough—you begin to grow weary of feeling soft and slow, and remembering yo optimal performance weight, you set a goal to reclaim it. Except this time, in your haste, you try to g there more quickly by dieting—that is, by sharply cutting your food intake. It seems to work—on or level, anyway. Before long, the scale displays the same reading it did on the day of your last big rac But there's a problem: You're not nearly as fit. That's because you've undernourished your body an consequently lost a lot of muscle along with some fat. So while your body weight is the same as it w when you were in peak shape, your body composition is different—you have a higher body-f percentage.

You see, when you're in peak shape, you are not only at your optimal body *weight;* you're also your optimal body *composition.* It's important to consider both of these factors, because you can be