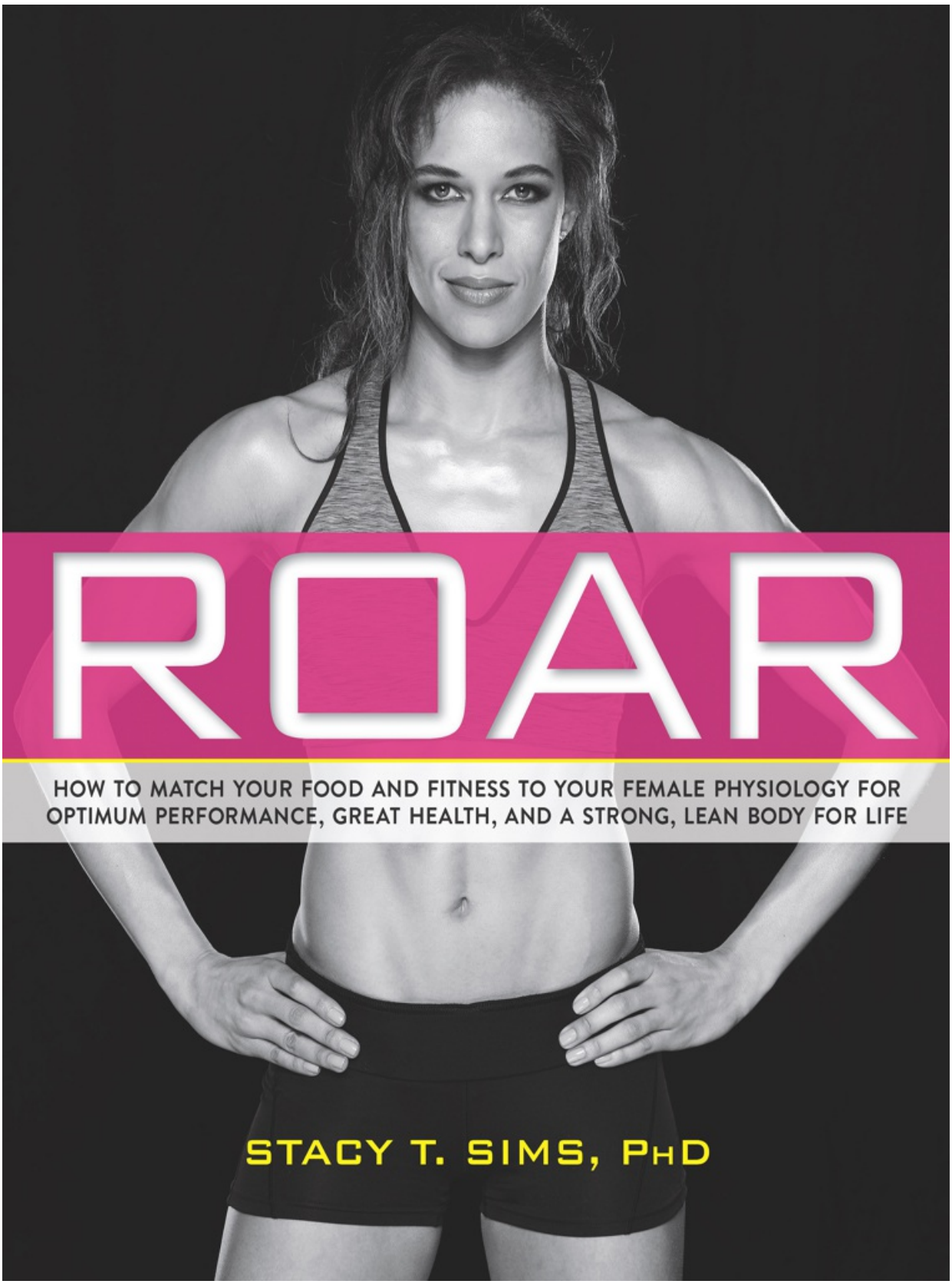
ROAR
HOW TO MATCH YOUR FOOD AND FITNESS TO YOUR FEMALE PHYSIOLOGY FOR OPTIMUM PERFORMANCE, GREAT HEALTH, AND A STRONG, LEAN BODY FOR LIFE
STACY T. SIMS, PHD

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RODALE

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INTRODUCTION

You are not a small man.

Stop eating and training like one.

Long before I was a nutrition scientist and exercise physiologist, I was an athlete. I ran. I raced bikes. I competed in triathlons, including the Ironman World Championships in Kona, Hawaii, and XTerra Worlds in Maui, Hawaii.

I wish I'd known then what I know now.

See, back then, I trained and fueled myself like a man, because that's what everyone did. Sure, I took in fewer calories because I was smaller. But I followed the same progressive training plans, ate the same bars and gels, and raced like a guy. And I suffered because of it. Some races I would feel great. But others, especially those that were in the week or so before my period started, were awful. I wouldn't be able to handle the heat (even though I prepped for it). I got dehydrated. I lost power. I had gastrointestinal issues. Being a scientific person by nature, I started taking notes on all my races in an attempt to spot trends and get to the bottom of my uneven performance. My initial suspicion was that it was something in my training plan, that I didn't taper right or I didn't have the right level of fitness going into each race.

It never occurred to me that it was actually my physiology working against me. Or more specifically, I was not working properly with my physiology. The breaking point was ending up in the medical tent at Ironman Kona after

becoming hyponatremic (low sodium levels in the blood). I distinctively remember riding out to Hawi, the halfway point of the 112-mile bike portion of the course, in winds so intense that I saw a woman about my size get picked up by the wind and dumped into the ditch on the side of the road. Yes,

I was freaking out and probably not 100 percent on top of my fueling needs, but I noticed on the way back that I had a low-grade headache and was getting swollen. I knew those were early signs of hyponatremia, so I pulled a couple of Gastrolyte tablets (a glucose and electrolyte combination) out of my pocket and ate them ASAP. Within a few minutes, I had to pee like a racehorse. I then spent the remaining time of the race wondering if and why any of my fellow teammates from New Zealand had similar issues. When the

race was said and done, I asked the other Kiwi women how they found the race. What was incredibly interesting was that those of us in the high-hormone phase (a few days out from getting our periods) had borderline hyponatremic issues; two ended up in the medical tent with clinically low blood sodium and on IV drips. My friends who were in the low-hormone phase (day 1 through 14 of your menstrual cycle, starting with the first day of

your period) had great races and didn't have any fluid or heat issues, even

though we all did the same heat-acclimation protocols and followed the same

nutrition protocols! This prompted me to change my PhD topic from altitude

to heat and to try to figure out why those of us in the high-hormone phase had

experienced such problems.

That's when I decided to become a biohacker for the female race. I was already living in New Zealand and studying for my PhD in environmental exercise physiology, nutrition science, at the University of Otago, where I had access to a lab, state-of-the-art data analysis systems, and lots of active friends, teammates, and colleagues. With full access to an environmental chamber; core temperature monitoring systems; blood analysis equipment for

things such as hemoglobin, hematocrit, fluid balance, and other hormones; a refractometer for urine analysis; and fully supportive PhD supervisors (who are wicked smart!) and lab managers, I went to work researching how hormones impact thermoregulation, macronutrient usage, hydration, performance, and recovery. Right out of the gate, it was apparent that sex differences extend far beyond ponytails and sports bras.

I soon developed what has become my mantra today: *Women are not small men*. That may seem blatantly obvious, but for ages, that's how most sports-nutrition manufacturers treated us. They simply formulated products that had

fewer calories and put them in pretty packages, maybe tossing in extra calcium or a bit of soy protein, and labeled it women's specific. For many years, women got the nutritional equivalent of "shrink it and pink it." That's a huge disservice, and it's time to acknowledge, treat, train, and fuel women as the different physiological beings we are.

HORMONE POWER

Hormones are your body's messengers; they course through your veins delivering orders from your organs to your brain (and vice versa) to perform nearly everything you do. Hormones tell your body when to eat, sleep, and even when to grow. They give us our appetite and sex drive. They help us have babies. They make us happy, sad, and giddy in love. In men, these hormones are pretty stable day in and day out (though they certainly change over a lifetime). In women, however, it's another story. And that story centers on the menstrual cycle.

The menstrual cycle not only has a profound effect on your fertility and moods (and chocolate cravings), it also can significantly affect your training and performance. Yet very few coaches and trainers take it into consideration with their athletes—even those in the most elite competitive spheres!

Case in point, marathon world-record holder Paula Radcliffe recently made

headlines around the world when she dared to speak about periods and performance. Calling out coaches and sports doctors who intervene in ways that make things worse, the legendary endurance runner plainly proclaimed, "They are men and just don't understand." Radcliffe recalled a time in 2013 where British Athletics medics gave fellow runner Jessica Judd norethisterone (synthetic progesterone, a female hormone produced in the ovaries and adrenal glands that helps the body prepare for conception and pregnancy and regulates the menstrual cycle) to delay her period at the 2013 World Championships. Judd lost. Radcliffe, who had been given synthetic progesterone herself in the past and found it made things a hundred times worse, wasn't surprised. In fact, Radcliffe broke the world record at the 2002 Chicago Marathon while suffering from menstrual cramps. She wants the public to know this because everyone finds it so surprising.

For the record, I am not surprised. What is surprising—shocking, really—is that it's 2016 and so many people who really should know better are still stumbling around in the dark about what is a fairly straightforward hormonal phenomenon that occurs like clockwork in half the population. You'll find a detailed discussion of how the menstrual cycle influences performance in Chapter 2, but to boil it down, women have two hormone phases each month: high and low. During the low-hormone phase, we are physiologically similar

to men in our carbohydrate metabolism and recovery. When our hormones rise during the other half of the month, however, is a different story.

High estrogen makes us spare glycogen (stored glucose/carbohydrate your body uses for fuel, especially during high-intensity exercise) and increases the amount of fat we use for fuel—not exactly what you're looking for when racing or doing threshold intervals. High progesterone delays our sweat response and turns up our core temperature, amps up our sodium loss, and increases muscle breakdown (while also hindering our ability to synthesize muscle because we can't access the building blocks of protein, amino acids, as well). The one-two punch of high estrogen and progesterone after ovulation as your hormones ramp up leading to your period causes fluids to shift into the cells (hello, bloat), decreases your blood plasma volume, and makes you more predisposed to central nervous system fatigue, which makes exercise feel harder than usual.

All that really stinks when you've been training for months, even years, and your A-race falls right before your period when hormones are sky-high. That's why I tell my athletes that it's not their fitness; it's their physiology. In order to succeed, you need to work with—not against—your natural physiology.

FEMALE PHYSIOLOGY IN ACTION

Menstruation is just the tip of the iceberg of the physiological differences between male and female athletes, and it's time for women to understand that. This book is about empowering women with the fitness and nutrition knowledge they need to compete on the same even playing field as men.

We'll start by taking an in-depth look at your female physiology in action; how we as women are built to be naturally good at endurance; where we carry our muscle and our power; how we sweat differently from men; and all the other ways our physiology makes us unique. Because your physiology changes over time, you'll also find entire chapters devoted to your menstrual cycle, pregnancy, and menopause (which nobody ever talks about!).

From there, we'll give you the expert training and nutrition advice you need to build a rock-solid fitness foundation. This is what I call getting fit to get fit, the phase where you train your body to optimally adapt to exercise. This includes determining—and reaching—your high-performance weight (which may or may not be your dream number on the scale); making lean muscle where you need it most; building strong bones; and boosting power and endurance.

Oh, and say goodbye to wild mood swings and uncontrollable chocolate cravings. What you as a woman may think—and have been told for decades—is all in your head is actually all in your gut, or more specifically, what's

not in your gut. In our fast-moving lives, we are often overtired, overstressed,

undernourished (although overfed), and immune compromised. This combination reaches far beyond that wanting-to-sleep-at-work feeling and extends to the interruption of our symbiosis with our gut bacteria. What does that have to do with your moods and cravings? Turns out, everything.

You'll learn all about these essential colonies of bacteria in your gut in Chapter 8, but as a preview: The human intestines contain more than 100 trillion microbes (10 times more than any other cells in the body). These enormous microscopic armies manipulate our eating behaviors and moods for

their own survival—often at the expense of our overall health. But news flash: You don't have to be at the mercy of your bacterial biome. You'll learn to master your gut, your moods, and your cravings and improve your overall health.

Finally, we'll pull it all together in your plan for peak performance. Women not only need different fuel before and during exercise, but we also have unique recovery needs. Our recovery window is a lot shorter than men's; it's harder to hold on to our valuable muscle tissue; and we are susceptible to performance difficulties in the heat. Worse, some of the products sold to us to offset the disadvantages of our physiology (looking at

you, soy protein) can actually make matters worse.

This final section of the book will arm you with the knowledge you need to hack into your personal female physiology, decipher what you find, and take action to be in the healthiest, fittest, strongest shape of your life. Now that's something worth roaring about!

1

BATTLE OF THE SEXES

ALL THE PHYSIOLOGICAL STUFF THAT MAKES YOU

"LIKE A GIRL"

You "throw like a girl." The "like a girl" insult is so ubiquitous, such a strong

underlying current in our culture, that a maker of feminine hygiene products took it head-on with the #LikeAGirl campaign, which turns the insult into an inspirational compliment.

Look, I'm not one to sugarcoat anything, so I'll give it to you straight. Yes, in head-to-head objective physical performance comparisons, women have some disadvantages. We also have some distinct advantages, but you never hear about those. So let's set the stage here with a complete look at your female physiology in action.

SUGAR AND SPICE AND EVERYTHING NICE: WHAT WE'RE REALLY MADE OF

No surprise: Women tend to be smaller and lighter and have a higher portion of body fat (hello breasts, hips, and all things childbearing!) than men. But dig a little deeper and the comparisons become more interesting and revealing.

First, let's talk about body mass and how it's distributed. Our mass is the stuff we're made of, which everyone commonly refers to as weight—the number you see on the scale. That's not exactly accurate. For one, technically

weight is determined by gravitational pull, so you'd weigh less on the moon and far more on Jupiter, but that's being picky. The more important factor is that the number you see on the scale—your weight—fluctuates widely

depending on fluid intake, what you've eaten during the day, salt intake, and how much glycogen you're storing in your muscles (for every 1 gram of glycogen, you store 3 grams of water; as you get fitter, you become better at glycogen storage, so before a big event, you can gain 5 or more pounds that you will blow through during your event, but you haven't gained or lost any fat). Body mass, by contrast, is the actual stuff you're made of—bone, muscle, fat, and organs—which requires tissue loss or gain and is harder to change.

We'll cover bones in Chapter 9, because a strong skeleton is essential for vibrant living, and women's bones are vulnerable to getting brittle. For now, however, let's focus on muscle and fat.

When researchers take core needles and pull out a column of muscle tissue from the designated muscle of interest (usually the shoulder, biceps, or quadriceps) of men and women, what they find might surprise you. There's not much difference. Men and women generally have the same muscle composition as far as the percentage of type I endurance (aerobic) fibers and type II power (anaerobic) fibers. What is different is that the largest fibers in women's bodies tend to be type I endurance fibers, while in men the type II power fibers take up the lion's share of real estate.

Since type II fibers are used to hoist barbells and push broken-down cars to the roadside, it's not surprising that in head-to-head strength comparisons,

women fall a bit short. Studies show that women are about 52 percent as strong as men in their upper bodies and 66 percent as strong as men in their lower bodies. In well-muscled women, those strength differences evaporate a bit. When you look at sheer strength relative to lean body mass, a trained woman's strength shoots up to 70 and 80 percent as strong as men in the arms and legs respectively. Still less powerful, but definitely closer.

Women give men more of a run for their money in the leg-press department because we tend to carry most of our lean muscle tissue below the waist. This is also why women's-specific bikes are designed with geometry that balances our center of gravity over the bottom bracket (where the pedal cranks are attached). Our power comes from our hips and legs.

Then there's fat, which is still a four-letter word for most athletes I work with, even though you can't train, race, or even live without it. Most of us think of fat as the stuffing we see under our skin (usually in places where we don't want to see it). That's our storage fat. Those are energy reserves we accumulate. That fat also acts as padding and generates key hormones such as adiponectin that regulate insulin (the hormone that helps your body use and store blood sugar). We need some, but not an abundance of, storage fat to

perform our best. Most of the fat you don't see in the mirror is essential body fat, which is in your nerves, bone marrow, and organs. Essential fat in men is about 4 percent, but in women, it is about 12 percent (because we are designed to reproduce!). As a woman, your breasts are also largely fatty tissue.

How much fat either men or women carry depends largely on lifestyle, but you can't dismiss the fact that there are also very distinct body types. For instance, there are people who are simply endomorphs. They tend to be larger, and they carry more body fat. On the other end of the scale are the wispy ectomorphs, who are naturally slim. And in the middle are mesomorphs, who tend to be lean and naturally muscular. You can also be a blend of the two; for example, a mesomorph with endomorph tendencies.

How active you are and the type of activity you do can impact the dominance of one body type over another. Your physical activity directly affects your body-fat levels and distribution.

We'll delve into the topic of body composition in great depth in Chapter 5, but generally speaking, healthy body fat ranges span from 12 to 30 percent in women and 5 to 25 percent in men.

In the athletic world, muscle is usually prized, while fat is shunned. As I see it, however, what you're made of is important, but more important is the

impact of what you're made of on what you do and/or want to do. Take two cyclists, for instance. A man may have big pectorals (pecs) and biceps, but those heavy upper-body muscles will only weigh him down when faced with a 10 percent climb. A woman who is lighter in the torso but still powerful in the hips and legs will have a far easier time pedaling her way up the mountain.

Likewise, women often dominate in the sport of open-water swimming. According to Open Water Source, female swimmers often perform better than their male counterparts, especially as the swims get longer. In fact, the average time for women in the Catalina Channel swim—an arduous 20-mile swim from the Southern California coast to Catalina Island—is 7 minutes faster than the average time for men. What's more, women hold the overall records in both directions—mainland to island and island to mainland. (In 1976, Penny Dean set the record from mainland to Catalina in 7:15:55, and Karen Burton set the record from Catalina to mainland in 7:37:31 in 1994.) And let's not forget that in 2013 Diana Nyad became the first person ever to swim the 110.86 miles between Cuba and Florida in a mind-boggling 52 hours and 54 minutes. Fat is more buoyant than muscle, so that extra padding may be a distinct advantage in the open water.

WOMEN ON THE RUN: OUR CAPACITY FOR CARDIO AND ENDURANCE

Whether you run marathons, cycle gran fondos, compete in triathlons, or just exercise to stay fit and healthy, training works similarly for both sexes. As you train longer and harder, you get fitter. Your body can deliver and use more oxygen (that's your max VO2); you can push the pace to a higher point before your muscles scream uncle (that's your lactate threshold talking); you become stronger and leaner (building muscle, burning fat); and your performance improves.

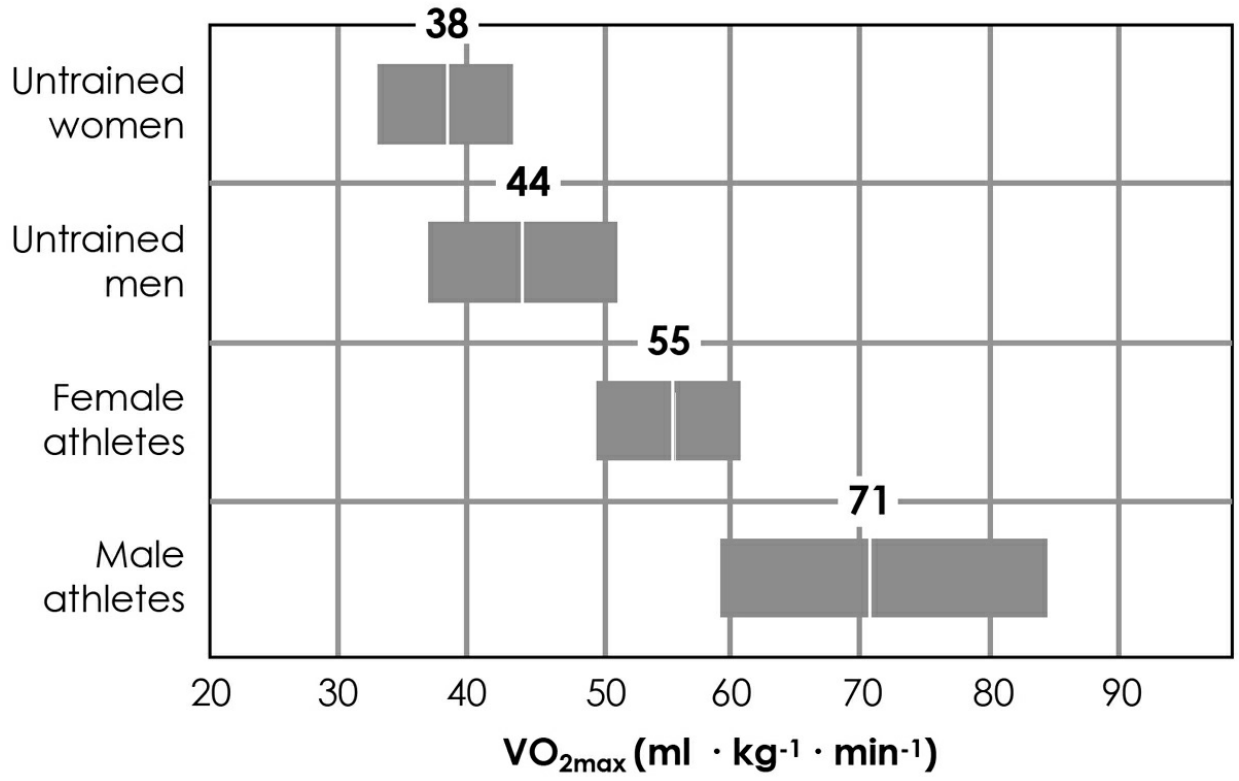
But that open-water swimming example aside, pound for pound, men still generally outrun, outwalk, and outcycle us. Female world records from the 800 meter to the marathon are about 11 percent slower than those held by men.

Why? Well, for the same reason that a Prius will have to pull some wily moves if it wants to race against a Mustang—we start with a smaller engine. As a woman, you have a smaller heart, smaller heart volume, smaller lungs (25 to 30 percent less capacity than men), and lower diastolic pressure (the pressure in the arteries when the heart is resting between beats and the ventricles fill with blood), which predisposes us to have lower maximum heart rates and greater problems with dehydration in the heat. This also means we pump out less oxygenated blood with every beat—about 30 percent less cardiac output than men.

Less oxygenated blood means we have to breathe more often, and as a consequence, our respiratory muscles—such as the diaphragm and intercostals between our ribs—need to work harder and use a lot of energy. Like other skeletal muscles, the contracting respiratory muscles require enough bloodflow to meet oxygen demand. If you have a greater oxygen cost

of breathing, you also likely dedicate a greater amount of bloodflow toward your respiratory muscles during maximal exercise. When you push the pace and breathe hard, it can be difficult to race against the guys because less bloodflow is going to your legs.

Testosterone also gives men a bit of an edge because the male sex hormone



increases the production of red blood cells, which absorb and carry oxygen to

working muscles. On average, men have 6 percent more red blood cells and 10 to 15 percent more hemoglobin (which is the molecule in red blood cells that carries the oxygen) concentration than women.

Our combined smaller heart and lungs and lower oxygen-carrying capacity means we have a lower max VO2 (the maximum amount of oxygen your body can use to make fuel) than men, about 15 to 25 percent lower on average, as shown in the chart below. So if two athletes are doing the same amount of work, the woman will have a higher heart rate and need more oxygen to get the job done.

MAXIMUM OXYGEN USE: WOMEN VS. MEN

Because of our hormones, we also use energy differently during aerobic exercise. We'll get into this in much greater detail in the following chapters, but in general, because of our high estrogen levels, we rely less on carbs and more on fat than our male counterparts. That sounds like a good thing, and in some ways it is, since fat is the main fuel for aerobic exercise. But it's not such a good thing when we need to go really hard, because that tendency to spare glycogen (which is really strong during the high-hormone phase of your menstrual cycle right before your period) can make it harder to hit high intensities. We really need those carbs to fuel the anaerobic energy system

when we push past our threshold. If you're running low on carbs in your bloodstream, it may mean slamming on the brakes instead of hitting the gas because your body just can't get the glycogen stores it needs to make the energy you want.

Speaking of energy, because men have bigger type II fibers and the energy-producing enzymes that go with them, they have a higher glycolytic capacity than women, which is a fancy way of saying that they can burn through more glucose in the absence of oxygen. That helps them outperform us in short-intense bursts of effort, but it also means they accumulate more lactate (a chemical your body makes and uses for energy during very high-intensity efforts; accumulating more than you can use leads to muscle acidity or "the burn" and forces you to slow down) and need longer recovery time for all-out efforts. Women, on the other hand, have a greater advantage in the endurance world, as our type I fibers are much more efficient at using fat as fuel and sparing glucose.

Finally, women are also more likely to sweat out excess amounts of sodium and are more likely to eat into their muscles for energy. We also have a harder time rebuilding and repairing those muscles after exercise during the high-hormone premenstrual time in the cycle when progesterone levels are high.

What's a woman to do? Well, let's go back to that wily Prius for a moment. Sure, that Mustang is going to beat her in a drag race. Maybe even in a race across New Jersey. But that efficient little vehicle will hum along much longer on less fuel and may even beat the high-horsepower vehicle in the long run.

On the pointy end of the field where the very elite athletes are, the fastest woman probably won't ever break the tape in front of the fastest man because they are too close in body size (top marathoners—male and female—often weigh within 5 pounds of each other). But for the rest of us, it means hanging with and passing or "chicking" the dudes is very much in the realm of possibility, so long as we know and work with our unique physiology. In this case, it's a matter of building up your plasma (the watery part of your blood) volume through training and feeding your body what it needs to keep your metabolism humming, which we'll cover in great depth in the chapters to come.

HORMONES AT A GLANCE

Hormones play a huge role in every physical function of living. You see that very clearly in the sphere of athletics. Here, at a glance, are the major impacts of male and female

hormones.

Testosterone (the primary male hormone) leads to:

• Bone formation, larger bones

• Protein synthesis (the biological muscle-building process), larger muscles

• Erythropoietin (EPO) secretion, increased red blood cell production

Estrogen (the primary female hormone) leads to:

• Fat deposition (lipoprotein lipase—the enzyme responsible for taking fatty acids

from the blood and putting them into fat tissue; estrogen increases this process)

• Inhibition of anabolic stimuli (harder to make muscle)

• Faster, more brief bone growth

• Shorter stature, lower total body mass

• More fat mass and higher percent body fat

FAST WOMEN: OUR STRENGTH, SPEED, AND POWER

Okay, CrossFit athletes and sprinters, this one's for you. As you saw in the

section on body composition, your biggest fibers are your type I fibers, which

can help you run a fast 10-K but don't necessarily chip in much for kipping

pullups or suicide drills on the soccer field. But that's not to say you can't

build your type II fibers through strength training. You most certainly can.

With training, you can honestly get nearly as strong as a man, relatively

speaking. For example, when researchers pitted 52 young men against 50 young women in max power tests on a stationary bike, the men frankly smoked the women—generating about 50 percent greater peak power. But the men were significantly heavier. When the researchers looked at how much power they could produce per kilogram of body weight, the difference dropped dramatically to 15 percent. Taking that one step further, when power outputs were adjusted for fat-free mass, the values plummeted to a 2.5 percent difference, or not statistically different—a pretty even match.

Just as is the case in the cardio realm, the strongest, most powerful woman will not out bench press or win a 100-yard dash against the strongest, most powerful man. But there are certainly plenty of women who can outperform and who are stronger than plenty of men. We are every bit as trainable. Even if we get less absolute hypertrophy (muscle growth and an increase in the size of muscle cells) through training than men, research shows that when women and men train equally, their relative strength and hypertrophy gains are pretty much the same.

Which brings me to the elephant that may be sitting in your room. Can women get bulky from strength training? Everyone says no, but then you read

plenty of articles in women's magazines that caution against too much muscle-building activity so you don't get fat (never mind the fact that muscle isn't fat). Case in point, an article came out a couple years back in *Harper's Bazaar* titled "Is Spinning Making You Fat? A growing number of indoor-cycling devotees are abandoning the bike, convinced it's making their backsides bigger." Yep. It goes on to quote a celebrity trainer who forbids his fashion-model clients to ride at all, lest their lower bodies get too big. Sigh.

So what's the truth? Yes, heavy resistance training in the gym or on a spin bike can make your muscles bigger. Have you seen track racers? Their quads are not small. They are powerful and yes, often large. That's from heavy, hard work in the gym and pushing a monster gear on the bike. It's the same for CrossFit enthusiasts, rowers, sprinters, and everyone else who trains for maximum strength. These women are generally not one bit bothered by the size of their muscles, because those muscles enable them to do the work and compete at the level they want.

Hypertrophy is what gives you nice muscle tone. That said, if you're truly averse to larger muscles, you can still train to get strong without gaining unwanted mass. And in fact, as a woman, you might have an advantage there.

Neural mechanisms (mind-muscle connections) are actually more important

for women's adaptations to strength training than they are for men's. So by doing power moves and low-rep, high-weight strength training, you enhance the number of fibers recruited for a contraction but don't really grow the size of your muscles very much. The short of it is that you end up with a stronger,

more powerful contraction with less muscle bulk.

As you'll see in Chapter 6, there are many ways to get the strength and power you want and need without gaining mass. But please, don't be afraid of a little muscle. Strong, as they say, is the new sexy. It's also plain smart, because as you get older and start losing precious lean muscle tissue, you'll be happy for all you kept in reserve!

WOMAN IN REPOSE: HOW WOMEN RECOVER

When it comes to reaping all the benefits of your hard work in the gym or on the court, field, bike, or trail, the quality of your training must be matched by the quality of your recovery if you hope to see measurable improvement. In short: Train hard, recover harder. And here is where I break the news to you that it is, in fact, somewhat harder for women to recover.

For one, our capacity for muscle glycogen turnover (accessing and using stored carbs) is generally lower, especially during times when our estrogen levels are high. That slows our recovery time because our bodies need available carbs not only to prevent us from eating into our muscles during

exercise, but also to help us recover quickly when we're done.

Although we mobilize more fat during exercise, the opposite is true during recovery. At this point women tend to burn an increased proportion of carbs, whereas men burn an increased proportion of fat. What's more, women's fat-burning postexercise metabolism drops back to normal about 3 hours after they've showered and gone about their day, while men's levels remain elevated up to 21 hours later. Progesterone also increases muscle breakdown (catabolism), and with the catabolic responses during exercise, getting a good

dose of protein postexercise becomes critical for us to rebuild our muscles and reduce the signaling to store body fat. So if you've ever wondered why the men you train with seem to drop weight more quickly, physiology is a major factor.

WOMEN IN THE WORLD: HOW WOMEN RESPOND TO HEAT, COLD, AND ALTITUDE

As a woman, your size, blood volume, and metabolism impact how you respond to your environment, especially when you're out working up a sweat

(or trying to stay warm). And, you guessed it, how you react to any given environment is likely a bit different from how your male counterparts do.

Let's start with the main one: thermoregulation, your body's ability to

maintain a consistent core temperature—about 98 degrees—regardless of how blazing hot or freezing cold it is.

Hormones definitely play a role in the ability to keep your cool when the going gets hot—core temp rises along with those hormones—but estrogen and progesterone aside, research shows that women generally start sweating later into a workout (if you exercise with guys, you've likely seen this phenomenon firsthand—they're pouring rivers and you've barely begun to glisten), and we sweat less. So if you take two non-acclimated folks and have them run a 5-K in Florida, the woman will generally struggle more with the heat than the man.

That said, and this will be a recurring theme throughout the book, it's trainable. Given time to acclimate (which can take up to 2 weeks), exercise heat-tolerance time for women actually increases more than men's, which makes that sex difference evaporate like a bead of sweat in the Arizona sun.

After you've completed a particularly steamy workout is another story. Women do have a more difficult time offloading the heat they built up during exercise, particularly when hormones are high. A few extra cooling measures such as a dip in the pool, drinking an ice-cold recovery drink, or running the hose over your head can accelerate the process.

How about the opposite extreme? It's a bit less clear. Some research indicates that women have a slightly higher average core temperature than men (97.8 versus 97.4). But their hand temperatures are much cooler by comparison (87.2 versus 90). This is also one reason Raynaud's syndrome (where your bloodflow reduces dramatically in response to cold or emotional stress, causing pain and discoloration in your fingers, toes, and sometimes other areas) is considered a woman's disease. When your hands feel cold, you feel cold. So you might need thicker mittens or some heating packs in your gloves to exercise in the same relative comfort as the man next to you when the temperatures dip. (You'll learn about dealing with extreme conditions in Chapter 13.)

How about when we go up into the thin air of high altitude? In one study, researchers examined a group of men and women at sea level and then again while they acclimated to high altitude at Pikes Peak in Colorado (14,109 feet of elevation). They found that while men tend to use more carbohydrates as exercise fuel at high altitude compared to sea level, women burned even more fat than they did in the lower elevations. Since women have more fat stores at their disposal and fat is a less limited source of energy than carbs, we have an advantage in the high mountains.

EQUAL BUT DIFFERENT

The best way to sum up the whole question of how women compare to men in exercise performance is that we are really pretty equal, even if we have different physiological needs. In absolute terms, we may not be able to match a similarly sized man in strength, speed, and absolute endurance. But we're not that far off.

And—I'll say it again—we're very trainable. Once you throw training into the equation, the gender gap shrinks considerably. If you look at records from the Olympics, the average difference between the gold-medal performances by men and women is about 10 percent across all events. In events such as shooting and equestrian competitions, where success lies not just in physical prowess but balance and mental concentration, the outcomes for women are often on par with the men.

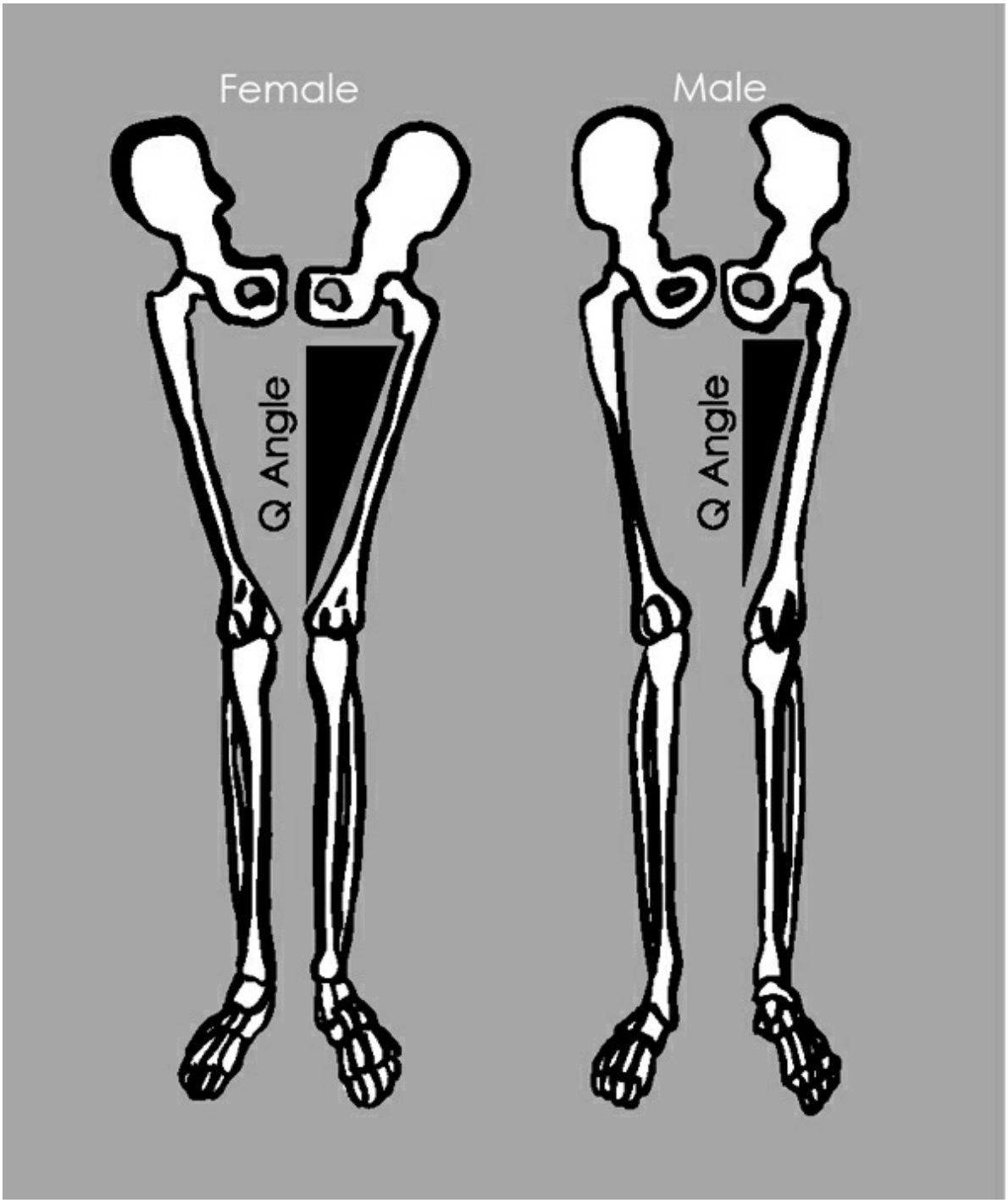
I contend that many of the differences we perceive in ability are just that, perceptions. Society still has different athletic expectations for women than it does for men. Oftentimes as women, we have different expectations for ourselves than we do for men. We have the power to change much of that. We just have to be willing to learn and try. So let's keep roaring on.

THOSE HIPS ARE MADE FOR BIRTHING

Women are hourglass shaped for a reason: We need wider hips if we choose to give birth to babies. The problem is, the same wide hips that make delivery easier can make other physical tasks, such as running and jumping, trickier for us than they are for our male peers. Wide hips increase what's known as our Q-angle—the angle between our quadriceps muscle and the patellar tendon that helps our knee track properly.

In one study of 100 men and women, the average Q-angle for women was 15.8 degrees compared to 11.2 degrees among the men. That's a significant difference and one that makes us more vulnerable to having knock-knees and pronated feet. Female joints (and tissues including collagen, the main building block) also tend to be hypermobile, which is great for gymnastics but maybe less so for overall stability, so areas such as the patella of the knee are particularly vulnerable for slipping out of place, causing pain and injury.

These structural differences are also why women are more susceptible to chronic exercise-related knee issues, such as chondromalacia and anterior knee pain, because their knees aren't tracking properly. Over time we can damage the cartilage underneath without even realizing it. We're also more prone to acute knee trauma such as anterior cruciate ligament (ACL) tears



and blowouts. In fact, young female athletes are up to seven times more likely to tear their ACL, the key stabilizing ligament in the knee, than the boys on the field. That's because when they land from a jump, their knees

collapse inward.

These imbalances and their consequences can be easily evaluated (even by yourself) and corrected so you have more solid, stable biomechanics. It's mostly a matter of strengthening those stabilizers in your core and hips, so your knees can fall in line no matter how you run, cut, jump, and land. We'll get into the details of that in Chapter 6.

As a woman, you have more essential fat, carry most of your lean mass in your lower body,

and have a greater proportion of type I endurance (also called slow-twitch) muscle fibers than men.

Women are naturally good fat-burners. That's great for endurance, but you sometimes need

a boost when you need to access those stored carbs to go hard.

Pound for pound, a well-trained woman is darn near as powerful as her male counterpart.

Sorry, it's true. Guys do lose weight more easily than we do. But pumping up your protein

intake can help a lot.

The top female athletes will likely never catch the top men, but they've gotten pretty close (within 10 percent nearly across the board). And plenty of strong, trained women can "chick"

the average guy.

2

DEMYSTIFYING AND MASTERING

YOUR MENSTRUAL CYCLE

YOUR PERIOD DOESN'T HAVE TO BE A CURSE WHEN

IT COMES TO YOUR PERFORMANCE

Women have a long history of being shamed into silence about their periods. Even if it's not directly stated, the underlying message is it's not something you talk about. You just deal with it. In the sports sector, matters related to menstruation have largely been sidestepped and ignored. Some women even worry that their periods may be viewed as a sign of weakness. In fact, even well into the last century, women were warned against taking part in sports during menstruation because of concerns it would harm their health.

If you are led to believe that menstruation is unmentionable, you are most likely not going to use it as an excuse for not performing at your best. Even when we do speak up, we're often more or less dismissed. While I was at

Purdue working on my undergraduate degree and participating in metabolism

labs, I asked my professor why I was getting different results when everything else was the same (I later realized it was due to the phase of my cycle). The response I got was very typical: “Oh, it just is an anomaly; we’ll just use the guys’ data.” Later, when I wanted to pursue research in sex differences, my advising professor actually cautioned me against it, warning me that women are too difficult to understand, since estrogen and progesterone can skew results.

But the physiological impact is real. There are sex differences from birth, but they aren’t really apparent until the onset of puberty, when testosterone rises in boys (stimulating muscle mass development) and the menstrual cycle begins in girls. Once that cycle is set in motion, it will have a profound impact on a woman for the rest of her reproductive life. It’s the natural rhythm of life that we work with. We owe it to ourselves to stop being blind to the impact of our menstrual cycle, no matter how profound or slight it may be for you. You don’t have to suffer in silence. You can actually manage—

even master—it through nutrition and smart exercise programming so that migraines, nausea, bloating, and cramps don’t derail your fitness goals.

DEMYSTIFYING YOUR PHASES

You likely learned all of this in junior-high health class, but unless you’ve had a refresher course, you may not remember all the technicalities of the

menstrual cycle. Truth be told, many women never really got them the first time around. So let's start with a little review.

The average menstrual cycle is 28 days long (though it can range between 21 and 35 days and doesn't always run like clockwork) and is broken down into two 14-day phases. Your cycle begins the day your period starts. Days 1 through 14 are what's called the follicular phase. Days 15 through 28 compose the luteal phase. Ovulation occurs right about in the middle. Rising and falling hormone levels trigger all of it.

After your period ends—about day 5 or 6 of your cycle—your ovaries gradually start ramping up their production of estrogen during the follicular phase. Through the rise in follicle-stimulating hormone (FSH) during the first

days of the cycle, a few ovarian follicles are stimulated, to "mature" the eggs for release. Around day 12 your estrogen levels surge along with a luteinizing

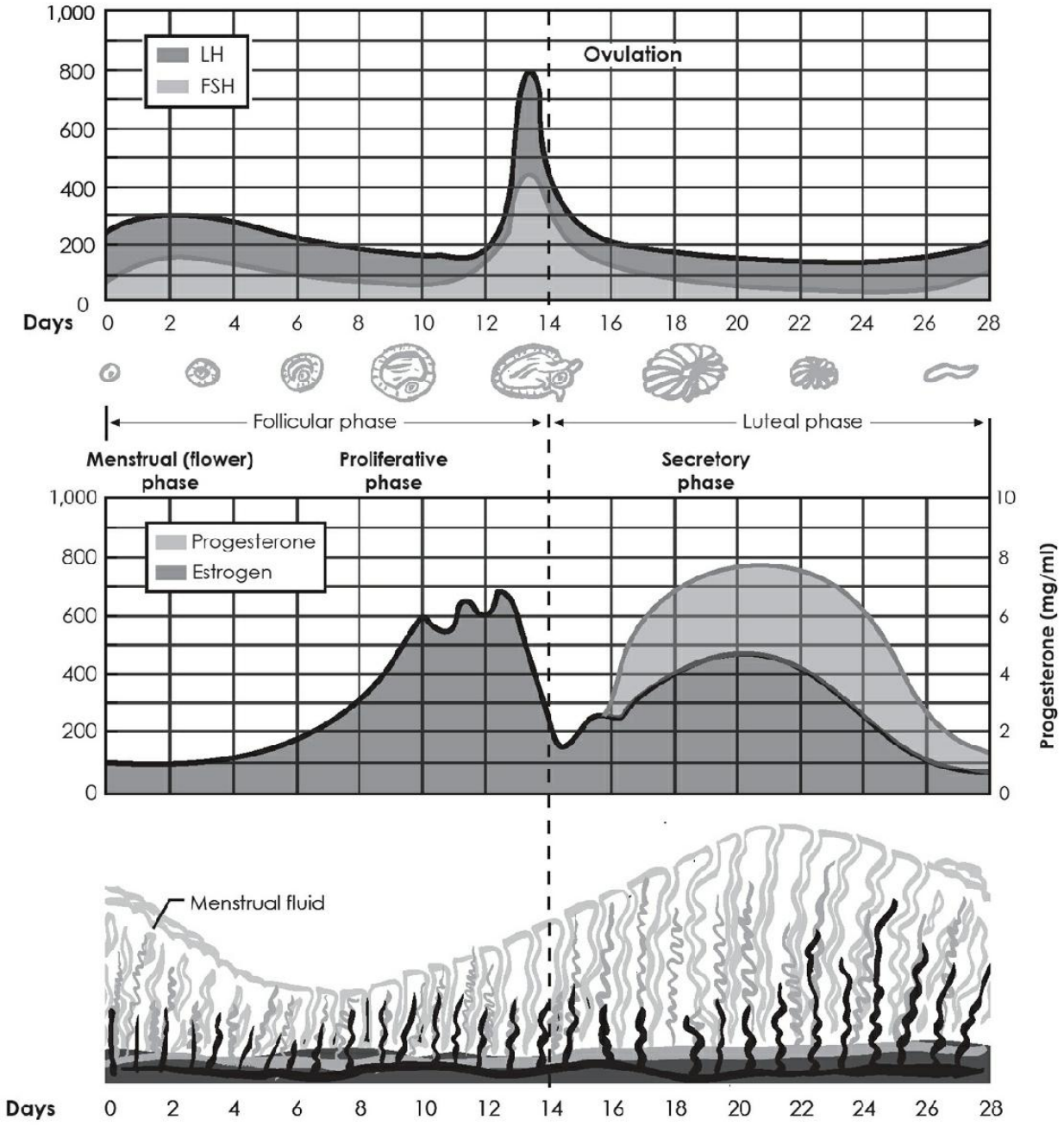
hormone (LH), which causes ovulation, and an egg is released from your fallopian tubes. Estrogen levels dip at this point but will soon rise again as the

body goes into nesting mode, in case that egg is fertilized. During this stretch

—the luteal phase—your hormones kick into high gear. Progesterone levels rise, surpassing estrogen, to prepare the lining of the uterus for egg

implantation. Both estrogen and progesterone reach peak levels about 5 days before menstruation. This is where premenstrual syndrome (PMS) symptoms can rear up. If a fertilized egg isn't implanted, progesterone levels fall and you shed the lining and are back to Day 1.

YOUR CYCLE AT A GLANCE



PERIODS AND PERFORMANCE: MASTERING YOUR CYCLE

What does this mean for your performance? I'd like to start with a fact that surprises many women. You can stop worrying about having your period on race day. Everyone worries about having their period for a big event, but in

reality, your hormones are favorable for performance once your period starts.

Remember Paula Radcliffe broke the world record for the fastest marathon in

Chicago in 2002 while she had menstrual cramps!

It makes sense, if you think about it. Once you're in the clear of the

possibility of pregnancy, the body goes into a more relaxed mode and all

those energy systems used in the high-hormone phase are at your disposal for exertion. Same goes for the low-hormone phase that follows your period. As

ironic as it may seem, your exercise physiology is most like a man's during

your period and the days that follow. And guess what? You're stronger, too.

In one study of 20 active females, researchers found that the women could

make greater strength gains and produce more force when they strength

trained during their low-hormone phase compared to training in the high-

hormone phase. You're also likely to feel less pain and recover faster.

So whether you're working out, training, or racing, it will feel easier when

you're in the low-hormone phase of your cycle, which starts the first day of

menstrual bleeding. Though there are very few specific studies on

performance throughout the menstrual cycle, one study conducted on

swimmers found that the women clocked their fastest times during

menstruation and their slowest during the premenstrual period.

That doesn't mean you're doomed if a key event lands on a high-hormone