# CONTENTS

*Foreword by Patrick Dempsey*  
Preface  
*Acknowledgments*

## PART I  WHAT IS CORE STRENGTH?

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Core Strength Means Better Results</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Common Injuries</td>
<td>27</td>
</tr>
<tr>
<td>3</td>
<td>Posture</td>
<td>51</td>
</tr>
</tbody>
</table>

## PART II  CORE ADVANTAGE WORKOUTS AND EXERCISES

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Flexibility</td>
<td>71</td>
</tr>
<tr>
<td>5</td>
<td>Getting Started</td>
<td>85</td>
</tr>
<tr>
<td>6</td>
<td>Level I Workouts and Exercises</td>
<td>95</td>
</tr>
<tr>
<td>7</td>
<td>Level II Workouts and Exercises</td>
<td>121</td>
</tr>
<tr>
<td>8</td>
<td>Level III Workouts and Exercises</td>
<td>147</td>
</tr>
</tbody>
</table>

*Appendix: Workout Logs*  
*Sources*  
*Index*  
*About the Authors*
WHAT IS CORE STRENGTH?
“Core strength.” Once practically unheard-of, this term is now so widely used in the world of sports and fitness that it has become easy to dismiss. Athletes, fitness experts, and weekend warriors talk incessantly about how they are working on building their core, learning how to use core strength, and “just learned the most killer core routine, dude—you’ve gotta try it!” Health clubs offer core strength classes, fitness videos promise stronger core muscles, and we all probably agree that better core strength would probably—definitely—improve our fitness, solve our problems at work, and make us better people.

The truth is, core strength may not instantly make you a better citizen, but it will definitely make you a better cyclist. A regular regimen of core strength exercises will train your muscles and joints to work at their highest efficiency when you are cycling, and it will reduce your chances of injury. A strong core will stabilize your muscle paths to improve your transmission of power from your hips and legs to the pedals of your bike. Core strength will also improve your acceleration, and not only in a sprint; it will also make a significant difference in the hundreds of big and small accelerations that occur constantly in a fast-moving pace line or group. Additionally, solid core strength will improve your climbing and descending skills.
Before we show you how core strength can make you a better cyclist, though, there are some simpler points surrounding core strength that we should address, such as what exactly is the core? And what makes the core so special that you need a bunch of specific exercises—not to mention a whole book—to take care of it?

**Understanding the Term “Core”**

The term “core strength,” while widely used, still causes a lot of confusion; many people mistakenly believe that “abdominals” and “core” are interchangeable terms. The abdominals consist of four muscles, all of which are located primarily on the anterior, or front, side of the body (Figure 1.1). The one exception is the transversus abdominis, which wraps around to the back side of the body.

The core consists of these abdominals plus all the other muscles that attach to the spine and the pelvis. In terms of geography, the core starts at the top of the torso and runs all the way to the bottom of the pelvis. That’s a large area, and it houses countless muscle groups (Figure 1.2).

Included in these groups are muscles you may have previously categorized as being “lower-body” or “upper-body” muscles, such as the gluteals and latissimus dorsi. While these muscles are indeed part of the lower and upper body, respectively, they serve a dual function as part of the core, because they have either an origin or an insertion into the spine or pelvis. The terms “origin” and “insertion” refer to the parts of the body that anchor the muscle on each end. The origin is typically the proximal point (closest to the spine), and it tends to cover a large area, while the insertion is the distal point (farthest from the spine) and tends to cover a small area. When a muscle contracts, the origin and insertion move closer together, and when a muscle stretches, they move apart.

For example, the gluteus maximus (glute max) has an origin along the entire posterior gluteal line, which includes parts of the sacrum, ilium, coccyx, and sacrotuberous ligament. The muscle then fans out and inserts into the iliotibial tract and the glutal tuberosity (Figure 1.3). When the glute max is contracted, the origin and insertion move closer together, causing the hip to extend and externally rotate. The
reason this movement is considered to be a “core movement” is because the pelvis is involved; the glute max must help stabilize the pelvis while the hip is being extended.

The actual number of muscles that originate and/or insert into the spine and pelvis is still up for debate, mainly because no one can agree on whether to count groups of muscles as one muscle or to name each one individually. For example, the hamstrings (which originate in the pelvis and are therefore part of the core) consist of three different muscles, but are almost always referred to as a singular “hamstring.” There is also the nagging question of whether large areas of fascia found in the core should be counted as core “muscles.” Regardless of these debates, the muscles belonging to the core are vastly greater in both number and scope than those included in the category of “abs.”

It is often thought that the sole purpose of core muscles is to keep the middle part of the body stable, but this is only a small part of their mission; Table 1.1 lists the various functions of the muscles that make up the core. Core muscles also generate power to the arms and legs, they protect the spine and pelvis from injury, and they help maintain good posture. Keeping the core muscles in tip-top shape is a good idea for everyone in general, but even more so for cyclists. Because cycling is performed in a semi-prone (facedown) position with the trunk of the body all squished up, the
FIGURE 1.2  CORE MUSCLES

ABDOMINALS
- RECTUS ABDOMINIS
- EXTERNAL OBLIQUES
- INTERNAL OBLIQUES
- TRANSVERSUS ABDOMINIS
- TENSOR FASCIAE LATAE

ADDUCTORS
- PECTINEUS
- ADDUCTOR BREVIS
- ADDUCTOR LONGUS
- ADDUCTOR MAGNUS
- GRACILIS

QUADRICEPS
- RECTUS FEMORIS
- VASTUS INTERMEDIUS
- VASTUS LATERALIS
- VASTUS MEDIALIS

ANTERIOR

PSOAS MINOR
PSOAS MAJOR
ILIACUS
SARTORIUS
IT BAND
demands on the core musculature are magnified, and so are the consequences of letting your core muscles become weak (Figure 1.4).

Any weakness in the core can inhibit your performance on the bike. Unfortunately, most cyclists suffer from several problems related to muscle weakness, because they tend to feed off each other. Muscular imbalances can lead to overuse injuries and poor posture; overuse injuries can cause decreased power production

TOMMY’S TAKE

Redemption time. That’s what Stage 3 of the 2012 USA Pro Challenge was for me. I was just coming off a terrible crash less than two months earlier in the Tour de France (see Chapter 2 for the full story), and I think a lot of people may have questioned whether I would be ready for the Pro Challenge. But Colorado is the state where I live and train, and I know the routes well, because I’ve ridden them many times, so I thought that if I could just come into the race with some solid strength and conditioning, I might actually have a chance. Turns out I got that chance during stage 3 from Gunnison to Aspen.

Our team strategy for that day was aggressive but simple: Get two guys in the first breakaway and create a 3- to 4-minute gap right from the start. Then I would attack out of the peloton and hopefully go across to the breakaway on the first climb. My teammates Dave Zabriskie and Nathan Haas were in that first breakaway. When I attacked over the top of the first climb I was going a bit faster than the rest of the 22 guys in the breakaway, so Zabriskie and Haas had to lift the pace a bit in order to maintain the 4-minute gap over the peloton. Dave stayed with me for the next 70 miles until the last climb. At the bottom of Independence Pass, I pulled ahead and essentially did the last 80 km of the race by myself.

Going it alone in front of my fans in my home state was an experience I will never forget. I didn’t know if I was capable of holding it the whole time; among other things, there was a lot of wind. I just took it moment by moment and set little goals for myself. Independence Pass is an icon of Colorado, and to be solo for such a long way was a special experience for me.

That day I really stressed my body, and at every moment I was expecting the next second to be the one where I lost my strength or pedal rhythm. But I was amazed at how all the hard work I had done on my core allowed me to keep my composure. It’s one thing to win in a solo breakaway and then be crushed for the rest of the race, but I had my best cycling performance ever in my home state, and I even went on to win the title of Most Aggressive Rider.
in the legs; poor posture can cause muscular imbalances. It quickly becomes difficult to identify which problem occurred first, which one is the worst, and how to go about fixing things. The first step in combating performance-depleting problems is to examine your current program to make sure you aren’t accidentally exacerbating the problem by doing inappropriate exercises.

**Stop Doing Crunches!**

Due to the misperception that only the abdominal muscles constitute the core, exercise routines commonly focus on strengthening those four abdominals, sometimes to the exclusion of all others. But each muscle of the true core has a specific function, making it important to achieve optimum strength in all the muscles, not just the abdominals.

Multiple problems can arise when the abdominals are strengthened and the remainder of the core is ignored; chief among these problems are muscular imbalances. When an imbalance occurs in the muscular system, a muscle or a group of muscles becomes dominant and overactive, while a different muscle becomes weak and inactive. The imbalance throws off the carefully designed system of duties for which each muscle is responsible.
One of the most common imbalances seen in the core musculature is the over-development of the rectus abdominis, which in turn causes the transversus abdominis, psoas, and low back to become weak and inactive. How does the rectus abdominis become so dominant? Too many crunches.

Consider a traditional ab routine: You start with some basic crunches, move on to some side crunches, and finish up with some reverse crunches. Sounds like a pretty complete set of exercises, right? The harsh truth for cyclists is that crunches actually do much more harm than good. If you fit the profile of the typical cyclist, you probably already have an overworked and tight rectus abdominis (the “six-pack” muscle used during crunches) due to the amount of time you spend in a crunch position while riding. A steady diet of ab crunches only makes the problem worse.

The primary function of the rectus abdominis is to shorten the length between the rib cage and the pelvis, which is an effective way to achieve an aerodynamic position on the bike. Off the bike, however, shortening the rectus abdominis over and over—which is what happens during a crunch—will encourage poor posture and put excessive pressure on the discs of the lumbar spine. Think about it: If you perform a crunch while standing up, you have to hunch your shoulders forward and stoop over in order to flex your abs.
Another problem with traditional crunches is that they are performed while lying on your back, thereby training your abdominal muscles to fire when the rest of your body is being stabilized by the floor. How many times do you actually use your abdominal muscles this way in real life? Probably never. Would you ever train for a ride by lying on your back and pedaling your legs up in the air? Of course not, because this type of training would never directly translate into improved performance on the bike.

As previously mentioned, the larger problem with a crunch-based routine is that it creates muscular imbalances, which in turn decrease the body’s ability to generate optimum stability and power on the bike. When a muscle (in this case, the rectus abdominis) is overdeveloped, it effectively starts bullying the muscles around it, making those muscles incapable of doing their jobs. The muscles of the core that are most commonly bullied into submission are the transversus abdominis, the internal obliques, and the muscles of the low back. These muscles are the primary providers of stabilization to the pelvis and spine during movement; when they aren’t functioning at full capacity, their ability to help the body move with optimum power and efficiency is drastically decreased.

In order for the muscles of the core to do their job, each muscle must be equally strong—no bullies allowed. The only way to accomplish this muscular balance is to take crunches off the field so that the other players get a chance to see some game time.

The notion of doing a core strength routine without crunches may seem blasphemous. As a vanity-obsessed nation, we have all been brainwashed from childhood to believe that crunches are good for us and that an Adonis-like six-pack is the ultimate sign of strength. Heck, even the president’s physical fitness test for schoolchildren includes a section that counts the number of curl-ups (another name for a crunch) that can be done in one minute! But now it’s time to set aside that old approach, step away from the ab crunch machine, and start working on the entire core.

**TOMMY’S TAKE**

All the core work I did before meeting Allison was based on doing crunches. I got pretty good at doing crunches, but they didn’t ever make me feel like a stronger cyclist. In fact, they made me more hunched over and contributed to my low-back pain.
### TABLE 1.1  FUNCTIONS OF THE CORE MUSCLES

<table>
<thead>
<tr>
<th>MUSCLE</th>
<th>CORE FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HAMSTRINGS</strong></td>
<td>Extends hips; stabilizes low back and pelvis during movement.</td>
</tr>
<tr>
<td>Consist of the biceps femoris,</td>
<td></td>
</tr>
<tr>
<td>semimembranosus, and semitendinosus.</td>
<td></td>
</tr>
<tr>
<td><strong>QUADRICEPS</strong></td>
<td>Flexes hips; stabilizes pelvis during movement.</td>
</tr>
<tr>
<td>Consists of the rectus femoris,</td>
<td></td>
</tr>
<tr>
<td>vastus lateralis, vastus medius, and</td>
<td></td>
</tr>
<tr>
<td>vastus intermedius. Rectus femoris is</td>
<td></td>
</tr>
<tr>
<td>also categorized as a “hip-flexor</td>
<td></td>
</tr>
<tr>
<td>muscle.”</td>
<td></td>
</tr>
<tr>
<td><strong>HIP ADDUCTOR COMPLEX</strong></td>
<td>Flexes and internally rotates the femur; assists with hip extension.</td>
</tr>
<tr>
<td>Consists of the adductor magnus,</td>
<td></td>
</tr>
<tr>
<td>adductor longus, adductor brevis,</td>
<td></td>
</tr>
<tr>
<td>pectineus, and gracilis.</td>
<td></td>
</tr>
<tr>
<td><strong>HIP ABDUCTOR COMPLEX</strong></td>
<td>Abducts (movement away from the body) the femur.</td>
</tr>
<tr>
<td>Consists of the gluteus medius,</td>
<td></td>
</tr>
<tr>
<td>gluteus minimus, and tensor fasciae</td>
<td></td>
</tr>
<tr>
<td>latae (TFL). The TFL is also</td>
<td></td>
</tr>
<tr>
<td>categorized as a “hip-flexor muscle.”</td>
<td></td>
</tr>
<tr>
<td><strong>HIP EXTERNAL ROTATORS</strong></td>
<td>Externally rotates and extends hips; stabilizes the pelvis and femur.</td>
</tr>
<tr>
<td>Consists of the piriformis, quadratus</td>
<td></td>
</tr>
<tr>
<td>femoris, gemellus superior, gemellus</td>
<td></td>
</tr>
<tr>
<td>inferior, obturator internus, and</td>
<td></td>
</tr>
<tr>
<td>obturator externus.</td>
<td></td>
</tr>
<tr>
<td><strong>GLUTEUS MAXIMUS</strong></td>
<td>Extends and externally rotates hips; stabilizes the SI joint.</td>
</tr>
<tr>
<td><strong>ILIOPSOAS COMPLEX</strong></td>
<td>Flexes hips; stabilizes the lumbar spine.</td>
</tr>
<tr>
<td>Consists of the iliacus, psoas major,</td>
<td></td>
</tr>
<tr>
<td>and psoas minor. Also categorized as</td>
<td></td>
</tr>
<tr>
<td>a “hip-flexor muscle.”</td>
<td></td>
</tr>
<tr>
<td><strong>SPINAL ERECTORS AND MULTIFIDUS</strong></td>
<td>Extends and stabilizes the spine.</td>
</tr>
<tr>
<td><strong>LATISSIMUS DORSI</strong></td>
<td>Stabilizes the thoracic and lumbar spine; stabilizes the pelvis.</td>
</tr>
</tbody>
</table>
Core Strength That Works for Cyclists

If you as a cyclist aren’t supposed to be doing crunches, then what are you supposed to do? It’s not enough to just randomly work all the muscles of the core and hope that useful core strength emerges. Instead, you need to work your core muscles in a functional manner so that their strength can be directly translated to the activity and demands of cycling.

So what is a “functional” core strength routine? Broadly, it is one that meets the criteria set out by the National Academy of Sports Medicine: “All functional movement patterns involve deceleration, stabilization, and acceleration, which occur at every joint in the kinetic chain and in all three planes of motion.”

Perfectly clear, right? Okay, let’s break it down. First of all, the overall thesis of functional training is that movements performed during training sessions should mimic movements performed in the sport for which you are training. For cycling, therefore, we need to train the muscles, joints, and soft tissue of your body.

<table>
<thead>
<tr>
<th>MUSCLE</th>
<th>CORE FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>RHOMBOIDS</td>
<td>Retracts (pulling together) and downwardly rotates the shoulder blades.</td>
</tr>
<tr>
<td>TRAPEZIUS</td>
<td>Extends and contralaterally rotates the cervical spine; retracts and depresses shoulder blades.</td>
</tr>
<tr>
<td>RECTUS ABDOMINIS</td>
<td>Flexes the spine; stabilizes the lumbar and pelvis.</td>
</tr>
<tr>
<td>TRANSVERSUS ABDOMINIS</td>
<td>Produces intra-abdominal pressure; stabilizes the lumbar and pelvis during movement.</td>
</tr>
<tr>
<td>ABDOMINAL OBLIQUES</td>
<td>Flexes and rotates the spine and pelvis; stabilizes the lumbar and pelvis.</td>
</tr>
</tbody>
</table>
to operate at their highest efficiency while you are riding. Put another way, the exercises in your core routine should focus on *specific movements* as opposed to *specific muscles*.

When you approach your core strength program in this way, it soon becomes obvious that lying on your back doing crunches is not really functional at all. Those crunches aren’t going to get you anywhere near where you need to be in terms of balanced muscle strength and stability.

Instead, you need exercises that qualify as functional. To get there, let’s look at the terms that help define functional training.

### Deceleration

Deceleration (also known as the eccentric muscle contraction) refers to the body’s ability to safely and effectively slow down a movement. As its name implies, deceleration puts the brakes on whatever action is being performed. Don’t worry, this kind of deceleration won’t slow down your cycling. It will, however, slow down your rate of injury. If a muscle can’t safely and efficiently slow down after it is put into motion, it will eventually move past its limit and tear. Think about the implications of driving a car with no brake pedal: The acceleration would continue on forever, and eventually the car would crash into something and sustain damage. The same is true of human movement.

The ramifications of poor or improper deceleration in musculature can best be exemplified by the number of anterior cruciate ligament, or ACL, tears that are sustained. Although the ACL is not part of the core, the hamstrings, the muscle group often responsible for ACL injuries, is an integral part of your core architecture. Of the approximately 200,000 ACL tears that occur each year, 80 percent are noncontact, meaning that the injury was sustained without contact or impact from another person or object. A noncontact ACL tear can almost always be attributed to poor hamstring strength. The hamstrings are responsible for decelerating knee extension during pivoting or landing from a jumping motion. This is a prime example of how weakness in a core muscle can potentially lead to injury.
CORE STRENGTH MEANS BETTER RESULTS

15

Given that cycling doesn’t require quick pivoting or jumping motions, you may be thinking you’re off the hook in terms of needing your hamstring muscles to provide deceleration. After all, almost every person you know who has torn an ACL did it while playing soccer, basketball, or skiing. While you may not be in danger of sustaining a knee injury from running around a field kicking a ball, you probably perform a basic squat countless times throughout the day, and this movement requires deceleration from the hamstrings in order to slow down the rate at which the knee extends when you rise and the rate at which the hip flexes forward when you squat (Figure 1.5). Without proper deceleration, your body could move upward too quickly, putting the joints of the hips and knees in danger.

Still not convinced you need to know how to squat as a cyclist? Do you ever stand up out of the saddle while riding and then sit back down? If the answer is yes, then you need to know how to squat properly.

Stabilization

The second aspect of a functional exercise is stabilization, otherwise known as isometric muscular contraction. A muscle is working isometrically when it is held at a fixed length instead of actively lengthening or shortening. By holding a muscle at a fixed length, the joints at either end are stabilized.

TOMMY’S TAKE

The idea of learning to squat properly seemed ridiculous to me until I understood how it could affect my power when I’m getting in and out of the saddle. It has always been easy for me to generate power when I’m going from in the saddle to out of the saddle, but when I go from out to back in, I tend to have a 2- to 3-second lull in my power output. Once my body readjusts to the seated position, I regain my power. By improving my core strength—specifically my ability to use my core to decelerate my body properly when I’m transitioning back into the saddle—I have been able to get rid of that lull and essentially keep the gas on the entire time. If you don’t lose power every time you transition back into the saddle, you will gain a real edge over your competition.

Given that cycling doesn’t require quick pivoting or jumping motions, you may be thinking you’re off the hook in terms of needing your hamstring muscles to provide deceleration. After all, almost every person you know who has torn an ACL did it while playing soccer, basketball, or skiing. While you may not be in danger of sustaining a knee injury from running around a field kicking a ball, you probably perform a basic squat countless times throughout the day, and this movement requires deceleration from the hamstrings in order to slow down the rate at which the knee extends when you rise and the rate at which the hip flexes forward when you squat (Figure 1.5). Without proper deceleration, your body could move upward too quickly, putting the joints of the hips and knees in danger.

Still not convinced you need to know how to squat as a cyclist? Do you ever stand up out of the saddle while riding and then sit back down? If the answer is yes, then you need to know how to squat properly.
In a traditional approach to strength training, stabilization is often supplied by a machine, a bench, or some other stable surface that supports the body. With functional training, stabilization is provided by the body itself, and it is provided both isometrically (body not moving) and dynamically (body in motion). It may seem odd to think of core muscles providing stabilization while the body is in motion, but this is exactly the capacity in which they must function when you’re on the bike. Each time you push down on a pedal, your core muscles have to provide dynamic stabilization so that your body remains stable while the bike is moving forward underneath it. Without proper stabilization, your spine and pelvis would be moving all over the place while you ride, which would not only put you in danger of falling off your bike, but would also decrease your ability to effectively transmit power from the core muscles out to the extremities.
Acceleration

Finally, there’s the aspect of functional strength training that interests all cyclists: acceleration. When you want to go faster on your bike, you increase the pace at which you are pedaling. This action happens in a split second, but it is the result of a very complex chain of neuromuscular events, one of which is a concentric muscle contraction, otherwise known as acceleration. Contrary to an eccentric contraction (or deceleration), a concentric muscle contraction shortens the muscle fiber. Earlier we looked at how the hamstring muscles work eccentrically to decelerate the rate at which you stand up from a squat position. Now let’s look at what the hamstring muscles do when they are shortening, or accelerating.

When the hamstring muscles contract and shorten, their main job is to assist with hip extension and knee flexion. Hip extension happens every time you take a step and push off the ground with your foot, every time you stand up from a seated position, and every time you push your foot behind your body. In cycling, hip extension

---

**TOMMY’S TAKE**

I had a tough lesson in muscle contraction velocity at the 2012 Vuelta País Vasco in Spain. As I started preparing for the 2012 season, I spent so much time on my regular road bike trying to increase my power that I ended up neglecting my time trial (TT) bike. When I showed up at the Vuelta País Vasco, my fitness on my road bike was pretty exceptional, so I assumed my fitness on my TT bike would be the same, even though I hadn’t devoted much time to it. To my surprise, when I got into my time trial, my power meter was reading really low, and I had one of my worst time trials. I was pushing as hard as I could, but the power wasn’t there—not even close. I believe the reason for that is the muscles that enable me to produce power in a time trial position weren’t firing correctly because they weren’t used to being fired in that extended position.

In time trialing, because of the position that you’re in, it is really important to be able to access the full muscle contraction velocity when you’re in a hyperextended position. So when I got back home to Boulder, Colorado, and started to train for the Tour of California, I focused on getting my hamstrings and glutes firing again on my TT bike, and the results paid off. I was on the podium largely because I had my full muscle contraction velocity available during every stage of the race.
happens as you extend your foot downward, and knee flexion happens when you pull your foot back up. This is why hamstrings are the main muscles working during your upstroke, and why your hamstrings always seem to scream when you start focusing on pulling up on the pedals instead of pushing down.

An important tenet of concentric muscle contractions is that the contraction velocity (acceleration) is inversely proportional to the load placed on the muscle. What this means in bike speak is that the lighter the load you place on a muscle, the faster it can contract. You can test this yourself: Start riding on a flat straightaway in a very low gear (little to no resistance), then gradually start to shift into higher gears (adding resistance) but try to maintain the same cadence. Eventually you won’t be able to keep the cadence you started with because your muscles cannot contract at the same speed; the load placed on the muscles has increased, and, consequently, the speed at which they can fire has decreased. One of the many talents that distinguish world-class cyclists is that they have the ability to maintain a very high pedaling cadence, even when the muscle is under a high load or force.

Core Strength in All Planes of Motion

Understanding how the terms “deceleration,” “stabilization,” and “acceleration” can affect your core training is definitely useful, but what truly differentiates functional core strength training from traditional core strength training is that all three of these movement variables happen in multiple planes of motion (Figure 1.6).

With a traditional approach to strength training, muscles are frequently isolated and worked in a stable, controlled environment through one plane of motion. Take the standard bench press as an example; during this exercise, the athlete lies on his or her back on a bench and pushes a bar loaded with weights toward the ceiling. While this exercise has the potential to build muscle mass and increase the force production of the chest and shoulder muscles (pectoralis and deltoids), the benefits pretty much stop there. In other words, an exercise like the bench press may give you nice-looking muscles for the beach, but it won’t necessarily improve your ability to use those muscles to efficiently perform daily movements, activities, and sports.
What many traditional exercises ultimately fail to deliver is a solid connection between the nervous and muscular systems. Sticking with the example of the bench press, let’s take a look at the number of joints and muscles involved and the plane of motion in which they are used. The primary muscle used (agonist) is the pectoralis major, with additional strength (synergists) being provided by the anterior deltoid, pectoralis minor, and biceps brachii. Absent from this scene are stabilizing and neutralizing muscles; the body is already stabilized and neutralized by the bench, which means the muscles that would ordinarily do this work are allowed to shut off or underperform during the movement.
Furthermore, the bar used in a traditional bench press is straight, meaning that the path the arms must follow to complete the movement is already determined by the straightness of the bar. When a movement is performed in a predicted, stable pattern, it only has to move through a single plane of motion, in this case, the sagittal plane.

This type of training would be very useful if we used our pectoral muscles in a single plane of motion during daily movements, but we don’t. In fact, we rarely use any muscle in a single, predicted plane of motion. And therein lies the entire foundation of functional training: To strengthen core muscles, exercises must mimic the actual movement in which you will use those muscles to perform activities or sports. By choosing core exercises that are functional and specific to the sport of cycling, you will avoid wasting time on exercises that don’t improve your performance.

How can you tell the difference between a functional core exercise and a traditional core exercise? Functional exercises will require the body to provide its own stabilization (no benches or machines), will work in multiple planes of motion, and will ask the muscles to speed up (acceleration), hold still (stabilization), and slow down (deceleration). Table 1.2 lists some examples of how to tell the difference between traditional and functional core exercises. You can find descriptions and explanations of the functional exercises in Part II.

### Table 1.2 Comparison of Traditional vs. Functional Core Exercises

<table>
<thead>
<tr>
<th>Traditional</th>
<th>Functional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hamstring curl machine</td>
<td>Hip Bridges (see p. 109)</td>
</tr>
<tr>
<td>Seated row machine</td>
<td>Shoulder Blade Squeeze (see p. 110)</td>
</tr>
<tr>
<td>Abdominal crunch</td>
<td>Mountain Climbers (see p. 111)</td>
</tr>
<tr>
<td>Adductor/abductor machine</td>
<td>Crossover Squats (see p. 140)</td>
</tr>
</tbody>
</table>
Using Core Strength for Balance on the Bike

One of the most important performance benefits you can receive from functional core strength is improved balance. By increasing the functional strength of your core, you are also improving your neuromuscular efficiency, one of the key players in achieving better balance.

Neuromuscular efficiency refers to the ability of the nervous system to properly recruit the correct muscles to control movement throughout all three planes of motion. By increasing the rate at which your nervous system can respond to outside forces such as gravity, ground reaction forces, momentum, and the movement of other muscles, you will also increase your balance. After all, balance is really just a reaction to something else that is going on.

For example, every time you take a step forward, your body must react to the force from the ground, the speed at which you are moving forward, and the power generated by muscles contracting. Without balance, you would fall over just walking.

For cyclists, balance stabilizes the body and the bike, and it must be achieved both isometrically (not moving) and dynamically (in motion). Isometric balance on the bike is needed in several scenarios: descending, stopping, or any other time you are holding your position steady atop the bike without moving your arms or legs. To achieve true isometric balance, each muscle in the core needs to contribute the proper amount of work. If there is a weak link in the chain, the weakness will be transmitted to the neighboring muscles, which can have devastating effects if you need to call upon your core to provide isometric stabilization when you're bombing downhill at 40 mph and hit a pothole.

Dynamic balance is just as crucial as isometric balance. Dynamic balance is often a difficult concept to understand, mainly because the traditional definition of “balance” involves holding something perfectly still and steady. A functional approach to core strength, however, recognizes that balance happens both while the body is held still and while it is in motion.

Even a basic movement like pedaling requires more dynamic stabilization than you may think. There are 29 muscles that connect to the lumbo-pelvic-hip complex, all of which are working together while pedaling to not only push the bike forward.
but also to keep you from tipping over as you ride. If the muscles of the core can’t hold your pelvis steady during a basic pedal stroke, your body will need to overcorrect to keep from tipping from side to side with each pedal stroke.

A more visual example of dynamic stabilization on the bike is climbing out of the saddle. With each pedal stroke executed out of the saddle, the muscles of the core must work to ensure the body stays stable atop the moving bike and that excess energy is not wasted moving from side to side. The deep core muscles are working to hold the spine and pelvis steady, allowing the muscles on the periphery of the core to move quickly and efficiently to push the pedals down over and over ... and over. If you have ever felt weak, unsteady, or just plain uncomfortable when climbing out of the saddle, a weak core may be the culprit. Once your core muscles are strengthened and firing correctly, you will be able to pop in and out of the saddle seamlessly without missing a pedal stroke.

**Using Core Strength to Gain Power**

It might seem difficult to believe that having strong, functional muscles in the center of your body could somehow increase the power output in your legs, but that’s exactly what happens. By maintaining strong core musculature, you decrease your
chances of experiencing what are commonly referred to as “energy leaks.” An energy leak is a point where energy is lost during the transfer of force. Leaks occur most frequently in the torso and are the result of the body not being able to stabilize joints correctly. In other words, energy leaks are most often caused by weak core muscles that cannot properly stabilize the joints of the spine and pelvis.

A common energy leak in cyclists occurs at the lumbar spine, or low back. If the deep core muscles are not strong enough to stabilize the pelvis during a pedal stroke, the low back will flex and extend excessively each time you push your foot down. The result is that energy is “leaked” at the low back instead of being transferred to the glute max, which is a larger and stronger muscle capable of producing more force. As Mike Allen, the director of rehabilitation services at the Steadman Hawkins Clinic in Denver, notes, “Efficiency, power, and injury prevention are strongly dependent on the cyclist’s ability to maintain proper alignment over extended periods of time. Low back and knee injuries commonly occur when alignment is compromised and energy is leaked to adjacent structures via compensation patterns. A well-developed trunk and hip strengthening program is essential for both performance and longevity.”

A second important way in which the core provides power on the bike is by giving the legs a strong foundation from which to work. The large muscle groups of the legs (hamstrings, quadriceps, and gluteals) all originate at the pelvis; if the core muscles are weak, the pelvis will be unstable and the leg muscles will not be able to move with optimum efficiency. The core acts as a power conductor for the extremities, helping to maximize muscular efficiency and decrease wasted energy.

Finally, having strong extremity muscles (i.e., big quads and hamstrings) but a weak core will lead to inefficient movement patterns, causing a decrease in force production. When a muscle is so strong and dominant that it starts to take over the function of other muscles, it creates a scenario called “synergistic dominance.” Every muscle in the body has a primary function, and when it’s working in this capacity it is called the “agonist.” For example, the gluteus maximus is the prime mover, or agonist, for hip extension. Hip extension happens for cyclists with every downward push on the pedals, so it’s important that your body can perform this movement correctly.
While the glute max is working as the agonist, the hamstrings and the erector spinae (muscles that run along each side of the spine) are also working to assist in this movement, which makes them the synergists. It’s very similar to how a baseball team works: Everyone has a position in which they specialize, and it’s the job of each player to be the best he can be at that position while simultaneously working as a member of a team. But what would happen if the first baseman noticed that the pitcher was faltering a bit and he decided to take over that position? The pitcher would be wandering around the field without a job, first base would be left uncovered, the first baseman wouldn’t be pitching very well (after all, it’s not his specialty), and pretty soon the team would fall apart. Likewise, if the glute max (which is part of the core, remember) is not doing its job to extend the hip, the synergist muscles (hamstrings and erector spinae, in this case) will step in and dominate—hence the term “synergistic dominance.” This is a problem not only because the hamstrings and erectors will eventually become injured from being overworked, but also because you will lose power and efficiency from not having the glute max on the job.

Get to Work!

The exercises and routines in this book focus on the core exercises that are most specific to cycling. All of the concepts discussed in this chapter have been assembled to create functional core strength training programs that will improve neuromuscular efficiency, strengthen muscles throughout multiple planes of motion, increase balance and coordination, and improve power production. If you want to be a better
cyclist, it’s time to start incorporating functional core strength training into your routine. It will take patience and diligence, and you will probably have some humbling moments (be sure to read Tommy’s Takes on this subject in Part II), but your hard work will yield a strong, functional core that will help increase your performance on the bike.
Level I Workouts and Exercises

There are several areas of concentration with the Level I workouts, but the two predominant goals are to establish motor neuron control in the core musculature and to activate muscles that have been shut off because of poor posture, injury, or chronic overuse. This may sound tedious and unexciting, but let’s face it: You aren’t reading this book to prepare for your swimsuit modeling session; you’re reading this book to become a strong, powerful cyclist. As any great athlete will confirm, working on your strengths and ignoring your weaknesses is never an effective strategy for success. If you want to build a strong core, it will take diligence and commitment, and the Level I workouts represent the first step in that journey.

Workouts 1 and 2 place a big emphasis on activating the muscles of the kinetic chain that are traditionally weakest on a cyclist: transversus abdominals, low back, middle back, and glutes. The goal is to establish some awareness of these muscles and to work on holding a contraction for a period of 5 to 10 seconds. Because these muscles have probably been shut off for quite some time, it’s important to start with 1 to 2 sets and to take adequate rest periods between sets so that your form doesn’t suffer. One of the primary causes of overuse injuries is poor form, which increases dramatically as fatigue sets in. For this reason, more is not necessarily better when it
comes to sets and reps in Workouts 1 and 2. Follow the parameters outlined, and you will set yourself up for success.

In Workout 3 we transition to a protocol that requires the core muscles to stabilize and engage during movement, which is exactly what those muscles should be doing when you’re on the bike. Additionally, this workout starts to address the incredibly important concept of “intramuscular coordination.” It sounds like a complicated term, but it simply means that you will be doing exercises that require different muscle groups to coordinate with each other and perform their respective functions at the same time. Think of it as a well-rehearsed choir of 20 voices; each voice is singing a different note, yet all of those notes come together to form a pleasing harmony.

Workout 4 is designed to challenge the endurance of the core musculature, hence the increased number of repetitions, which in turn increases the total workout time to 25 minutes. This is the longest workout in Level I, and for good reason. The abdominal muscles are composed primarily of Type I endurance fibers, which means they need to be worked primarily in an endurance fashion in order to see optimum results. In Workout 4, you will have the opportunity not only to increase your total time to fatigue, but also to address any lingering strength discrepancies between the right and left hemispheres of your body. All but one of the exercises in Level I, Workout 4, is performed unilaterally. This allows the muscles of the core to build strength independently and not to rely on the strength of the dominant side to do all the work.

Tommy’s Take

I have to admit that my least favorite exercise is the TVA Activation. When I’m cycling, I feel confident in my strength and ability—I know I’m above average. But when I’m doing the TVA Activation, I feel really weak and below average, especially when compared to Allison . . . and the 90-year-olds in the gym rockin’ out core routines like it’s their job.

On the other hand, I really love doing the Low Back Stretch in Doorway. I feel it uses a natural movement that effectively stretches all the muscles that are ignored both on and off the bike. Plus, it allows me to get a great stretch without taxing my brain too much; I already get enough of that on the bike!
Workout 5 in Level I is a smorgasbord of exercises that help to establish optimum power, strength, and endurance. As with the endurance workout, you will still be performing 3 sets of each exercise, but now the reps have been taken down slightly (from 15 to 12) and the complexity of the exercises has been increased. The emphasis is still on addressing the chronically weak and underused muscles of the posterior, while also working the entire core musculature.
LEVEL I EXERCISE EXPLANATIONS

The Level I exercises have been carefully selected to provide you with an effective, safe, scientifically based place in which to begin building core strength. If you are starting with Level I, you probably haven’t been doing core training with much frequency (maybe not at all), so the emphasis will be on lengthening the tight and inhibited muscles on the front side of the body while simultaneously building strength and muscular integrity on the back of the body.

Throw away your old core routines that were based on traditional crunches and sit-ups, and step into a more holistic, functional approach to core training. You will notice that the Level I exercises emphasize the low back, glutes, deep abdominals, low abs, and obliques, all of which are typically ignored in a traditional core strength program. Crunch-type movements usually require you to lie on your back and lift your upper body by curling your spine toward your knees. This is exactly the type of movement you want to avoid, because it only perpetuates that hunched-over position you are already holding for hours on end while you ride. Instead, the goal of the Level I exercises is to reverse all those postural distortions, poor muscle-firing patterns, and injuries that result from having an overactive rectus abdominis.

Several of the exercises in Level I ask you to hold a certain position for several seconds, which helps to establish a mind-muscle connection with muscles that have probably been shut off for quite some time. Don’t go into Level I thinking it will be easy—you will be challenged and sore just like the first time you tackled a big ride!
GOAL > Improve intramuscular coordination between the core and the extremities; teach the core to use the glute major for hip extension.

Start in a quadruped position (on hands and knees), making sure that hands are directly below the shoulders and knees are directly below the hips. Keep the back of your neck long; do not look up or let your chin drop toward the ground. Activate the abdominal muscles by gently pulling your belly button up, being careful not to round your upper back at the same time.

Keep your hips and shoulders parallel to the ground and lift your right foot and left hand at the same time. Extend the fingertips forward and toes backward as far as possible. Squeeze your right glute. Hold this extension for 5 seconds and then bring your hand and foot down to the mat at the same time. Repeat on the other side, and continue alternating until you have completed the designated number of repetitions.

MUSCLES TARGETED

Low back, glute major
GOAL > Increase strength and range of motion in the low back; teach stabilization in the thoracic and cervical spine when the arms are moving.

The term “prone” means face down, which is the position of the body for this exercise. Start with the arms extended along your sides with palms down A. Keep the back of your neck long and your shoulder blades dropped down toward your waist.

Gently squeeze your glutes and slowly begin to raise your feet, chest, and hands off the ground B. Do not lift more than 6 inches. Create a “snow angel” by sweeping your arms overhead and separating your feet C. Without bending your arms, try to bring your hands all the way together above your head D. Return to starting position and allow your feet, chest, and hands to relax down to the ground E. Repeat until you have completed the designated number of repetitions.

If your shoulders and chest muscles are tight, you will not be able to touch your hands together at first. It’s better to keep your arms straight and have your hands slightly separated above your head than to bend your arms and touch your hands.

MUSCLES TARGETED
Low back, middle back, hip abductors
**GOAL** > Teach the core muscles (specifically the TVA) to stabilize the pelvis while the legs are in motion.

Start in a push-up position with a small towel under each foot A (if you are on a carpeted floor, place a small piece of cardboard under each foot). Avoid rounding in the upper back by squeezing your shoulder blades together, and do not push your chin forward. Lengthen through the spine and activate the TVA by pulling the lower abdominal area up toward the spine.

Without rocking or swaying your hips, slowly slide your right knee in toward your chest B and slowly push back out. Wait until the right leg is back in starting position before you pull in the left knee C. Keep a close eye on your upper and lower back positioning throughout the exercise, and don’t forget to keep the hips steady. Continue switching legs until you have completed the designated number of repetitions.

**MUSCLES TARGETED**

Transversus abdominis, hip flexors, quads
**GOAL** > Release chronic tightness in the lower back and outer hips while simultaneously using the obliques to control movement.

Start in a supine position (lying on the ground, faceup) with the feet off the ground and legs forming a 90-degree angle at the hips and knees. Arms should extend out from the body in a “T” position.

Keeping your upper body relaxed, drop your knees as far to the left as possible without letting your right arm and shoulder blade come off the ground. Return your legs to center and drop to the right. Concentrate on trying to use your abdominal muscles to lift your legs off the ground.

Continue alternating side to side.

**MUSCLES TARGETED**

Obliques, low back
Abdominals, 4, 5 (fig.), 6, 9, 13, 92, 96, 103; core and, 4; crunches and, 11; low, 103
Acceleration, xi, 13, 14, 17–18, 20, 24, 56; core strength and, 3; understanding, 18
ACL. See Anterior cruciate ligament
Acupuncturists, 48
Aerodynamic position, 10, 36, 56; back problems and, 34; effective, 51, 64
Agonists, 23, 90
Alignment: compromising, 23; improper, 55; optimal, 51, 57
Allen, Mike, 23
American Journal of Sports Medicine, The, 31
Anaerobic zone, 51
Annulus fibrosus, 45
Antagonists, 90
Anterior cruciate ligament (ACL), 14, 15
Anterior deltoid, 19, 37
Audrey Two, 100, 105; described, 118; photo of, 118
Axial rotation, 55
Back Extension with Hands Under Chin, 149, 152, 155; described, 158; photo of, 158
Balance, x, 11, 54, 72, 122; core strength and, 21–22; dynamic, 21; isometric, 21
Bench presses, 18, 20
Biceps, contracting, 91
Biceps brachii, 19
Bicycle Crunch, 153, 155; described, 162; photo of, 162
Bike-handling abilities, 77, 85
Blood flow, increased, 76, 77
Body weight, spine and, 46
Bone density loss, 52
Breathing, 52; decreased capacity for, 60
Brontosaurus neck, 34, 36
Bulging, 47
Butt kicks, 76
Cadence, 17, 18
Calves, 42, 61
Center of gravity, 54
Cerebral palsy, 64
Cervical, 45
Cervical lordosis: excessive, 58 (fig.), 59; negative effects of, 59; signs of, 65
Cervical nerves, 44
Cervical spine, 52, 55; curvature in, 54, 91; lordotic curve of, 59; supporting, 36
Chair Squats, 99, 102, 105; described, 119; photo of, 119
Chest, 52, 77
Chest Stretch Against Wall, 99, 100, 101, 124, 125, 126, 150, 151, 152; described, 81; photo of, 81
Chiropractors, ix, 48
Climbing, 148; core strength and, 3
Coccyx, 4, 45
Competition Check, 151, 153, 156; described, 166; photo of, 166
Contract-relax variation, 74, 75
Contractions: concentric, 17, 18, 91, 92; eccentric, 14, 17, 91, 92
Coordination: exercises for, x; intramuscular, 96, 122
Core: abdominals and, 4; conditioning, 29, 31; described, 4–5, 8–9; healthy/strong, 25, 28, 47, 67; isometric stabilization and, 21; neuromuscular relationship and, 22; pedaling and, 21–22; performance and, 8, 20, 25; power and, 23; weak, 10 (fig.)
Core exercises, xi, 5, 14, 38, 73, 77, 85, 103, 147; choosing, 86–87; cycling schedule and, 92–93; functional, 20, 48; knee pain and, 32; performance-enhancing, 148; performing, 93, 148; traditional vs. functional, 20 (table); trigger points and, 35
Core muscles, 6–7 (fig.), 13, 42, 88, 90, 95, 96, 97; bike control and, 67; building, x, 3, 5, 18, 20, 39, 50, 56, 85, 154; demands on, 8; function of, 12–13 (table); hips and, 47; injuries and, 14; low back and, 47; maintaining, 22, 67; power and, 16; squats and, 16 (fig.); weak, 23, 28
Core strength, 4, 13–14, 27, 50, 89; acceleration and, 3; balance and, 21–22; building, 3, 11, 14, 48, 88, 91, 93, 95, 103; climbing/descending and, 3; crunches and, 11; functional, 13; incorporating, 25; lack of, 66; optimum, 148; planes of motion and, 18–20; power and, 22–24
Core workouts, x, 3, 31, 55, 66, 86, 103
Crossover Squats, 20, 124, 125, 127, 130; described, 140; photo of, 140
Crunches, x, 13, 14, 103; abdominal, 11; basic, 10, 11, 91; core strength and, 11; imbalances and, 9; low back and, 11; posture and, 10; reverse, 10; side, 10; stopping, 9–11
Curvature of the spine, 64; excessive, 59, 62
Deceleration, 13, 14–15, 20, 55; understanding, 18
Delavier, Frederic, 73
Delavier's Stretching Anatomy (Delavier), 73
Deltoids, 18
Descending, core strength and, 3
Disc degeneration, 47, 60
Disc herniation, 47, 60; stages of, 46 (fig.)
Disc prolapse, 47
Disc rupture, 60
Discs, 57; health of, 43, 47; imbalances and, 42; injuries to, 27, 42–43, 45, 46–47, 60, 61, 62; LBP and, 42; thick, 60; typical, 45
Dry needling, ix
Efficiency, 3, 14, 42, 154; loses in, 34; muscular, 23; neuromuscular, 21, 24, 121; optimum, 11, 23
Endurance, 85, 92, 97, 147, 148; decreasing, 72; muscular, x, 121
Endurance fibers, 92, 96
Endurance Workouts, 85, 101, 122, 126, 152
Energy leaks, 22, 23, 24
Erector spinae, 24, 40
European College of Sports Sciences, 73
Exercise, 19, 77, 90, 92; inappropriate, 9;
   open-chain, 128; protocol, 66;
   variables, 88
Extensibility, increasing, 73
External obliques, 5, 41
Fasciae latae, 29
Fatigue, 95, 96, 122
Femur, 32
Fitness, 3, 88, 89
Flexibility: improving, 74; performance
   and, 71
Force: producing, 18, 23, 36; reducing, 31, 91
Forward curvature, permanent, 59
Forward head carriage, 59
Functional strength, 21
Functional training, 13, 14, 16, 20
Genetics, 47
Gerdy's tubercle, 32
Gluteal tuberosity, 4
Gluteals, x, 4, 23, 41, 61, 95, 103;
   activation of, 42, 49; connection with,
   42; strength of, 42; tight, 40
Gluteus maximus, 4, 5, 23; firing, 17, 41;
   function of, 12; origin/insertion of,
   9 (fig.); working, 24
Gluteus medius, 32, 34
Goals, 66, 67, 87, 88, 89
Grab the Water Bottle, 125, 127, 130;
   described, 141; photo of, 141
Haas, Nathan, 8
Hamstrings, 5, 7, 23, 24, 41, 77; connection
   with, 42; function of, 12, 17–18; squats
   and, 15, 17; stretching, 72, 74, 75, 76;
   tight, 40, 61
Headaches, 52, 59
Heart rate, 22
Hip abductors, function of, 12
Hip adductors, 6; function of, 12;
   weakening of, 40
Hip Bridge with Heel Slides, 20, 98, 101,
   102, 104; described, 109; photo of, 109
Hip extension, 17–18, 23
Hip external rotators, 7, 12
Hip flexors, 15, 40; injuries by, 28;
   overusing, 29, 34; pain in, 29–31, 34, 39,
   41, 48; psoas and, 30 (fig.)
Hips, core muscles and, 47
Hold-relax variation, 74–75
Hold-relax with agonist contraction, 74
Humerus, 37
Iliac bones, 47
Iliac crest, 32
Iliacus, 29, 31
Iliopsoas complex, function of, 12
Iliotibial (IT) band, 33–34, 77
Iliotibial band (ITB) syndrome, 32–33
Ilium, 4, 63
Imbalances, x, 10, 11, 33 (fig.), 49, 91, 121;
   creating, 56; crunches and, 9; injuries
   and, 8, 48; pain and, 33; pelvic tilt and,
   39 (fig.), 40 (fig.); performance and, 42;
   posture and, 9; spinal discs and, 42
Inchworms, 149, 152, 155; described, 161;
   photo of, 161
Injuries, 31, 50, 57, 86–103; avoiding, 48,
   50; common, 28 (fig.); core muscles
   and, 5, 14; disc, 27, 43, 45, 46–47, 60;
   imbalances and, 8, 48; nagging, 29,
   154; overuse, 8–9, 24, 27–38, 39, 42,
   48, 87, 95; pain and, 28; preventing,
   23, 48, 49, 74, 85, 121, 128, 154; rate
   of, 14; recovering from, ix, x, xi, 27, 48,
   49, 85; risk of, 36, 92; routines for, 50;
   spinal, 27, 51; stretching and, 72, 73, 76;
   weaknesses and, 28
Injury-Prevention/Rehab Workout, 98, 121, 123, 147, 149
Innervation, importance of, 43
Insertion, 4
Internal obliques, 5
International Sports Medicine Journal, LBP and, 38
Intervertebral discs, 45, 45 (fig.)
Ischemic tissue buildup, 52
Isometrics, 16, 21
IT band. See Iliotibial band
ITB syndrome. See Iliotibial band syndrome
Jackknives, 150, 153, 155; described, 160; photo of, 160
Joints, 3, 57; stabilizing, 23; translation of, 47
Jumping Jacks on the Floor, 151, 153, 156; described, 170; photo of, 170
Kinetics, 13, 95
Knee flexion, 18
Knee pain, 31–34, 39, 48; anterior, 32; core exercises and, 32; treating, 33
Kneeling Quad Stretch to Hamstring Stretch, 99, 101, 124, 126, 150, 152; described, 79; photo of, 79
Knees, injuries with, 28
Kyphosis, 52
Kyphotic curve, 52
Lateral flexion, 55, 57
Latissimus dorsi, 4, 12
LBP. See Low-back pain
Length-tension relationship, 29, 34, 39, 71, 76; optimum, 30 (fig.), 37; shortened, 30 (fig.)
Level I, 85, 88, 89; choosing, 87; placement test for, 86
Level I exercises, 50, 97, 104–120; explanations for, 103
Level II, 85; choosing, 87, 88; placement test for, 86
Level II exercises, 121, 122, 129–145; explanations for, 128
Level III, 85; choosing, 87; placement test for, 86
Level III exercises, 86, 155–171; explanations for, 154
Ligaments, 4, 14, 15, 63, 75
Lordosis, 52, 59; cervical, 58 (fig.), 59, 65; lumbar, 54, 60–61, 61 (fig.), 65
Low back, x, 23, 77, 95, 103; connection with, 42; core muscles and, 47; crunches and, 11; injuries with, 28; weak, 10
Low-back pain (LBP), 38–43, 45–47, 48, 56, 60; chronic, 61, 62; disc injuries and, 42
Low-Back Stretch in Doorway, 96, 98, 100, 102, 123, 125, 127, 149, 151, 153; described, 80; photo of, 80
Lumbar kyphosis: excessive, 61–62, 62 (fig.); negative effects of, 62; signs of, 65
Lumbar lordosis: excessive, 60–61, 61 (fig.); negative effects of, 61; signs of, 65; women and, 54
Lumbar nerves, 44
Lumbar spine, 23, 45, 52, 55, 59, 60; pressure on, 10
Lumbar vertebrae/sacrum, 46 (fig.)
Lumbo-pelvic-hip complex, 21
Lung capacity, 52
Massage, ix, 32
Mental fuzziness, 93
Mental stamina, 122
Motor neuron control, 95
Mountain Climbers, 20, 100, 101, 102, 104; described, 111; photo of, 111
Movements, 14, 18; inefficient, 23; predicted/stable, 20
Multifidus muscles, 40; function of, 12
Muscle-firing patterns, 77, 103; optimization of, 76, 93
Muscle mass, 18, 37, 64, 66
Muscle soreness, flexibility and, 71
Muscle tears, 75
Muscles: blood-starved, 52; building, 22, 24; chronic tightening of, 37 (fig.); contracting, 18; efficient, 3; extremity, 23; functional, 22; groups of, 96; impaired, 61, 62; length of, 15, 29; overused, 29, 64; shortening, 15, 29; stabilizing, 3; synergistic, 24; tight, 32, 39, 60; traditional exercises and, 19
Muscles targeted, 78; described, 90
Muscular atrophy, 64, 66
Muscular integrity, building, 103
Musette, 148, 150, 152, 155; described, 164; photo of, 164
National Academy of Sports Medicine, 13, 72–73
Neck, 37; hyperextension of, 34; injuries with, 28; overstretching, 36; pain in, 34–38, 39, 48, 59; trigger points in, 35 (fig.)
Nervous system, 19
Neuromuscular competence, 154
Neuromuscular connections, 93
Neuromuscular control, 147
Neuromuscular events, 17
Neuromuscular function, 54
Neuromuscular relationship, core and, 22
Neutral position, 52
Nucleus pulposus, 45

Oblique Crossovers, 151, 152, 156; described, 169; photo of, 169
Obliques, 5, 13, 41, 103, 154
Opposite Arm/Leg Reach, 98, 104; described, 106; photo of, 106
Opposite Arm/Leg Reach from Plank Position, 123, 129; described, 131; photo of, 131
Opposite Arm/Leg Reach from Push-up Position, 149, 150, 155; described, 157; photo of, 157
Origin, 4
Overhead Squats, 126, 130; described, 144; photo of, 144
Overstretching, 36
Overtreatment, avoiding, 50
Pac-Mans, 99, 101, 105; described, 117; photo of, 117
Pain, 28, 29; back, 88; chronic, 33, 41, 47, 48 (table); imbalances and, 33; injuries and, 28; reducing, 35, 56, 89; riding with, 27; seat height and, 33; shooting, 63; site of, 41; sources of, 33, 39, 41, 48 (table); sport-induced, 27
Patella, 32
Patellofemoral pain (PFP) syndrome, 32–33; muscular imbalances leading to, 33 (fig.)
Pectoralis, major/minor, 18, 19, 20, 37
Pedaling, xi, 8, 16, 17, 18, 23, 43, 56; core and, 21–22; dynamic stabilization and, 21–22; hip flexion and, 29
Pelvic tilt: anterior, 39, 40, 40 (fig.), 41, 60; imbalances and, 40 (fig.); lateral, 62–63, 63 (fig.), 65; muscular imbalances with, 39 (fig.); negative effects of, 64; posterior, 39, 39 (fig.), 40, 41, 61
Pelvis, 47; healthy/strong, 66; neutral, 40, 51; stabilizing, 16, 22, 23
Performance, x, 23, 67, 154; core and, 8, 20, 25; endurance-based, 72; flexibility and, 71; imbalances and, 42; improving, 11, 20, 77, 78, 89, 93; poor, 54; postural distortions and, 57; posture and, 51; problems depleting, 9; strength-based, 72; stretching and, 72, 76; suboptimal, 43
PFP syndrome. See Patellofemoral pain syndrome
Planes of motion, 13, 19 (fig.), 21, 154; core strength and, 18–20; multiple, 18, 20, 24; strength training and, 18
PNF. See Proprioceptive neuromuscular facilitation
Posterior gluteal line, 4
Postural distortions, 55–57, 59–64, 91; causes of, 64, 66; correcting, 66; performance and, 57; problems associated with, 57 (fig.); spinal column and, 59
Posture, 42; bad, 51; benefits of, 67; concerns about, 67; core muscles and, 5; correct, 51, 54, 56, 73, 85, 87, 148, 154; crunches and, 10; distortions/pains, 122; dynamic, 52, 54–55, 57; flexibility and, 71; good, 52, 65, 67, 89, 122; imbalances and, 9; improving, 47, 56, 67; maintaining, 148; perfect, 87; performance and, 51; poor, 9, 10, 55, 56, 64, 88, 95; problems with, 56; self-diagnosing, 65; static, 52, 53–54, 55; testing, 65
Posture-Correction Workout, 99, 124, 150
Power, x, xi, 56, 71, 147; building, 42, 50; core and, 16, 23; core strength and, 22–24; decreasing, 72; establishing, 15, 97; importance of, 24; optimum, 111; producing, 17, 24–25, 71; squats and, 15; stretching and, 73, 76
Power meters, 17
Programs: deciding from, 86–87, 89; moving to next, 87–88
Prone Snow Angels, 90, 99, 102, 104; described, 108; photo of, 108
Prone Snow Angels with Shoulder Press, 121, 124, 127, 129; described, 133; photo of, 133
Proprioceptive neuromuscular facilitation (PNF), 73–75
Psoas, x, 10, 29, 31; hip flexors and, 30 (fig.)
Psychological barriers, 77
Psychological Science, 67
Quadriceps, 6, 23, 41, 42, 43, 61; function of, 12; stretching, 72; weakening of, 40
Rainbow Stretch in Doorway, 98, 99, 100, 101, 102, 123, 124, 125, 126, 127, 149, 150, 151, 152, 153; described, 82; photo of, 82
Range of motion, 55, 75, 76, 154
Rectus abdominis, 5, 37, 41, 91, 103; eccentric role of, 92; function of, 13; overdevelopment of, 10; tight, 40
Rectus femoris, 29
Reps, 64, 88, 89; described, 90
Resistance, 18, 75, 76
Rest, 88; described, 92
Reverse Crunch, 123, 126, 127, 129; described, 137; photo of, 137
Rhomboids, 35; function of, 13; weakening of, 40
Rhythmic bounce, upper/lower body, 22
Routines: abdominal, 10; sample headings for, 90 (table); terms used in, 89–92
Sacral nerves, 44
Sacroiliac (SI) joint, 38, 38 (fig.), 62; injuries to, 63; misalignment of, 63; pain in, 46, 47, 64; purpose of, 63
Sacrotuberous ligament, 4
Sacrum, 4, 45, 63
Sagittal plane, 19, 20
Sartorius, 29
Sciatica, 46
SCM. See Sternocleidomastoid muscle
Scoliosis, 64
Seat height, pain and, 33
Seated Boat Row, 126, 127, 129; described, 138; photo of, 138
Sedentary, 64, 66
Seratus anterior, tight, 40
Sets, 88; described, 90
Shoulder Blade Squeeze, 20, 49, 99, 104, 122; described, 110; photo of, 110
Shoulder Blade Squeeze from Push-up Position, 121, 124, 129; described, 135; photo of, 135
SI joint. See Sacroiliac joint
Side Plank with Hip Drops, 152, 155; described, 163; photo of, 163
Side Planks, 100, 102, 105, 125, 130; described, 115, 139; photo of, 115, 139
Single-Leg Dead Lifts, 152, 156; described, 167; photo of, 167
Single-Leg Squats, 151, 153, 156; described, 168; photo of, 168
Sitting, 55
Six-pack muscles, 10, 11
Skeletal disorders, 64
Slouching, 55, 56
Soigneurs, 74
Speed, improving, 42, 77
Spinal column, 60, 66; composition/function of, 43, 45; nerves of/muscles controlled by, 44 (fig.); postural distortions and, 59; range of motion and, 55
Spinal cord, 43, 45
Spinal erectors, function of, 12
Spinal extension, 92
Spinal flexion, lateral, 57
Spinal rotation, 92
Spine, 43; body weight and, 46; healthy/strong, 66; injuries to, 51; natural curves/regions of, 53 (fig.); newborn, 54; stabilization and, 16
Spine magazine, 41
Squats: core muscles and, 16 (fig.); hamstrings and, 15, 17; power and, 15
Stability, 63, 85; addressing, 89, 122; strength and, 14
Stability and Bike-Handling Workout, 100, 125, 148, 151
Stabilization, 11, 13, 15–16, 20, 41, 96, 128; bike/body, 22; dynamic, 16, 21–22; isometric, 21; spine/pelvis and, 16; understanding, 18
Stamina, 122
Steadman Hawkins Clinic, 23
Sternocleidomastoid muscle (SCM), 37
Straight leg kicks, 76
Strength, 71; building, 95, 96, 97, 103, 128; losing, 8; optimum, 9; stability and, 14; stretching and, 76
Strength training, 16, 17, 78; core, 24, 25, 32, 85; planes of motion and, 18; whole-body, 92
Stress, flexibility and, 71
Stretching, 29, 56; assisted, 74; ballistic, 75; cycling and, 77; dynamic, 48, 73, 75–76, 77–78; excuses about, 71; injuries and, 72, 73, 76; multiple types of, 71–72; performance and, 72, 76; power and, 73, 76; routine, 72; static, 72–73, 75, 76; strength and, 76
Supermans, 100, 104; described, 107; photo of, 107
Supermans with Heel Touches, 125, 129; described, 132; photo of, 132
Supine Figure 4: 98, 102, 123, 127, 149, 153; described, 83; photo of, 83
Supine Knee Drops, 101, 105; described, 116; photo of, 116
Swayback, 39, 40
Synergistic dominance, 23, 24
Synergists, 19, 24, 90
Tailbone Tucks, 98, 104; described, 113; photo of, 113
Tempo, 78, 88, 89, 92, 93, 122; described, 91
Tendons, damage to, 75
Tension, decrease in, 31
Tensor fasciae latae (TFL), 31, 33, 34
Thigh bone, 32
Thoracic curve, excessive, 59
Thoracic kyphosis, x, 61; excessive, 58 (fig.), 59–60; negative effects of, 60; signs of, 65
Thoracic nerves, 44
Thoracic spine, 45, 52, 55, 59, 122; healthy, 60; roundedness of, 36, 60; supporting, 36
Tick-Tocks, 149, 156; described, 165; photo of, 165
Tim-berrr!, 123, 124, 129; described, 136; photo of, 136
Time trial (TT) bikes, 17, 55
Time Trial (TT) Final Sprint, 127, 130; described, 145; photo of, 145
Time Trial (TT) Position Acceleration, 124, 126, 130; described, 143; photo of, 143
Time Trial (TT) Position Hold, 66, 90, 100, 101, 105; described, 120; photo of, 120
Tommy D’s Optimum Performance Workout, 50, 85, 87, 89, 102, 122, 127, 153
Torso twists, 76
Toss the Water Bottle, 150, 156; described, 171; photo of, 171
Tour de France, 8, 49, 50, 54
Tour of California, 17
Training, ix, 13, 148
Transverse plane, 19
Transversus abdominis (TVA), 4, 5, 11, 41, 96, 154; delayed firing of, 41; function of, 13; tight, 40; weak, 10
Transversus Abdominis (TVA) Activation, 96, 98, 99, 104; described, 112; photo of, 112
Trapezius, 35; function of, 13; tight, 40
Trigger points, 34, 35 (fig.), 38
TVA. See Transversus abdominis Type, described, 90
Upper back, 37; injuries with, 28, 36; overstretching, 36; pain in, 34–38, 39, 48, 60; rounding of, 34, 60; stretching, 35; tight, 35; trigger points in, 35 (fig.)
Upper body, 4; rounding of, 36
USA Pro Challenge, 8, 49
Vertebrae, 43; articulating, 45
Vuelta a España, ix, 66
Vuelta Pais Vasco, 17
Walking Hip Bridge, 123, 126, 129; described, 134; photo of, 134
Walking lunges, 76
Wall, the, 125, 130; described, 142; photo of, 142
Wall Squat with Pelvic Tucks, 105; described, 114; photo of, 114
Warm-up, 76, 78, 85; core routines as, 93; dynamic, 90, 92; exercises, 147
Weaknesses, x, xi, 10, 21, 23, 28, 40, 48, 64, 95
Weight lifting, 72
Windshield wipers, 150, 155; described, 159; photo of, 159
Workouts, 66; choosing, 86, 87, 88, 90; core, x, 3, 31, 55, 66, 86, 103; cycling, 93; designing, 67, 89; sample, 89, 90 (table); terms used in, 89–92
Zabriskie, Dave, 8
TOM DANIELSON is one of the world’s top professional road cyclists. His career began with Team Mercury in 2002 and continued with Team Saturn, Fassa Bortolo, and Team Discovery. He is currently a member of Garmin-Sharp-Barracuda. Known for his incredible climbing ability and his large lung capacity, “Tommy D” currently holds the record for the fastest ascent of Mt. Washington in New Hampshire and the Mt. Evans Hill Climb in Colorado.

Tom brought home his first major victory, the Dodge Tour de Georgia, in April 2005. The win was sealed on the Brasstown Bald stage, where he left the rest of the peloton gasping and won the stage on the supersteep climb to the finish. Just one year later, while riding for Discovery, Tom won the grueling stage 17 of the Vuelta a España and subsequently supported his team in several victories through 2007. His debut performance in the Tour de France in 2011 resulted in a ninth-place finish, making him the highest-placed American overall. He also led his team to a stage win
in the Team Time Trial as well as helping to seal the overall team classification. In 2012, despite having crashed out of the Tour de France just six weeks earlier, Tom once again displayed his fortitude by winning stage 3 of the USA Pro Cycling Challenge, where he was also named Most Aggressive Rider.

In addition to his time in the saddle, Tom is known for his contributions to the sport and his encouragement of young riders. He helped create the Fort Lewis College Cycling Scholarship fund to assist young collegiate cyclists. In November 2006, Tom established the Tom Danielson Junior Race Series and Camps to provide support, encouragement, and skills development to junior racers in a competitive environment.

Tom lives in Boulder with his wife, Stephanie, and their children, Stevie and Stella. He enjoys riding motocross bikes in his spare time.

ALLISON WESTFAHL is a nationally renowned exercise physiologist, author, and fitness personality. After graduating magna cum laude from Yale, Allison moved to Colorado to pursue a career in fitness. At the age of 25, she became the youngest director of personal training at Flatiron Athletic Club, which was named “Best Gym in America” by Men’s Journal. Two years later she was honored with the Pursuit of Excellence Award, a grant given to two trainers annually by the National Academy of Sports Medicine. Allison has been featured in Fitness Business and Athletic Business for her career accomplishments, and she is regularly called upon by local and national publications for her expertise in the field of strength training. She holds a master of science degree in exercise science and multiple certifications through the National Academy of Sports Medicine and USA Triathlon.

Allison’s ability to create effective, efficient workouts that improve athletic performance has been featured in Shape magazine, Bicycling, the Denver Post, and Bob Greene’s workout DVD 8 Week Total Body Makeover. Allison’s first book, The Gluten
Free Fat Loss Plan, was published in May 2011. She has written prolifically on the topic of strength and conditioning and is frequently asked to guest-blog on popular fitness Web sites.

Allison lives in Denver with her husband, Brian, and dog, Muppet. In her spare time she sings with a professional chamber choir and experiments with trying to sit still.
The strength routines in this book will help you build power and performance on the bike. You will improve your balance, coordination, and muscular endurance without adding unwanted muscle bulk.

You don’t need a gym. You don’t need special equipment. With Tommy D’s simple core exercise routines, you will eliminate muscle imbalances and lingering pain from injuries. You’ll maintain power out of the saddle, climb stronger, and reduce fatigue at the end of a long ride.

Pro cyclist Tom Danielson used to have a bad back. He shifted in the saddle, was never comfortable, and often rode in pain. Core strength workouts fixed Tommy D’s back pain, and core strength has become his cycling advantage.

Tom Danielson’s Core Advantage includes:
- 45 core strength exercises
- 5 dynamic warm-up exercises
- Workout plans in 3 levels, beginner to pro
- Exercises to build strength, endurance, and balance
- Cures for back, shoulder, and neck pain
- Workouts to improve climbing and out-of-the-saddle power

Tom Danielson’s core exercises are essential for stronger riding. They are easy to master, and they don’t take much time. Best of all, they will improve your performance on the bike and extend your cycling career.