



How to Perfect Your Riding Position & Technique

Cycling is full of extraordinary numbers - distances ridden, calories consumed, tires trashed. Another statistic that can seem astounding is the number of pedal strokes made.

Let's suppose it takes you six hours to ride a century and you pedal at the rate of 90 rpm throughout. As you cross the finish line, you will be making pedal stroke number 64,800 (32,400 for each leg).

That's a lot. But it barely registers on the scale of what happens during a full season. For example, during the year in which I had my biggest mileage total, I figure that I got there by pushing the pedals around approximately 11,232,000 times (1,560 hours of riding).

Can you say, "Repetitive use injury"? You can see why cyclists are good candidates, especially if we aren't pedaling from a nearly perfect position. For those of you who are fans of competitive cycling, you may well know the name Ivan Basso. Ivan was third overall in the 2004 Tour de France, second in 2005, and won the 2006 Tour d'Italia. But let's see what improper bike fit can do even to one of the most elite cyclists in the world (taken from the 19May05 edition of *Road Bike Rider*):

"Cycling's second-best stage race -- the Giro d'Italia or Tour of Italy -- is shaping up for a great final 10 days. All the favorites are bunched among the top 10 of the overall lead.

Let's see what the race is teaching us.

*One of the top guns, **Ivan Basso**, just gave us a classic example of how important one small change in bike setup can be. It happened near the end of stage 7, which saw Basso unable to stay with the lead group on the final climb. He finished a minute behind, but it wasn't a lack of strength that cost him the precious time.*

"The backside of my left thigh suddenly cramped up," Basso explained. "I had a puncture (aka - flat tire) just before the penultimate climb and was forced to change my bike. As it turned out, the new bike had a different saddle than the one I'm used to, which is why I got cramps. It was very unfortunate."

Different saddle, different shape, different sitting position, perhaps a slightly different reach to the pedals. We often talk of bike fit being a matter of millimeters between the ideal and something less comfortable or efficient.

Basso's cramp cost him the Giro lead the next day when he finished an impressive second in the stage 8 time trial. It lifted him to second place overall, just nine seconds out of the top spot."

Your body and bike must fit together and work together in near-perfect harmony for you to be efficient, comfortable, and injury-free. The more you ride, the more

essential this is. If even one thing is out of whack, it's a good bet that it will cause a problem during thousands of pedal strokes.

Fortunately, it isn't difficult to arrive at an excellent riding position. But it does take time and attention. You need to be careful with your initial bike set-up, then conscientiously stay aware of your body and the need for occasional refinements. As time goes by, your position will stabilize and you'll be riding in a smooth groove.

The following guidelines come from my personal experience and the knowledge one has gained from many colleagues and experts in this important area of cycling. One is Andy Pruitt, Ed.D., the director of Colorado's Boulder Center for Sports Medicine. Andy has probably solved more position problems than anyone during his years of work with elite cyclists. And just one more note, the guidelines below relate primarily to standard road bike configurations. Slightly modified, we can use similar formulae for mountain, triathlon or time-trial bikes.

Now, let's get down to business. We do not need many tools here – generally, a ruler, calculator and an allen tri-wrench takes care of most bike fit issues.

And as we work on your riding position, always remember:

“Adjust your bike to fit your body. Don't force your body to fit the bike.”

- **Frame:** Measure your inseam from crotch to floor with bare feet 6 inches apart, **then multiply by 0.68**. The answer is a good approximation of your road frame size, measured along the seat tube from the center of the crank axle to the center of the top tube. (For obvious reasons, I would like each of you to consider taking this measurement at home – kinda like a 'homework' assignment. Just make sure that whatever you are using to measure up to is as level as possible, as shown here.



As a double check, this should produce 4 to 5 inches of exposed seat post when your saddle height is correct. When the crank arms are horizontal, the top tube should be right between your knees when you squeeze them together.

For a **mountain bike**, I recommend a frame in the range of **10–12cm smaller** than you take in a road frame. For example, if you ride a 55cm C-T road frame, look for a 43–45cm (17–18") C-T mountain frame.

In many ways, though, it is more important to fit a mountain frame by the **top tube length** needed, rather than by the seat tube length. For instance, you might be able to get to the proper frame clearance, saddle height and neutral knee position on either a 17" frame or a 19" frame. Yet the 19" frame will likely have a top tube 1" longer than the 17" frame, which changes your stem length accordingly. Or, one manufacturer's 17" frame may give you a 22" top tube, while the next one's 17" gives you a 22.8". All that said, the frame size becomes difficult to calculate with today's variety of multi-geometry, multi-shock-absorbed framesets. But we'll do our best.

- **Arms:** Keep your elbows bent and relaxed to absorb shock and prevent veering when you hit a bump or brush another rider. Hold arms in line with your body, not splayed to the side, to be more compact and aerodynamic.
- **Upper Body/Shoulders:** Don't be rigid, but do be fairly still. Imagine the energy wasted by rocking side to side with every pedal stroke on a 25-mile ride. Save it for pedaling. Also, beware of creeping forward on the saddle and hunching your shoulders. There's a tendency to do this when pushing for more speed. Shift to a higher gear and stand periodically to prevent stiffness in your hips and back. Believe me, your neck and shoulders will thank you the next day.
- **Head and Neck:** Resist the temptation to put your head down when you're going hard or getting tired. It takes just a second for something dangerous to pop out of nowhere. Occasionally tilt your head to one side and the other instead of holding it dead center. Change your hand location to reposition your upper body and give your neck a new angle.
- **Hands:** Prevent finger numbness by moving your hands frequently. Grip the bar firmly enough to keep hands from bouncing off on unexpected bumps, but not so tightly that it tenses your arms. For the same safety reason, keep your thumbs wrapped around the bar instead of resting on top. Move to the drops for descents or high-speed riding, and the brake lever hoods for relaxed cruising. On long climbs, grip the top of the bar to sit upright and open your chest for easier breathing. When standing, hold the lever hoods lightly and sway the bike side to side in synch with your pedal strokes, directly driving each pedal with your body weight.

- **Handlebar:** Bar width should equal shoulder width to open your chest for better breathing. A bit too wide is better than too narrow. Make sure the hooks are large enough for your hands. Modified “anatomic” curves may feel more comfortable to your palms. Position the bottom, flat portion of the bar horizontal or pointed slightly down toward the rear brake.
- **Brake Levers:** Move them around the curve of the bar to give you the best compromise between holding the hoods and braking when your hands are in the hooks. Most riders do best if the lever tips touch a straight edge extended forward from under the flat, bottom portion of the bar. The levers don’t have to be positioned symmetrically. If your reach is more comfortable with one lever closer to you than the other, put them that way.
- **Stem Height:** Start with the top of the stem about one inch below the top of the saddle. This should give you comfortable access to every hand position. As time goes by, think about lowering the stem as much as another inch (not all at once) to improve your aerodynamics. If your lower back or neck starts complaining, or if you notice you’ve stopped using the drops, go back up. Never put the stem so high that its maximum extension line shows, or it could be snapped off by your weight on the bar.
- **Top-tube and Stem Lengths:** Combined, these two dimensions determine “reach.” Depending on your anatomy and flexibility, your reach could be longer for better aerodynamics, or it may need to be shorter for back or neck comfort. For most riders, when they’re comfortably seated with their elbows slightly bent and their hands on the lever hoods, the front hub will be obscured by the handlebar.
- **Back:** A flat back is the defining mark of a stylish rider. Notice I didn’t say a great rider. Anatomy and flexibility have a lot to do with how flat you can get. Lance Armstrong, for instance, has a rounded back that’s not picture perfect and yet he still manages to go down the road pretty well. Once you have the correct reach, work on flattening your back by imagining touching the top tube with your belly button. This helps your hips rotate forward. You don’t want to ride this way all of the time, but it’ll help you get more aerodynamic when you need to.
- **Saddle Height:** This is the biggie, and here’s the one I like best. .Begin by standing on a hard surface with your shoes off and your feet about 6 inches apart. Using a metric tape, measure from the floor to your crotch, pressing with the same force that a saddle does. Multiply this number by 0.883. The result is your saddle height, measured from the middle of the crank axle, along the seat tube, to the top of the saddle.



Add 2 or 3 mm if you have long feet in proportion to your height. If you suffer from chondromalacia (knee pain caused by damage to the underside of the kneecap), a slightly higher saddle may feel better. However, it should never be so high that your hips must rock to help you reach the pedals. If this formula results in a big change from the height you've been using, make the adjustment by 2 or 3 mm per week, with several rides between, until you reach the new position. Changing too fast could strain something.

- **Saddle Tilt:** The saddle should be level, which you can check by laying a yardstick along its length and comparing it to something horizontal like a tabletop or windowsill. A slight downward tilt may be more comfortable, but be careful. More than a degree or two could cause you to continually slide forward, putting pressure on your arms and hands, and changing your knee position over the pedals .
- **Fore/Aft Saddle Position:** Sit comfortably in the center of the saddle, click into the pedals, and set the crank arms horizontal. Hold a weighted string to the front of your forward kneecap. For most of us, the string should touch the end of the crankarm. This is known as the neutral position. Loosen the seat post clamp so you can slide the saddle to get it right. Seated climbers, time trialists, and some road racers may like the line to fall a centimeter or two behind the end of the crank arm to increase pedaling leverage. On the other hand, track and criterium racers may like a more forward position that breeds leg speed. **Remember, if your reach to the handlebar is wrong, use stem length to correct it, not fore/aft saddle position.**
- **Butt:** By sliding fore or aft on the saddle you can bring some muscles into play while resting others. Moving forward emphasizes the quadriceps muscles on the front of the thighs, while moving back highlights the hamstrings and glutes—the powerful butt muscles.
- **Feet:** Some of us walk like pigeons, others like Charlie Chaplin. Your footprints as you leave a swimming pool will tip you off. To make cycling easier on your knees, shoe cleats must put your feet at their natural angle. This is a snap with clipless pedal systems that allow feet to pivot freely (“float”) several degrees before release. Then all you need to do is set the cleats’ fore/aft position, which is easy. Simply position them so the widest part of each foot is centered on the pedal axle. If you experience discomfort such as tingling, numbness or burning (especially on long rides), move the cleats rearward as much as a centimeter.



- **Crank arm Length:** In general, if your inseam is less than 29 inches, use 165-mm crank arms; 29-32 inches, 170 mm; 33-34 inches, 172.5; and more than 34 inches, 175 mm. A crank arm's length is measured from the center of its fixing bolt to the center of the pedal mounting hole. The length is usually stamped on the back of the arm. If you use longer crank arms than recommended, you'll gain leverage for pushing big gears but lose some pedaling speed.