

PERFORMANCE CYCLING CONDITIONING

A NEWSLETTER DEDICATED TO IMPROVING CYCLISTS

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Medicine of Cycling: Bike Fit

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Curtis is the founder of Revolutions In Fitness in San Jose, California. Curtis has been practicing as a Licensed Physical Therapist (LPT) for over 15 years. Curtis was selected by the Garmin-Cervélo Professional Cycling Team for bike fitting and physical therapy services.

Curtis has been an avid cyclist for more than 20 years and has spent thousands of hours on his bike. He is a nationally competitive mountain bike racer and races road bikes regionally. He has also ridden several multi-day long distance rides, including the 600-mile California AIDS Ride. Decades of experience with competitive cycling, extensive continuing education in manual and exercise therapy, and an expert coaching certification has given him a unique perspective on the challenges and benefits of being an athlete, particularly a cyclist.

Competitive Road and Mountain Bike Athlete:

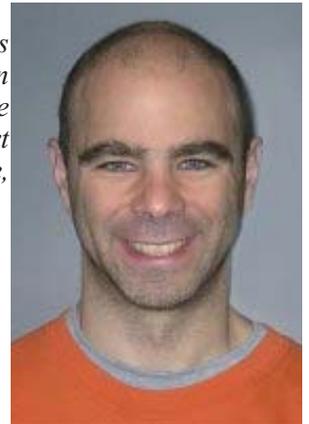
2nd place, Downieville, 2006

2nd place NC Norba Series Nationals, 2006

8th place, 2007 Mountain Bike Nationals, Sport Class

Finisher of several multi-day 600+ mile rides, including AIDS Lifecycle & X North Carolina

Cat 5 Road Cyclist



Curtis Cramblett

The ideal bike fit is one in which the rider can ride comfortably and efficiently in what is commonly thought of as a neutral position. Unfortunately, most of us are not perfect and acquire more physical ailments with time. Wear and tear of injuries, long hours on a job contribute to stiff, imbalanced bodies, with some areas strong while others remain relatively unused and weak. Many people do not feel immediately comfortable and efficient in the most neutral position on the bike. For some accommodating the bike to the imperfections and limitations of the body can help achieve a fit that is either maximizes comfort or efficiency. Most discussions about bike fit focus on adjusting the bike to the person, but does not assume that the riders will attempt to make their bodies healthier, stronger, and more efficient to be able to live and ride in a non-accommodated bicycling position.

Andy Pruitt makes the metaphor of a bike fit to a relationship, calling it a "marriage between bike and rider." Like in a good marriage, there needs to be give and take from each party. The healthier each party is, the healthier the relationship is likely to be. Ideally, accommodations to the bike are a short-term fix, but at times become a long term crutch. Although the accommodation is addressing the problem of pain or inefficiency, it does not address the root of the dysfunction. Using bicycle accommodations as the sole fix to a problem is the equivalent of agreeing to use crutches for the rest of your life after a car accident but not going through a physical therapy course to rebuilt strength. Though this is a simplistic example, the same is true of most underlying issues that call for bicycle accommodations.

A good bicycle is a balanced machine. Any imbalance of a rider-machine relationship reflects imbalance of the rider. For an unbalanced body to feel comfortable successfully motoring that machine, the body naturally makes small adjustments to accommodate it's own idiosyncrasies. These adjustments work in the short term but over the length of an average bike ride lasting at least an hour, the muscles that are recruited to manage the imbalance tire, resulting in pain and inefficiency. This is precisely the role of a proper fit, used to accommodate for dysfunction resulting in obvious biomechanical inefficiencies. In athletes with imbalance who continue to ride without fixing possibly underlying weakness or dysfunction, knees may not track correctly, hips may be rotating unevenly, neck strain, nerve impingement and other issues that worsen over time. Accommodations of the bike are diagnostic of a dysfunction that requires further evaluation by a physical therapist or physician trained in sports medicine, physical medicine and rehab,

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or orthopedics to start the rider on the road of improving weakness or imbalance if possible. With these interventions, as many of the accommodations as possible should be gradually pulled out until a more neutral, non-accommodated fit is reached.

Let's begin with the assumption that there is a neutral fit range for a road bike rider who is looking for optimal handling and performance on the bike. This is the most common position and what most schools of thought on bike fitting aim for. Here we discuss some of the major points of a common bike fit:

- 1. Pedal Position:** There are ideally few to no shims necessary and minimal to no rotation of the shoe. The cleat rotation is set up so that the center of the foot is under the hip and knee, and is ideally over the center of the pedal
- 2. Statically Measured Seat Position:** For height, with foot in a pedaling position, the knee should be 25-40 degrees from straight. The fore/aft position is more controversial, but generally, the tibial tub should be right over the center of the pedal spindle. Another possible goal for a proper fore/aft position is a good balance between the pelvis, femur and foot such that one is able to lift his hands off the bars without having to sit upright. The seat angle should be roughly zero degrees.
- 3. Handlebars:** The seat to bar drop is very dependent upon the rider's goals. Generally, the torso should be at about 45 degrees to horizontal while in the hoods (racers can reach 30 degrees and riders who most interested in comfort will go towards 50 degrees). With huge variation, this generally means the bars are one to three inches below the saddle. The angle should be such that the rider is able to ride in the drops comfortably down hills and sometimes on flats, depending on the rider's goals. The seat to bar reach will ideally put the rider in a position with a shoulder angle of between 90 and 100 degrees, with the elbows slightly bent. The correct seat to bar reach will result in a rider with a neutral to slightly flexed lumbar spine, a neutral mid-back, knees in neutral going up and down like pistons, hips pointed straight ahead with minimal rocking on the bike. Optimally there is little to no rotation of the upper body or lower body while on the bike, but it will move just slightly in the transverse plane.
- 4.** The goal of this neutral position is to have a body that is balanced on the bike such that there is good weight distribution from right to left pedal and right to left hand, and from front to back wheels. The bike fit should feel comfortable for the rider, and look good to an onlooker.

Some potential reasons why some riders don't function as well in this neutral bike fit position include tightness, weakness, injury and poor alignment. If a cyclist's biomechanics are poor, then the cyclist's power and performance decrease while the likelihood of pain increases. What is a fitter to do besides make bike-fit accommodations that will improve biomechanics and help get rid of symptoms?

The most common accommodations can be divided by body/bike part and summarized as follows addressing relatively un-complicated and common issues.

Feet:

- 1. Tipping Foot** – These can include shoe either varis /valgus or toe/heel, can be accommodated with shims on the inside or outside of the shoe.
- 2. Inefficiencies at the forefoot, midfoot (arch), or rearfoot** – Orthotics are traditionally recommended though with little evidence.
- 3. Leg length discrepancy** - This problem is almost always best fixed by figuring out if it a functional or structural problem and then treating sparingly through shimming.
- 4. Fore/aft cleat placement** that puts the body in an asymmetrical/non-neutral position - possibly accommodating for LLD, or a rotation somewhere in the chain
- 5. Rotation in the pelvis, tibia, or foot** - Pedal extenders, asymmetrical spindle length or spacers

A foot that is not in need of accommodations can appropriately pronate slightly on a down stroke, get better weight shifting on a pedal for corners, apply more power with the knees in an appropriate position, take stress off knees and give the rider powerful pedal stroke. These are the most frequently used and abused accommodations.

Seat:

- 1. Asymmetrical pelvis** – Asymmetrical seat placement (left/right), infrequently used
- 2. Fore/aft placement** – This can be used to open up hips or change balance on the bike
- 3. Comfort of seat, stability on saddle** – Angle of saddle outside of level
- 4. Inflexibility of the hips and back** – Adjusting the seat height

Handle bars

- 1. Severe Scoliosis** - Right/left asymmetrically placed bars and asymmetric hood placement
- 2. Upper back weakness, shoulder blade collapse, and poor posture** – Narrow bars
- 3. Neck pain** – Adjusting handle bar height

Bar position is a frequent change that is made that can relieve stress on many structures, but above a certain point (depending on geometry of the bike) can make the bike unstable or handle poorly.

Finally in all this talk about asymmetries and accommodations, one must not forget about a cyclist learning to be a good

cyclist through proper pedaling and handling a bike properly. There is a great deal of need for the teaching of proper pedaling mechanics, body position, weight distribution, and other good bike handling skills. Many of these deficits get accommodated for instead of trained out! A good cycling coach may be able to evaluate the rider's cycling mechanics and fix many problems through correcting technique rather than making accommodations to the bike fit.

So when do you, the cyclist, fitter or coach, consider getting more help?

1. When a cyclist needs more than minor accommodations and can't assume a relatively neutral fit (Some examples include needing more than a shim or possibly 2 in or outside of a shoe; needing a very large arch support/orthotic; needing a very short or high stem; requiring a saddle that needs rotation; or needing cleats that are not symmetrically positioned on the shoes).
2. When you have tried multiple fits and are still not getting things to resolve
3. Where you are finding significant asymmetry in the body
4. When the cyclist has is more than minor discomfort
5. When the cyclist has had an old musculoskeletal injury or trauma that may be causing symptoms (inquire about old injuries, both on and off the bike)
6. Any red flags that have been mentioned in the previous MOC article

If you do decide that further help is needed to get the cyclist back to a more neutral fit, you have several options. The goal is to have a healthy symmetrical cyclist that meets the bike in a neutral position, allowing for a healthy marriage between rider and bike. O

Chain Links: Click [HERE](#) to link the article Cycling The Four Critical Aspects of Bike Fit—Updating Classic Cycling Literature by Andy Pruitt, Ed.D., to learn more about bike fit.

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