Bicycle Fitting Protocol

A. General Questions We Ask During a Fitting

1. What type(s) of riding will you be doing? Will it be road biking/racing, mountain biking, time trials, or leisure riding?
2. Do you have any medical issues that need to be addressed? Are there limb length variations or old injuries?
3. What do you like and not like about your existing bike or fit?

B. Flexibility

1. General flexibility

We do a simple test of overall flexibility by asking you to touch your hands to the floor. If you can touch with your fingertips, you are slightly above average. If your palms touch, you are extremely flexible. This is by no means a comprehensive test, but it does give us an idea of the rider's ability to bend forward to reach the bar.

2. Hamstring flexibility

Hamstring flexibility is assessed by having you lie on your back and raise one straight leg up until your hip lifts off the ground. The angle between the torso and leg gives us an indicator of how far you can bend over to reach the bars before your back goes into flexion. This helps to determine the ideal bar height and reach. .

3. Hip flexion and Gluteus flexibility

To assess this, we'll have you lying on your back with your knee bent. This position eliminates the hamstrings and isolates the glut. We'll push the bent knee toward your chest until the glut lifts off the ground. This measurement gives us an idea of how far the leg can come up in the pedal stroke and, also, how far forward the hip will be able to rotate forward before the back goes into flexion. This is another good determinant of ideal bar height and length. .

C. Cleat and Pedal Considerations

1. Fore and Aft

The ideal position for the cleat is centered under the ball of the foot. In cases of foot pain, moving the cleat towards the back of the shoe can sometimes provide relief for arch or lateral foot pain. Doing this places more of the foot over the pedal for better support. If one leg is longer than another, the cleat can be moved forward on the shorter leg to compensate, but only for slight differences up to 1 cm. For length differences of more than 1 cm, the short leg is shimmed between the pedal and the shoe one half the leg length difference.

2. Rotation
The cleat should be positioned in the center of its float when the foot is in its neutral position. To find the right position, we use Rotational Adjustment Devices, or RAD, the best tools for this measurement. These devices work with most types of pedal systems by way of various adaptors, and can be used with either fixed or floating cleats. They use a swiveling pedal and channel that detects the amount of rotation in the lower leg, and reference rods that help set the cleat to the center of the natural gait. This ensures that there are no equipment-induced stresses placed on the leg joints, entry and exit into the pedal is easier, and the chance of premature release is reduced. You may want to carry tools to fine-tune the cleat adjustment for a few rides. A properly adjusted cleat will feel natural throughout its range of float.

Floating cleats are ideal for most riders. They can allow for a slight mis-alignment of the cleat without undue stresses on the legs. Some people find them more comfortable on longer rides, since they are adjusting the body's position to compensate for fatigue or soreness. While it is true that the less float you have, the less your muscles have to work to stabilize your foot on the pedal and produce power, caution should be used with fixed cleats make sure that they are set up perfectly from the start to avoid serious joint problems

3. Side to Side Adjustment
The cleat should be placed on a line from the tibia to the 2nd toe, so that, viewed from the front, the lower leg is positioned straight up and down from knee to ankle.

4. Cant
In the perfect foot, the bottom of the forefoot is parallel to the bottom of the heel. Some studies have shown that most people have a cant, or angle in the forefoot that can cause knee or ankle problems in riders. Riders with knock-knees or bowed legs may also experience knee and ankle pain while riding. Some people have found relief from knee pain by placing a wedge between the cleat and the shoe. Wedging the cleat keeps the foot and lower leg from rolling in or out and placing pressure on the knee. This must be done carefully as there are many factors that can cause knee pain, and a consultation with a medical professional may be necessary. Not all wedge systems are compatible with all shoes, and orthotics or insoles may be needed to support the whole foot.

5. Crank Length
Crank length is another consideration, together with saddle fore and aft, knee strength, thigh length and flexibility. In general, the longer the femur, the longer the crank arm. Longer cranks increase leverage and promote a slower cadence. Longer cranks will also put more strain on the knee at the top of the stroke. Shorter cranks are easier to spin and cause less compression.

D. Saddle Position

1. Height
When correctly aligned, the crank arm is in line with the seat tube, rather than perpendicular to the road. This allows the leg to extend to the farthest point from the saddle, and to gain more power from full use of the gluts. We use a goniometer to line it up the ankle bone, the center of the knee, and the head of the femur. 25 to 35 degrees is the optimal extension range. The closer it is to 25

degrees, the less stress on your knees and more hamstring use. At 35 degrees or more your knee has more compression at the top of the stroke. Most people seem to be comfortable at closer to 30 degrees. Seat height will depend on flexibility. Discomfort can result from a saddle that is too high. Reaching for the pedals can cause friction between the skin and saddle, and result in saddle sores. Reaching can also cause hamstring soreness and loss of power since you will be rocking. As a general rule, if the saddle is too high, pain will be felt at the back of the knee. If it is too low, it will be felt on the front.

2. Fore and Aft

Traditionally, road bikes are set up with the rider on the saddle, and clipped in to the pedals with the cranks level at 3 and 9 o'clock. A plumb line is hung from the front of the knee, intersecting with the center of the pedal spindle. This gives the maximum pushing force with the least amount of stress on the knee, and uses the femur as the most efficient lever. This is a good natural position. Each rider may vary 1 to 2 cm either way based on their riding style and flexibility. If the rider sits too far forward, there is more stress on the knee, and a greater risk of injury. Sitting too far back causes loss of power and strain the back. In a proper fitting, we make sure to double check the seat height after adjusting the fore and aft, since one adjustment affects the other.

3. Tilt

A saddle should fit the sit bone width and shape of the pelvis. Its ideal starting position is level, or 1 to 2 degrees up or down. This will place the sit bones on the wide portion of the saddle and hold the trunk up. If the saddle is nosed down, the rider will be pushing up from the handlebars and putting strain on the hands, shoulders, and neck. This can also signal the handlebars are too low, as dropping the saddle nose can temporarily relive some saddle discomfort. If the saddle is tilted up too much, the pelvis will rotate backward and round the low back, making it harder to hold on to the handlebars.

E. Handlebar Placement

1. Bar Shape and Lever Style

There are many handlebars to choose from with variances in shapes, sizes, width, drops, and reaches. The handlebar size needs to be considered together with stem length handlebar reach, and brake lever style. Reach is the distance from the center of the stem to the farthest point forward on the bar. Many newer handlebars have a straighter extension to the lever that works well with the newer-style integrated brake/shift levers to create a flat platform for the hands, rather than the angled-down extension that kinks the wrists. The drops are the lower portion, or “hook" of the bar and can vary in depth and shape. Generally, deeper drops work well for larger hands, and shallower drops fit smaller hands. The shape can be the traditional rounded shape, or an anatomic bend with a flat or shaped section to fit the hand. Round drops usually place the fingers closer to the brake levers, and can allow a little extra extension. Handlebars are vital to the overall comfort of the bicycle, so we take our time with helping our clients to choose wisely. Width should be equal or a little wider than the shoulder center to shoulder center.

2. Stem

Stems come in many different length and rises. Height adjustments were easy to make on the old style quill stems, since they could be moved up and down inside the steerer tube of the fork, and sizing was mainly based upon length. The newer style clamp-on stems slide over the fork steerer

tube and clamp over it. Height adjustments are more limited with this style, which requires more consideration of different rises. Height is still adjustable, but relies upon spacers placed below or above the stem itself. Many stock bicycles have their steerer tubes cut short, giving only so much room for adjustment, and may require a stem change to achieve the proper position.

3. Reach and Drop to the Handlebar

After the saddle height and position are finalized, we now ask the rider to rotate at the hips, keeping the spine straight with hands on the bars. Flexibility again plays a big role. Loose hamstrings and external hip rotators will allow forward rotation and a straight back. If they are tight, it will feel like the reach is too far forward. Reaching for the handlebars causes steering with the upper trapezius muscles, which are used to hold your head up, instead of steering with the latisimus dorsi muscles (Lats). Steering with the lats is preferred because it allows the arms to have a slight bend and helps dampen road shock.

We use all these factors to help determine where to place the handlebars. Most long distance riders will have the handlebars from one to five centimeters lower than the seat. Some younger road racers can have a drop of as much as twelve centimeters. Body measurements give an idea of the necessary reach (top tube and stem length combined), but flexibility and core strength must be taken into consideration as well.

4. Tape and Padding

Many riders find relief with double wrapping, or padding under their handlebar tape. Unless the rider has very large hands, it is recommended to pad only the top sections of the bar. Wrapping all the way around the bar can make it too large, and fatigue the hands. Gloves can help with dampening road shock (as well as keeping the hands protected in a crash), but too much padding can make it hard to grip the bar.

If you have any questions, comments or would like a personal fitting, please contact me:

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