

9

ENSURING PROPER BIKE FIT

As a high school cycling coach, it is important that you help your student athletes fit their bikes properly before taking them out on a ride. Many students who are new to riding may be on borrowed bikes or newly purchased bikes that have not been properly fit to their bodies. Proper fit is important for injury prevention, maximizing riding enjoyment and increasing overall safety. By utilizing the following guidelines, you will be able to quickly adjust the bike to best serve the rider.

Fitting is made easier by having the following tools:

- Stationary trainer with front wheel stand or something to elevate front wheel;
- Plumb line (can be made with a long strand of string and a heavy bolt or metal washer);
- Level;
- Allen wrenches (sizes 4, 5, 6 mm);
- Torque wrench;
- Electrical tape;
- Goniometer (angle-finder) – optional.

Please note: Be aware of torque settings especially for smaller bolts especially when clamping carbon components. For example, most 4 mm bolts have a torque setting of only 5 Nm.

Section 1: Preparing to Fit a Bike

While not absolutely necessary, a stationary trainer is extremely helpful for fitting. If you have a trainer, follow these steps:

- Mount the bike to the trainer and make sure the rear axle is locked firmly;
- Measure ground to rear axle while bike is in trainer and record measurement;
- Measure ground to front axle and raise or lower front wheel to ensure that bike is level; and
- Begin fitting steps as described.

Don't be worried if you don't have a stationary trainer as you can still conduct a good fitting. However, before you get your rider on a bike to be fitted, ensure that you are working on level ground. An easy way to do this is to use a level to confirm. If not level, find another location that is level (e.g., paved tennis court or parking lot). Have the rider balance against a wall while on the bike or have another person holding the bike upright when taking measurements from the rider.



Section 2: Cleats / Foot Position

Don't be intimidated by the wide variety of shoes and pedal systems that exist. Some riders will start with non-cycling shoes and flat pedals which is fine. However, we recommend that riders acquire off-road cycling-specific shoes and pedals.

Sole of shoe/cleats: Look closely at the sole of the rider's shoe to determine the condition of the cleat and how much room you have to

work with. All cleats can be adjusted forward/backward and some offer inward/outward adjustment as well. Depending on the type of pedal, there will be varying degrees of foot rotation (known as “float”) before the pedal releases. Shimano pedals allow the release tension spring to be adjusted. Other pedal systems do not, but tend to have relatively low release tension. For riders new to clipless pedals, it is a good idea to loosen the pedal to allow for easy release as this

will decrease the chance of the rider falling over when coming to a stop (note: check the pedal’s instructions for details how to adjust the pedal).

Stance (foot width): It is very common to find young rider’s cleats centered on the shoe in a manner that results in a stance that is too

wide. Whether or not this is the case with your rider, it is important to know how to determine the correct stance. Begin by standing behind the rider on the trainer and watch him or her pedal and observe how the rider’s knees track relative to his feet. If the knees bow inward toward the frame and feet appear wider than the knees, the stance needs to be narrowed by moving the cleat toward the outside or little toe side of the shoe.

If the rider’s knees move laterally away from the bike wider than the feet (typically on the upstroke), their feet need to move outward. This is achieved by moving the cleat toward the inside/big toe side of the shoe.



If a further width is required, a pedal washer or two can be inserted between the pedal and crank arm, physically moving the pedal farther out from the bike. If using pedal washers to increase stance, add no more than two washers to maintain sufficient spindle thread length in the crankarm.

Fore/Aft: To determine the proper fore and aft cleat position relative to the foot, try to set the cleat so that it is lined up with the widest outer edge of the foot, or the “knuckle” of the little toe. You can easily see this with the rider’s shoe off and their foot on the pedal or by gently squeezing their shoe when they are on the bike.



SADDLE

Angle: Saddles can be level, tilted nose up or down. While a saddle pointed downward may feel better on steep climbs, and a nose up saddle may feel better on steep descents, riders are typically not going to adjust their saddle during a ride. Thus, it is important to adjust the saddle angle to serve the rider for all terrain. If your rider has a hardtail bike with front suspension only, positioning the saddle slightly tilted up works best as the front of the bike will settle downwards under the weight of the rider, resulting in a level saddle position. The compression of the suspension fork under the rider’s weight is called “sag.” Dual suspension bikes that have similar front and rear sag should begin with the saddle level. For more information on properly configuring sag, you please see “suspension basics” in Chapter 2 of NICA’s *Teaching Mountain Bike Skills Manual*.





Fore/Aft: To determine correct fore/aft saddle position, have the rider comfortably sit on the saddle with the rider's foot in the forward-most point of the pedal stroke and drop a plumb line from the inside edge of the rider's knee, in the groove just behind and to the side of the kneecap. The plumb line should be over the pedal axle or close to it. Riders with longer legs can be slightly in front and those with shorter legs can be slightly behind it.

Height: Saddle height is determined by the rider's knee angle at the bottom of the pedal stroke. The knee angle should appear as a slight bend, between 30-35 degrees if measured with a goniometer (angle-finder). Start by having the rider pedal slowly and watch to see what their form is:

- Are they pointing their toes down?
- Are their heels flat or dropped?
- Does their knee overextend?
- Do their hips rock?

By watching a few revolutions of the pedal stroke, you will be able to quickly ascertain whether the saddle needs to be elevated or dropped. Ideally, riders should pedal with a neutral foot angle, which is neither significantly pointed toe down nor heel down. A slight toe-down angle is fine. Hips should be stable on the saddle and pedal revolutions smooth.

If determining proper knee angle by eye, the knee should be slightly more extended than halfway between 90 degrees and fully extended straight.



Section 3: Handlebar Width, Reach & Drop

Once the correct saddle position has been established, the front end of the bike - specifically reach and drop of the handlebars - can be addressed. Reach and drop should be defined by a neutral torso and arm position of the rider. Looking at the rider from the side, if you draw a horizontal line through the rider's hips, the torso and arms should each form approximately a 45 degree angle to that line.



While some mountain bike handlebars come very wide, a bar that is too wide results in the rider turning his elbows outward with a significant bend. This is a less efficient position requiring that the bars be cut down to a shorter length. Note: consult a bike shop mechanic if the bar needs to be cut.

Section 4: Controls

To improve bike control and to reduce rider strain, the controls (brake levers and shifters) need to be properly positioned. Modern shift and brake levers can be adjusted in a variety of positions. No matter how the levers are adjusted, you must be sure that the brakes are properly set and functioning to allow the rider to safely slow and stop the bike.



Side-to-side: Disc brakes are strong enough to allow single-finger braking.

Reach: Many modern brake levers enable the distance of the reach to be adjusted and this is helpful as many young riders have short fingers. Set the reach so that the braking finger can rest easily on the lever.

Angle: Set the brake lever angle so that when the rider is braking there is a straight line through the forearm, hand grip, and lever. Ask the rider what feels natural and prevent the rider from bending the wrist in an awkward angle.



BAD

GOOD

Section 5: Closing

When adjusted properly, the bike will help your rider remain comfortable and increase their safety. Keep in mind that high school aged athletes grow at various rates and thus their position on the bike may change as they age. After a bike has been fit to the rider, have him or her measure and document their inseam length and following key bike dimensions:

- **Saddle Height** (center of bottom bracket up seat tube to top edge of saddle);
- **Saddle Setback** (nose of saddle behind center of bottom bracket);
- **Handlebar Reach** (from tip of saddle nose to center of grip); and
- **Handlebar Drop** (vertical height of saddle measured from ground minus vertical height of grip – Note: bars can be higher, lower or level with saddle).

With these basic measurements, the rider can track their changes over time and ensure that they are able to adjust the bike back to a proper fit if any of the components have to be removed or adjusted. A simple trick to mark saddle height is to wrap a piece of electrical tape around the base of the seatpost at the edge of the seat collar of the frame. Be sure to check each rider's fit at the beginning of the season as they may have grown over the summer.



FITTING CHECKLIST

- Rider stable on the saddle (no rocking, sliding forward or back);
- Pedal stroke smooth and circular looking;
- Knees track well over feet;
- Upper body relaxed, slight bend in elbows;
- Head position neutral, easy to look ahead when descending;
- Rider's body appears fluid and relaxed on bike as terrain varies.

ACKNOWLEDGEMENTS

Thanks to Dario Fredrick for his assistance in developing this chapter. Dario is the head bike fitter and founder of Whole Athlete and has over a decade of fitting experience with cyclists of all levels, as well as 14 years of experience teaching Iyengar Yoga in studios and community college. His knowledge of riders and bodies is complemented by a Master's degree in applied exercise science that also includes formal biomechanics training. He coaches cycling talent in the US, and volunteers his time to fit junior racers in the NorCal High School Cycling League. You can view the Whole Athlete site on the web at www.wholeathlete.com

NICA also acknowledges and appreciates the following student-athletes who gave their time as fit models: Sean Bennett (El Cerrito High School), Josie Nordrum (Redwood High School), Ousmane "Moose" Sow (Berkeley High School) and Chris Nicas (Berkeley High School).

