

Uncompromising position: here's how to achieve optimal bike fit

BY CHARLES HOWE

Across the spectrum of cycling skill and experience, off-season is the time to evaluate bicycle fit. New riders purchasing a stock road bike need to be assessed to determine the correct frame size, or whether they should consider getting a custom frame, while experienced riders may benefit from one of the technical fitting services mentioned below, even if they feel their position is “dialed in” after years of riding.

Letting others do it

Fitting services can be traced back at least to the introduction of the Fit Kit in 1982, with numerous others appearing since. An increasing number of area shops offer some kind of fit service beyond traditional guidelines and visual methods. Most all can be divided into two categories:

Dynamic fitting methods, such as those developed by Serotta, Specialized, Slowtwitch F.I.S.T (time trial/triathlon-specific), and Wobble-Naught, determine optimal position with the rider seated on the bicycle, using visual inspection, video analysis, laser beams, or a combination of these. Certification for each approach requires several days of training in Colorado, California, or Idaho, at a cost of around \$1,500. *Static* methods, such as Body Scanning and the procedure described below, take measurements of the rider off the bicycle, then use this data to calculate recommended frame dimensions and adjustment parameters. (Use the links at the end of the article to find the nearest certified technician for each method.)

An appointment is usually required, and the cost ranges from \$75-\$300, however, most shops include some type of fit session with the purchase of a new bicycle (check with your local dealer for details). The higher the price, the more involved the approach; the most sophisticated take several hours to complete. They may include an interview and flexibility assessment before the actual fit session on a stationary, adjustable sizing bike, plus adjustments such as forefoot varus or valgus (downward or upward canting, respectively, of the medial forefoot), to improve sagittal alignment of the knee, as needed.

Doing it yourself

No single position definitively maximizes power generation for any given individual, which is why there has never been a controlled, peer-reviewed study demonstrating as much; rather, cycling economy – the ratio of mechanical power output to oxygen uptake – is largely determined by the percentage of Type I (slow-twitch) fibers present within the working muscles, although muscles are adaptive, and will, in a relatively short time, become marginally more efficient for *any* position within a given range of movement. Even so, bicycle fit can clearly be optimized for overall riding comfort and to minimize aerodynamic drag.

Factors such as flexibility (which may increase over the course of a season, or be lost due to aging, injury, or inactivity), riding style (e.g., touring, recreation, competition), aerodynamics, and comfort will all modify the guidelines proposed here, so keep in mind that they are just that – *guidelines* – which should not be taken rigidly, as any sort of final word, but as a starting point that are subject to further adjustment, such as from an old-fashioned, low-tech visual inspection by an experienced eye, or refinement from perceptual feedback. Whatever you do, *don't* make any sudden or drastic in-season changes to your set-up, rather, evolve your position gradually, changing each parameter (such as saddle height) one at a time, by no more than 3 mm every two weeks or so. More dramatic alterations may be made in the off-season.

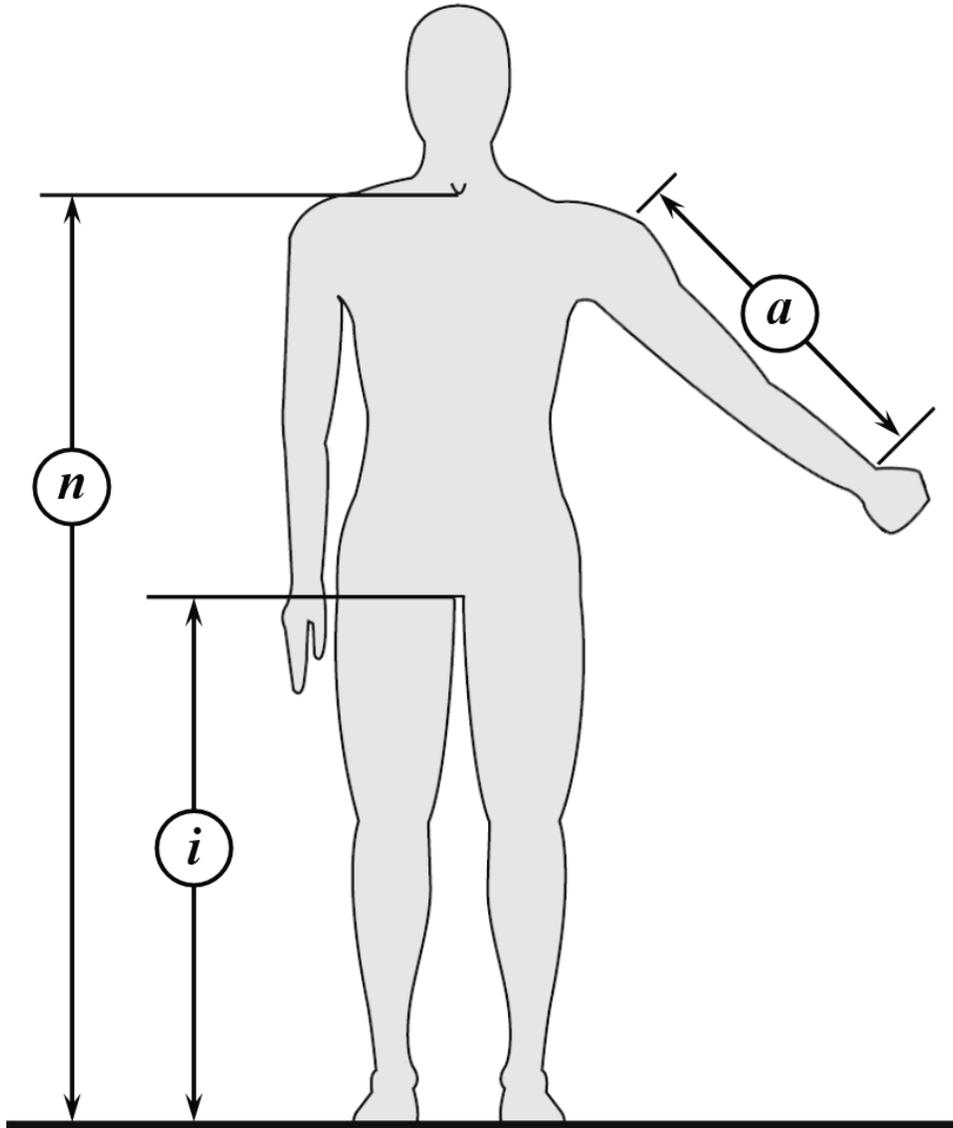
Measuring the body

Before getting started, you will need to be dressed in riding shorts, socks, and tank-style top. You will also need to round up the following items:

1. 3' or 4' carpenter's level
2. 12" × ¾" (20 mm) diameter dowel with level attached
3. spool, line, and lead sinker or plumb bob

4. metric tape measure
5. masking tape
6. Sharpie® marking pen
7. 2 sheets blank paper, pencil, and cellophane tape

The following dimensions should be taken at the same time of day, such as just after rising, since the pull of gravity will compress the spine and reduce torso length as the day wears on:



In socks and cycling shorts, stand on a hard, even surface, feet about 6-8 inches apart from instep-to-instep (or so that legs are perpendicular to the ground), knees completely extended, in front of a smooth wall. Tape a sheet of blank paper to the wall at the point opposite your crotch. Have a partner (the measurer, and someone you trust!) sit on floor to either side of you and push the carpenter's level up between your legs, with the top edge facing up and kept level, and the front edge butted against the paper on the wall. With the level parallel to the ground and once the measurer is exerting enough pressure, mark the position of the end of the top surface of the board on the paper. The distance from the mark to the floor is inseam length i (see diagram below). What is enough pressure? Enough to compress the chamois liner of the shorts, but not so much that you are lifted off the floor. Take 3-4 measurements, always being careful to keep the level horizontal, and average the closest 3 values. Usually, the first one is a bit short and should be discarded.

Next, measure torso length, standing in front of the wall in the same position. Tape a sheet of blank paper to wall across from your sternal notch (the depression at the top of the sternum, just below the Adam's Apple). Gently insert a straight $\frac{3}{4}$ " dowel (about 12" long) in this depression and move forward until the face of the dowel is flush against the wall. Once again, you need to strap a small level to the dowel, but this time, the measurer checks it. When it's level, mark the **lowest** point at which the dowel contacts the wall, and label this measurement n , for sternal notch height. Repeat several times, and average the 3 closest measurements. Subtract inseam length i from n to obtain torso length t .

Now, take a seat, and with the lower leg exactly vertical and the upper leg horizontal, obtain lower leg length by measuring from the floor to the knee joint separation, which is located just above the proximal end of the fibula. Subtract this from inseam length to obtain upper leg length l_u .

One last anthropometric data point . . . arm length a . With elbow joint fully extended and arm raised to 45° below horizontal, measure from the acromial (lateral) end of the clavicle (bump on top of shoulder) to the distal end of the ulna (bone directly below knuckle of pinky finger). Finally, measure lower arm length a_1 by having the person being measured sit at a table as though they were about to arm-wrestle you. With the arm perpendicular to the table (i.e., vertical), measure from the table surface to the distal end of the ulna.

Record each measurement on a piece of paper. Next month, we'll use this data to determine recommended frame dimensions.

On-line resources

General information – <http://www.bikefitting.com>

Body Scanning – <http://www.bikecomfort.com>

Cyfac Postural System – <http://www.cyfac.fr/Pages/Content/Index.aspx?pid=7&cid=7>

Fit Kit – <http://bikefitkit.com>

Retül Fit System – <http://retul.com>

Specialized – <http://www.sbcuonline.com>

Serotta – <http://www.serottacyclinginstitute.com>

Slowtwitch – http://www.slowtwitch.com/Bike_Fit/index.html

Wobble-Naught – <http://www.wobblenaught.com>

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Saddle height discussion at <http://forum.slowtwitch.com/gforum.cgi?post=1166282#1166282>