



The long, the short & the tall

To get the right fit on your bike you need a tape measure, a plumb line and precise mathematical formulae. Nonsense, says bike designer **Mike Burrows**

Some of the science and technology that goes into that bane of our lives, the motor car, is relevant to the bicycle. Aerodynamics, materials technology, and even tyre design. But not size. If you were to go into your nearest Ford showroom and ask for a Mondeo, the salesperson would offer you a lot of variations such as colour, trim, and engine. Size would not be an option. Mondeos do not come in 1cm increments or even in small, medium and large. No, when it comes to sizing the cycling world has more in common with Saville Row. This has led to a lot of very fuzzy thinking and

The first golden rule of cycle fitting is: there are no golden rules! We are all different

even fuzzier writing on the subject of cycle fitting.

When I first got into cycling as a complete novice I simply bought a cheapish off-the-peg 'racing bike'. Then after a couple of years of CTC rides and much discussion with and observation of my fellow riders' mounts, I bought a 531 frame and selected all the shiny bits to go on it. The next step for most people back then would be the custom frame, built for them and with every angle and dimension discussed with the builder. (This was not a step that I actually took as by then I was starting to move sideways, as it were, but that is another story.)

This is a far less common path these days as the ready-to-ride (usually made in Taiwan) cycle generally offers far better performance and value than the small builder can, partly due to purchasing power (Giant make about four million bikes a year) and partly technology. Yet

the myth that the cycle frame should be cut to fit the limbs of our bodies as if 531 were a type of pin stripe persists. This despite the fact that most professionals are happily plying their trade on off-the-peg models and despite the fact that the fastest upright bicycles ever built (my monocoques!) were only ever made in one size.

Forget the formulae

The 'necessity' of a cycle frame tailored to you is just a myth. The only thing that matters from the perspective of fit or ergonomics is where the bits are that you actually come into contact with, i.e. saddle, bars and pedals. What they are attached to, whether it's a diamond frame, Moulton or monocoque will make no difference to your comfort. (Yes, I know the Moulton has suspension but that is not what we are talking about here!)

More relevant is that the size of the frame could affect other things such as handling – or feedback, to be exact. For example, a frame with a 52cm top tube and 14cm stem will 'feel' different from one with a 58cm top tube and an 8cm stem. Not that it will affect the actual road holding ability as such, just how it feels as you ride along the road. At least, if you are on the road. For off-road riding things do get a bit more complicated and I have broken too many limbs to be able to preach in this area.

Nevertheless, we want to look 'right' on our chosen mounts. So when I chose my first frame it was a 56cm because I am 5'10". A smaller frame would have meant that I had borrowed my little brother's bike. Any larger and it would have been my dad's!

These days that is no longer a problem thanks to the brilliance and farsightedness of, er, me. You can now ride a Compact Road™ frame. Actually the idea was to reduce the tooling costs



The no-nonsense way to set your saddle height. With the arch of your foot on the pedal, your leg is straight with cranks in line with the seat tube

And then when you put the ball of your foot on the pedal, there's a slight bend in the leg

of the moulded carbon frames, which Giant did by adopting a three-size-fits-all approach. It seemed to work for the mountain bike so why not road? So we got a small frame with a sloping top tube and such a long seatpost that any visual link with size was gone.

All of this worked better than we could have hoped, even to the extent that the ONCE team riders – whom we ended up sponsoring – got by with only two sizes for 20 riders! There was a lot of variation in seatpost extensions and stem sizes, of course, because the position of the points of contact can be important.

So to the first golden rule of cycling fitting, which is: there are no golden rules! We are all different. Our bodies are different, our needs are different and our determination is different. So forget any formulae for finding your exact position. Those various fitting formulae can be useful but only as a starting point.

You need to be aware that there is no such thing as perfection in anything, least of all concerning comfort on a bicycle. So you will only ever be 'pretty close'. If there were golden rules they would be that you should know what you

are trying to achieve, and that you should know in which direction to err.

KOPS and rubbish

The most important dimension for most of us will be the distance from the saddle to pedal. There are lots of ways to calculate it, none of which need bother you. Just sit on the bike with the pedal at the bottom of its stroke. Place the *arch* of your foot on the pedal and set the saddle so that your leg is *fully* stretched. When you then place the ball of your foot on it, the leg will have a slight bend.

This as I have said is the starting point. Depending on what sort of cycling you are doing it could need fine tuning a millimetre or two up or down to suit you and your needs. Remember that it is better to err on the high side and that it is generally better to be stretched out rather than hunched up – and the further and faster you plan to ride, the more important that becomes. Conversely, if you are just popping down to the shops, it is not a big deal: a slightly lower saddle height can make hopping on and off a lot easier.

Setting your saddle height is not necessarily a quick process. Some people I know will still adjust their saddles a bit here and there even after a lifetime of cycling. (Incidentally, for some of the same reasons that high saddles are good, so are short cranks. I have written about this in *Cycle* before but just to add that they can allow a lower body tuck for those that are interested in how fast they can go.)

Staying with the pedals, the most mysterious advice ever given to cyclists must be: 'the knee should be over the pedal spindle with the crank forward'. Really? So would that be when the bike is on the flat? Because when I rode up Ventoux it was sort of pointing up for quite a long time, and I was tending to slide back on the saddle as you do on long climbs (probably wrongly), making it even worse. And even more remarkably, I have just set a British record for part-faired cycles of 28.5 miles in one hour with my knee about 85 degrees out of line!

No, 'knee over pedal spindle' (or KOPS) is the sort of formula you might expect to find in chapter three of *The Da Vinci Code*. It has no place in the real world.

Reach for your bars

Saddle position can make a difference, not to your ability to pedal as such but to your weight distribution and to any pain you might get in your back! The further back you set your saddle (i.e. shallower seat angle), the more weight will be taken by the saddle and the less by your arms – and the more you will need to bend your back for any given position. Not a problem for shopping but not what you want to go fast or far.

Moving the saddle forward is what you generally want for speed. More weight is taken by the arms but as you will be pedaling harder, this in itself will reduce that load. Sadly, at least for me, the reduced weight on the saddle does not necessarily make it comfortable. I do tend to slide off the front quite a lot. (The solution to all these problems of comfort will be revealed later – it does not involve saddles.)

The usual way of checking the saddle-to-handlebar dimension is to put your elbow against the front of the saddle. Your outstretched fingers should be about 50-75mm short of the bars (the top of drop bars; this doesn't work for flat bars), with the longer position being generally better for the back – at least, it is for mine.



A rough guide to reach: elbow against the saddle nose, the bars are a little further forward than the fingertips

For tri-bars it is a bit more complex. There are rules governing them, but generally the further forward and higher they are set for *any given body position*, the more aerodynamic but less comfortable you will be – as you are using your muscles to hold up your body. Far better for comfort to move them back a bit until the upper arm is roughly vertical and is then propping you up. Not good over cobbles like this, but on smooth roads elbow rest bars can be very comfortable for long distance touring too – although they're not so good when following a wheel.

Lastly, the easiest one of all: handlebar height. Low equals speed and pain. High equals comfort and views of the countryside rather than your front hub. If you set the bars *very* high then headwinds can be a source of discomfort.

Are you sitting comfortably?

Now, all of the above does of course apply to the more upright of cyclists. For those of us who have gone over to the dark side and adopted a more laid back approach to cycling,

'Knee over pedal spindle' is the sort of formula you'd find in The Da Vinci Code

good advice is harder to give. Thankfully it is less important as laid-back cycles are by their nature rather more suited to the ergonomic requirements of the human frame. But they do come in rather more flavours than their upright cousins, so a word or two to help get you going...

The semi-recumbent city cruiser types are the easiest to ride but like the upright town bike with the big saddle, they do not do distance very well. For that you need to lay down a bit more so that more of your weight is taken by your back and less by your backside. Also look for moulded seats and foam cushions. It is rather more sweaty than canvas webbing but a sweaty back is not at all uncomfortable whereas a numb bum is.

And finally, for those of you who have picked this magazine up in the dentists and are not really cyclists but have just bought a dual-suspension 'thing' for £80 from the local warehouse: you should lower the saddle by about three inches. That way other cyclists will think that it's not yours and that you have only borrowed it.

SECOND OPINION: THE BIKE FITTER

Mike Veal of BikeDynamics is one of a number of people fitting cyclists to their bikes. He explains what he does and why.

The BikeDynamics approach to bike fitting is to combine the best practice guidelines for cycling posture with accurate measurements of the rider whilst pedalling. The dynamic measurement is important because our bodies respond differently under load and in motion compared to when stationary. All cyclists can benefit from a bike fitting but especially those feeling any discomfort, a perceived lack of performance, or who tinker with their position and would like some peace of mind.

Dartfish Pro Suite motion capture software enables the simultaneous acquisition of HD video from the front and side aspects with subsequent geometrical analysis of key anatomical reference points. One key metric is the angle of the knee joint at maximum extension, which is by far the best means to define saddle height. The front aspect allows us to track the knees, with the ideal behaviour being symmetrical, vertical paths with minimal lateral displacement between the up and down strokes. Other measurements include minimum knee and hip angles, upper body posture and stability, flexibility, power, and left/right balance.

Continual analysis of this data has confirmed that we are all a very different shape and what suits one person is inappropriate for another. Generally, setting saddle height with the 'heel on the pedal with a straight leg' rule can be quite inaccurate, largely because there is huge variability on how people hold their ankles. The Knee Over Pedal Spindle (KOPS) rule for fore-aft placement does work quite well, but should not be regarded as sacrosanct. One myth that does need to be dispelled, however, is that you will get more power by pushing your saddle back as far as it will go!

Here's an outline of the BikeDynamics process.

- Customer interview.
- Turbo trainer warm up with live video.
- Data acquisition, analysis and review.
- Flexibility and anatomical checks.
- Modifications, measurement and re-analysis.
- Recommendations, conclusions and report.

For more information see BikeDynamics.co.uk or ring 0560 2422694

