Colin Thomson and John Russell have provided the following information on setting up your bike.

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WHAT THIS IS ABOUT

This is intended to be a basic introduction to setting up your riding position. It is aimed at new cyclists, and cyclists who have never previously taken much interest in their riding position. I will often give two methods for an aspect of bike setup, for example for saddle height I give the “heel on pedal” rule of thumb, but I also give what I hope is a reasoned explanation of why your saddle height should fulfil more than one criterion, and what it should look and feel like when you ride. Many riders I see on the road would be more comfortable if all they did was follow the rules of thumb.

This is just a bit of friendly advice from one cyclist to another, if you really want to know about the interaction of your body with your bicycle, my best recommendation is to read everything you can find on the internet by Steve Hogg. He is informed and analytical in his approach, but not everything he writes is an easy read.

The shape of bicycles is heavily influenced by fashion and marketing. If you Google “Tommy Simpson” you will see that just a few years ago world class professional athletes used less aggressive riding positions than what is currently marketed to weekend cyclists by many bike manufacturers. For racing, a low, aerodynamically-efficient riding position is a considerable advantage. This is achieved by rotating the contact points around the bottom bracket; the saddle goes forwards and up, the bars go forwards and down, and forceful pedalling contributes to supporting the weight of the rider’s torso. Unfortunately, similar riding positions are “trickled down” to the sort of “road” bikes bought by recreational cyclists, who then need to make some changes in order to get comfortable.
BEFORE YOU CHANGE ANYTHING

Before you change the position of your saddle, cleats or handlebars, mark, measure and photograph everything. Put a bit of tape around the seatpost a measured distance above the frame and take a photo, ideally with a ruler. Then you know exactly where you started from, and you can get right back if you want to. I hope I can motivate you to play with your riding position, its free, its easy to do, and it could make you more comfortable and less liable to injury.
In general terms, you need to pedal with the ball of your foot on the pedal. If you pedal with your instep on flat pedals, not much of these notes will be relevant.

If you are setting up cleats, the best place to start is having the ball of your foot just in front of the pedal spindle, say 5 or 10mm. Its a quick job to try the cleats in a different position. Because the pedal is narrower than your foot, cleats should be set so your foot is as close as practical to the crank. Even then, you may find your feet roll outwards (supinate) because the outer edge of the foot is not on the pedal. Stiff-soled shoes or a pedal with a wider surface can prevent supination. Most pedal systems provide some angular “float” so that the foot is free to move for example from “straight ahead” to “heel out”. The cleat must be set so that when riding the foot is never up against the end of the float, it should always be free to move in either direction.

Don't expect your comfortable position to be completely symmetrical. My left foot is always more “heel out” than the right foot.
SADDLE HEIGHT

Saddle height is a big deal, because saddle height governs how much knee extension you get when you turn the pedals (how “straight” your knee is). The degree of knee extension is important for two reasons;

1) You get maximum power for minimum muscle work when the knee is almost straight.

2) If you over-extend your knee each time the pedal goes down, you will eventually get a sore knee (or back). Pedalling toe down all the time just to reach the pedal at the bottom means you are just one step away from over-extending your knee. (That “one step” can be something as simple as riding further, harder, or more often than you are used to, or riding when you are tired, stiff or injured, or not properly warmed up.)

In order to pedal smoothly “through the bottom” your body needs to keep some bend in your knee with the pedal at the bottom. If you set your saddle too high, your body will keep that bend in the knee the cost of pointing your toes and rocking your hips to increase the effective length of your leg as you over-reach for the pedal at the bottom.

Saddle at normal height, bend in knee at bottom when pedalling - foot level.
SETTING SADDLE HEIGHT FROM SCRATCH

Set your saddle height so that wearing low-heeled shoes your knee is locked out with the pedal at the bottom and your heel on the pedal.

Heel on bottom pedal, knee locked.
Freewheeling with your knee locked, your heel will be lower than your toe.

Pedalling normally, most people find their foot is roughly level on the downstroke.
FORCING THE GEAR

“Forcing the gear” means pedalling at low cadence with a high load, like a gear or two higher than comfortable up a rising road; this is when you will be looking for maximum power for minimum muscle work. With the saddle height set as I recommend, maximum power is available at low cadence by sliding back in the saddle for more knee extension. Also for a rider with an “average” action, the heel usually drops more on the downstroke when forcing the gear, this also increases knee extension. Users of cleats should be able to push the pedal forward over the top, and pull it back at the bottom when forcing the gear. If you are still pedalling smoothly when you are off the back of the saddle, raise it 5mm and try again, if sliding back means you are reaching for the pedal, lower the saddle 5mm and try again.

More heel drop forcing the gear.
CADENCE

Most experienced cyclists pedal most of the time at high cadence with low force. This is a more efficient use of your limited energy than getting into a high gear and forcing the pedals round, and its kinder on your knees. However, its something that you have to learn to do, and when you start it will make you breathless very quickly, until you build up fitness. If you are going to pedal at high cadence, make sure you have enough bend in your knee with the pedal at the bottom, so that you can be smooth through the bottom even on your worst day, when you are tired and your legs are stiff. If you set your saddle too high you risk over-extending your knee (or twisting your back) with each turn of the pedals, but if you set it a bit low, you can increase your knee extension by simply sliding back in the saddle.

HEEL DROPPER OR TOE DIPPER?

The “average” rider will have his foot roughly level on the downstroke. Some people are naturally heel-droppers, in that their natural style is to have their heel well down on the downstroke. Some people are naturally toe-dippers, and pedal with their toes down all the time. Others who pedal toe-down all the time will revert to an “average” technique with a lower saddle. If you pedal toe-down without a correspondingly high saddle, this results in an exaggerated bend in the knee, the thigh/calf/foot resembles a letter “Z”. Setting your saddle back may make it easier to get your heels down.

SADDLE HEIGHT ADJUSTMENT

Saddle height is the most critical aspect of bike set up, I reckon I can tell if my saddle height is wrong by 3 or 4 mm. If you have been riding with your saddle height considerably different from what I recommend, its probably easier to alter it in small steps, say 5mm at a time. If you alter saddle height a lot in one go, it will feel odd at first; this is what happens if you pay for a bike fit.

ARE YOU SITTING COMFORTABLY?

.....This section contains some anatomical terms.... I can’t think of a way to write this section without using the term “genitals”, so if reading that term will upset you, please stop reading now.

You need to sit on the broad bit at the back of the saddle. You need to take your weight on your bum bones, officially known as ischial tuberosity, if you want to Google it. No other bit of your backside is equipped to support your bodyweight for any length of time; if you put weight on other areas, it will be uncomfortable at best, and at worst it can cause actual damage. Saddles that are soft enough for your bum bones to sink into can transfer weight to other areas. The general advice is to set your saddle level.

In general terms, the back of your saddle needs to be wide enough to support your bum bones, but too wide can lead to chafing of your thighs as you pedal. But it doesn’t quite end there; your ischial tuberosities are curved rather like the rockers of a rocking chair, except that they are closer together at the front than at the back. It follows that if you tilt your pelvis forwards when leaning forwards to hold the handlebars you are then sitting on a part where your bum bones are closer together. This is why bikes with drop handlebars have narrower saddles than bikes with flat handlebars. The front (or nose) of your saddle needs to be narrow enough not to chafe your thighs as you pedal. In an ideal world, you will have next to no weight on the nose of the saddle.....as the world is frequently less than
ideal, many people like saddles with a cut-out, the idea being that the cut-out takes the weight off the most sensitive areas.

Men....should count ourselves lucky because our genitals are at the front of the pelvis, in front of the pubic bone, and its almost impossible for us to sit on our genitals. If a man gets his saddle badly wrong, about the worst he can expect is to put pressure on the nerves and blood vessels that supply the genitals. This produces what is known as “numb willy syndrome” which is fairly harmless and resolves itself when you stop riding.

Women's genitals are underneath and behind the pubic bone, so as a woman tilts her pelvis forward when leaning forward to hold the handlebars this puts pressure on the genitals. The usual way to alleviate this pressure is to use a saddle with a cut-out. It may also be worth trying tilting the nose of the saddle down, but there is a point where this makes you slide forwards. There are saddles where the back is built up (RIDO, and possibly others) and some saddles have very soft padding on the nose, to try to lessen the pressure on the most sensitive areas.

There are a couple more confounding factors. Women are, on average, shorter than men, and bike wheels don’t scale. A woman 5’ 2” tall will be riding the same size wheels as a man 6’ 4” tall. If the woman doesn’t want to kick the front wheel her bike can’t be very much shorter than the 6’ man’s bike, so the woman is likely to have too long a reach to the handlebars, dragging her forward to sit on the nose of the saddle. Added to that, most bike manufacturers use a “fiddle” to get the reach to appear to be “shorter” on small bikes. What they do is make the seat tube angle steeper, and this makes the top tube shorter. However, making the top tube shorter doesn’t alter the place a short rider needs to have their saddle in order to be “in balance” on the bike, it simply means the rider needs to set their saddle further back on the seatpost. (See next section “SADDLE SETBACK”)

For purely anatomical reasons, women are much more likely than men to have problems with pressure from the saddle, and their problems are likely to be much more serious.

If you want a bit more reading, Google “Lovely bicycle blogspot female anatomy”....
SADDLE SETBACK

Saddle height is about pedalling, saddle setback is about distributing your weight between the contact points...saddle, bars, pedals.

Recreational cyclists who expect to ride for more than an hour or so need very little weight on their hands. Too much weight on your hands will result in a sore back, neck or shoulders, and can even restrict your breathing. Racing cyclists pedal with sufficient force that the reaction helps to support the weight of their torso, and maintaining a “racing crouch” requires good flexibility and core strength.

Try this test; ride along with your hands in their “usual” place, for example on the lever hoods. Without sitting up, put just your thumb (both hands) on the lever hood, there should be little enough weight that you can easily support it on just one digit, or even take your hands right off the bars. If you have too much weight on your hands, slide back in the saddle and the weight will come off your hands. You can keep doing this to find the right saddle setback, or you can use the usual rule of thumb to get close to the right setback. That rule of thumb is “knee over pedal spindle” or KOPS, which is much maligned all over the internet, but it gets most people close to the right saddle setback.
If you pedal with your knees stuck out at the sides, it’s only a question of time before you get sore knees, because your knees work best as a straight hinge joint, with no twisting or side to side movement. Moving your saddle back might help you to “get your knees in”.

**Riding Along.....How Much Weight On Your Hands?**

Freewheeling or just trickling along turning the pedals gently, I have a little bit of weight on my hands, just enough so that I don’t have to curl my fingers round the bars in order to steer the bike, the weight on my hands is enough to steer by.

As soon as I put a bit of effort into pedalling, the weight comes off my hands, for example on a rising road, or into a headwind. If I’m “forcing the gear” I am pulling up and back on my right hand as I push the right pedal down (and my left hand as I push the left pedal).

Riding rough, potholed roads I can distribute my weight between the contact points (bars, pedals, saddle) to reduce jarring.
HANDLEBAR HEIGHT AND REACH

If you are not used to drop handlebars, having the bars and saddle level is a good place to start. Recreational touring cyclists don’t really need the bars any lower than the saddle.

I wish I had a pound for every time a rider has told me they need a short reach. There is always a “reason” people need a short reach.....they have a “bad back” or their shoulders/neck/wrists/hands hurt. However, all these things can be caused by having too much weight on your hands, and having the saddle too far forward throws your weight forward onto your hands. Get your saddle height and setback right first, then you can start thinking about reach to the handlebars.

There are very many recommendations for setting handlebar reach. Some say if you put your elbow on the saddle nose, your outstretched fingers should brush the handlebar. Some say it should be elbow to fingertip, plus the width of your hand. Some say that sitting on the bike, the front hub should be hidden from view behind the handlebar. Some say a touring cyclist’s back should be at 45 degrees to the horizontal, some say the arms should also be at a similar angle.

Elbow to saddle nose.

However you do it, you need to arrive at a comfortable reach. Too long or too low can make your neck or shoulders sore, even if your saddle setback is right. Too upright is inefficient, apart from wind resistance, you need a reasonable reach to brace your lower back to provide a secure anchor for the muscular effort of pedalling. Riding out of the saddle (standing on the pedals) needs enough forward reach so your hands are still in front of you.

For recreational, touring cycling, you need to be comfortable with your hands on the lever hoods, so brakes and gears are to hand. You will then be able to use the drops for headwinds, and the tops for looking over the hedge.

To adjust reach, use a different handlebar or stem; don’t move the saddle forward or back to adjust reach, saddle position is set for pedalling and weight distribution, and therefore is sacrosanct.

Road bikes are sold with long handlebar stems so that racing cyclists can achieve an aerodynamic riding position, very many recreational cyclists will find they need a shorter (or shorter and higher) stem.

If the reach is too long, you can be dragged forwards so you are sitting on the nose of the saddle.
If my reach is too short, I find myself sitting on the back of the saddle, even if the saddle setback is what I normally use.
Tops

Hoods

Drops
**PELVIC TILT**

The forward lean to reach the handlebars has two components. You can tilt the pelvis forwards, and you can flex the spine forwards. Most riders do both to varying degrees, but a few riders lean forward mainly by tilting their pelvis forward, keeping their back (relatively) straight. How much pelvic tilt and how much spine flexion you use appears to be an individual thing, and you probably can’t change it even if you want to. However, the angle of the pelvis will govern which part of the range of contraction of the gluteal and quadriceps muscles you use when pedalling. If you are in the habit of riding with the nose of your saddle any more than very slightly raised, it can be worth trying the saddle more nearly level. This will reduce the amount your back has to bend and it will put your weight on your bum bones....it will also mean you use a slightly different part of the range of contraction of the glutes and quads, as above.

**TECHNIQUES and WASTED WORK**

You can make your cycling easier and more enjoyable by learning a couple of techniques.

Practice turning the pedals quickly and smoothly, this is more efficient and kinder to knees than getting in a big gear and straining. Try to pedal in circles rather than just pushing the pedals down.

What do you do when you can’t avoid a pothole? If you stand up on the pedals and lose contact with the saddle you have less control than if you maintain saddle contact. If your saddle height is right, you can carry on pedalling still in contact with the saddle but with no real weight on it, by sharing your weight between the front pedal (going down) and the back pedal (coming up), I find I am pulling up on the bars to keep balanced when I do this.

Riding over a big bump, you need to take the weight off first the front wheel then the back wheel, so the bike moves under you like a rocking horse. If you sit on the saddle like a sack of spuds, a big bump can fire you up in the air.

You want the work you do to drive the bike along the road, or up the hill. However, there are lots of things you can do which waste your work, and your precious energy. You need to be comfortable and relaxed on the bike, contorting your body into an excruciating position wastes work. Supporting your torso on your arms not only wastes work, it also uses muscles which would be far better employed filling your lungs with air. Having your foot too far back on the pedal wastes work stabilising the foot, Steve Hogg reckons that simple mistake can steal 5 or 10 heartbeats per minute at maximal effort, those heartbeats would be better used supplying blood to the muscles you actually need for pedalling. An efficient pedalling technique means extending your knee enough to use the part of the extension where you get maximal force for minimal muscle work, but not over-reaching so you rock your hips or pedal on tiptoe, another waste of work.