

Tim De Waele

If the Shoe Fits...

By Steve Hogg

How well a cycling shoe fits has a dramatic effect on rider performance. I spend a lot of time looking at the bare feet of clients and there is a massive variety of shape, proportion and function out there. So much so, that it is surprising that as many people achieve a good fit in mass production cycling shoes as they do. That doesn't mean that there aren't multiple factors that affect how well a cycling shoe fits. This article will be an attempt to outline and explain what those factors are.

Factors That Affect Fit and Performance Basics of Shoe Fit

A cycling shoe should fit snugly but without any sense of lateral compression across the MTP joints (base knuckles of the toes). When compared to a jogging or walking shoe, it should be perhaps half a size smaller and fit more closely, at least within the bounds of comfort. The heel cup should be a close fit, the instep closure should prevent any vertical slop between foot and shoe upper and there should be enough room in the toe box to wiggle the toes. Length should be such that the fronts of the toes don't press hard against the shoe upper.

When shopping for cycling shoes, there is one important factor to keep in mind. Extracellular fluid build-up. During periods of inactivity, whether standing or sitting, extracellular fluid (lymph) falls to the lowest point, the feet, causing them to increase in volume. Unlike the arterial / venous system, lymph is not propelled around the body by the contractions of the heart. Instead lymph is circulated by the force of muscular contractions and a series of one-way valves. In other words, by activity. If someone is sitting or standing around for a period, their feet swell. This is why many cyclists recognise the need to reach down

and retighten their shoes 15 minutes into a ride. The muscular contractions of the legs applying force to the pedals expels excess extracellular fluid from the feet decreasing their volume.

So if in you're any doubt about whether a pair of cycling shoes fit well, take them home on approval and sit around watching TV for several hours while wearing the shoes. Under these circumstances, your feet will swell. If the shoes are still comfortable after doing this, it is a safe bet that they will be comfortable on the bike, providing there is enough adjustment potential in the closures to allow for the expulsion of extracellular fluid once riding.

If you use any non standard footbed, orthotic or arch support insole, it is important that you insert these in any shoe that you are trying on for size.

Gender Differences

Contrary to what you would think reading the advertising copy of some cycling shoe manufacturers, there is no gender difference between feet. Female feet exhibit the same enormous range of shape, proportion and function as male feet do. Generally the only difference is that relative to stature, most women have smaller feet than men and occasionally, painted toenails. 'Women's specific shoes'

owe more to marketing than to reality and in effect, generally only differ in colour and occasionally, closure arrangement.

Heel Cup and Instep Fit

This is the key area of shoe fit. When off the seat sprinting, the rider is forced to pull up forcefully to transit through the greater zone of low leverage caused by being further forward over the axis of crank rotation than is the case during seated riding. Under these circumstances there should be no 'upslip' of the heel relative to heel cup of the shoe and no vertical slop between foot and shoe. Some brands of shoe offer the possibility of heat moulding the heel cup for a more personal fit. Sidi have a small amount of adjustment potential in the heel cup.

Instep fit is generally not a problem as just about all shoes have a closure at this point that pulls the upper down on to the foot.

Forefoot Fit

Ideally there should be enough vertical space in the toe box to not squash the tops of the toes. There should be enough width to not compress the nerves between the MTP joints (base knuckles of the toes). Any extra is relatively unimportant providing the shoe fits securely around the heel and over the instep.

Narrow Feet, Average feet and Wide Feet

These days most shoes have moderately wide uppers which suit the majority of riders. People with wider than average feet are reasonably well served with Shimano offering a wide version (EE) of several models and Sidi offering their 'Mega sizing' (EEE) in several models. Lake offers a wide version in some models too, but it is unsure at this stage if they will make it to Australia. Specialized and Giro upper level shoes also suit wide to wider than average feet.

One common mistake made by riders with wider than average feet is to purchase shoes that are one to two sizes longer than necessary in an attempt to gain sufficient width. In many cases the shoe will fit around the heel cup and instep well so that is not the problem. The problem is that when a rider uses an unnecessarily long shoe, they usually end up with a cleat position that is too far forward because the shoe was designed for longer feet than theirs. From a performance point of view, it is much better to spend the time sourcing Shimano, Sidi or Lake's wider range of shoes than it is to buy shoes that are too long.

Those with narrow feet are even less well served and in many cases have to be content with shoes with more than an average amount of take-up in the uppers. Sidi are probably the best in this regard in their upper range models, with a combination ratchet strap and capstan closures. Sidis are a moderate width shoe but their capstan system of closures can be adjusted to narrow the fit of the shoe upper significantly. Diadora have an upper ratchet strap with Velcro strap closures for the mid and forefoot but the Velcro straps have intermeshing locking serrated teeth on the front two straps that can be adjusted up quite a way. These work much better than the similar at a glance, Sidi arrangement on their moderately high end Genius range.

When all is said and done, there appears to



Tim De Waele

be no commonly available manufacturer that designs shoes specifically for narrow feet.

Arch Support

The one thing that is sorely lacking in mass production cycling shoes is quality arch support. In terms of foot correction, arch support is king and most cycling shoes are supplied with insoles that offer little or no real support for the arch. Humans have evolved to walk and run and vertical movement in the arch is necessary for this. We haven't evolved to exert force on pedals via more or less rigid soled cycling shoes. If the arch of the foot drops or deforms much under a pedalling load, then there is potential challenge to the plane of movement of the knee. Simply put, arch drops, knee rolls in, at least theoretically. In practice, as a group, cyclists tend to compensate so well that they are not aware of the problem as this is not a conscious process.

Even compensating effectively doesn't solve the problem. Rather, the load is shifted somewhere else. Too often the compensatory mechanisms we evolve to minimise the impact of a dropping arch on the knee are asymmetric and affect how squarely the rider sits on the seat. In a positional sense, a bike is a symmetrical apparatus. The closer to functional symmetry the rider can be while cycling, the better they will perform and the lower the odds of developing overuse injuries. Arch support plays an important role in this.

Effective arch support should be mildly intrusive when standing in the cycling shoe. It should feel like a bit too much when standing but firmly supportive without pain when cycling. There are various heat mouldable insoles out there with Formthotics being the most commonly available. The best off the shelf package at time of writing is Esoles. Esoles are a pair of insoles with four different heights of arch support that can be interchanged. As a rule of thumb, effective arch support for cycling is usually one level higher than is comfortable for walking or running. Some shoe manufacturers offer a means of

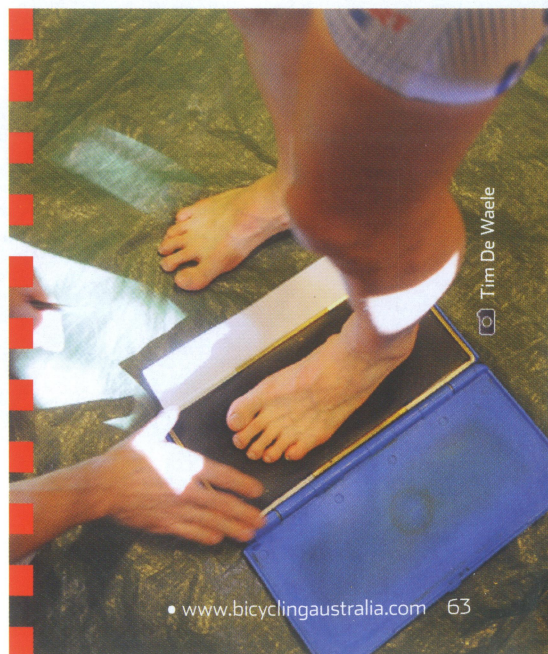
increasing arch support by supplying an insole kit or various heights of arch support that can be purchased after market. The near universal mistake to date is that the highest arch offering of all of them is not high enough for anyone with reasonably high arches.

Shoe Upper Construction

The vast majority of production shoes have an approximately similar basic design. The upper is folded under at the bottom and then glued to the sole. The major exception is Bont who use a 'bathtub' sole (more about this over) where the upper is glued to the outside of the bathtub.

Shoe uppers are available in various synthetics or a mix of leather and synthetic. None really stand out as being a better choice. Leather has a 'feel-good' advantage but most production shoes with partial leather uppers have a large amount of synthetic at key stress areas of the upper.

Closure types can vary significantly. There are capstans where a fishing line or fine flexible wire is wound up to pull the shoe upper in onto the foot. Ratchet straps are ubiquitous, as are Velcro straps.



Tim De Waele

Some Velcro straps are assisted by locking intermeshing teeth (Gaerne). Often there is a mix of closures on a single shoe, with a ratchet strap just in front of the ankle combined with Velcro straps over instep and forefoot being probably the most common arrangement.

Which is Best?

I don't think there is a clear-cut answer. Even with the Boa system, different manufacturers place them in different locations on the upper. Velcro straps can lose their grip over time so I tend to favour them less than ratchet straps or Boa or Sidi capstans. Buy the shoe that fits your feet best within the budget you are prepared to spend. If that is a shoe with Velcro straps that get a bit tired after a year or two, a boot maker can fix the problem relatively cheaply.

Sole Type

Soles can be formed from carbon fibre, fibreglass or various plastics. Plastic soles generally have significantly more give under a pedalling load than carbon fibre soles of the same thickness. This means that carbon fibre is preferred from a performance point of view as a better transmitter of forces generated by the rider. The greater stiffness of a carbon fibre sole can exaggerate any existing shortcomings with rider foot function or limb biomechanics. This is not a major concern for most, but I see instances of it from time to time. I don't think the best

solution for the rider is to reduce shoe sole rigidity and accept compromised mechanics. The best solution is to fix or correct the underlying problem with function.

While bathtub construction is commonly used in custom shoe manufacture, Bont are alone in using it for production shoes. 'Bathtub' means that the sole has vertical extensions for the entire perimeter of the sole. So the foot is contained within the 'walls' of the bathtub with the walls rising high at the heel and less so around the rest of the foot.

The advantage of bathtub construction is that the sole can be incredibly stiff for a given weight or thickness. The disadvantage is that shoe has to be closer to an ideal fit compared to the mainstream because there is much less ability to 'take up' the upper. Bont shoes can be heat moulded but there are limits to what can be achieved in terms of altering the fit. By comparison, a shoe with a non bathtub sole can have an upper that allows the perimeter of the foot to project to the sides outside the line of the shoe sole.

If you are buying a bathtub shoe, make sure that they fit well from the start. If they do, you will be rewarded with an obvious increase in foot control and sole rigidity.

Cleat Position

Once a shoe fits well, it has to be engaged into a pedal. The placement of the cleat holes on the shoe sole will have a bearing on rider comfort and performance.

Rider foot proportions play a part in this. Two people with the same length feet may have quite different foot proportions in the sense of how long the toes are and how square the front of the foot is. Cleat position is a contentious area. Just google 'cleat position' and find out. You may well have your own ideas on cleat position.

At the moment, the shoes with the most rearward cleat mounting holes are Specialized and Giro. Then come Lake, Diadora and Gaerne as a group, followed by Shimano, Sidi, Northwave. Further forward cleat mounting holes can be found in Pearl Izumi, Louis Garneau, Fizik, Carnac and DMT. Currently Mavic have the furthest forward cleat mounting position.

I favour a more rearward position for most people most of the time. You will have your own views and the above list is an attempt to place major shoe manufacturers in context in terms of cleat placement.

A related subject is the fore and aft adjustment potential of the major pedal systems. Shimano, Time and Keywin have the greatest rearward adjustment potential in standard form. Speedplay have much further rearward adjustment gain if an additional baseplate adaptor, part 13330 is purchased. In standard form they have less rearward adjustment potential than the three mentioned above. Look Keo have the least amount of rearward adjustment potential.

