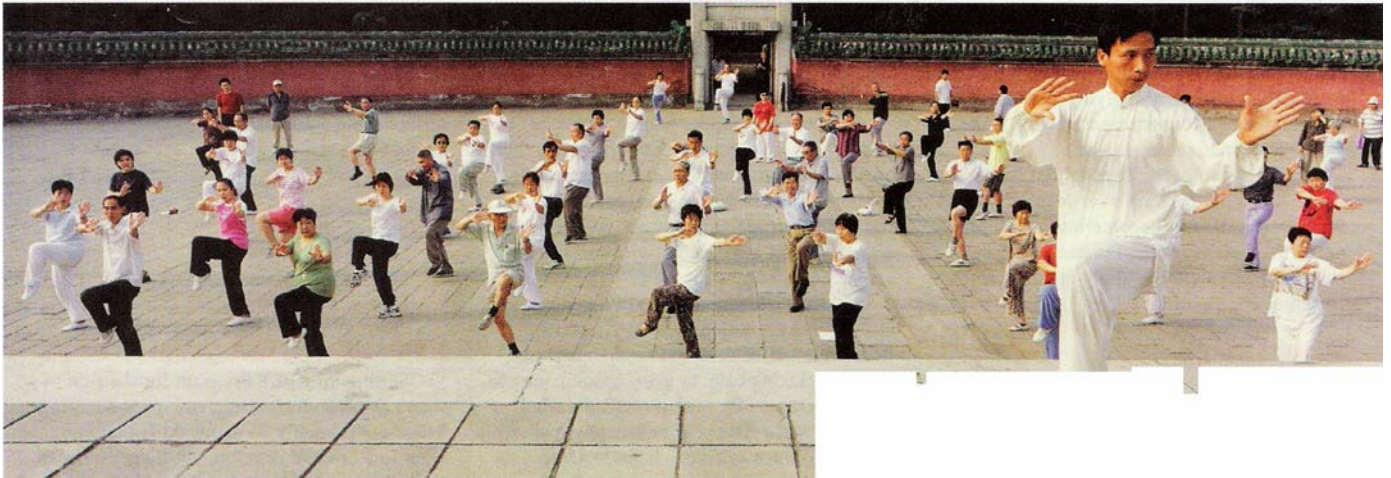


FOUNDATIONS *of Positioning*



Another Frontier. One of the greatest areas for athletic improvement lies in structural fitness, which can be trained through 'mind/body' disciplines such as Tai Chi. Photo: Sport The Library

STEVE HOGG goes to the core to uncover foundations of bike positioning and suggest another frontier for athletic advancement—structural fitness.

I have taken time out from my 'Positioned For Success' series of articles to respond to a letter to the Editor by Michael Hanslip. For those who have not read Michael Hanslip's letter, it can be found in full (1,700 words) in the April 2002 edition of *Bicycling Australia* on pages 8 and 10.

Michael politely took issue with a number of things I had written in the first instalment of 'Positioned for Success', which appeared in November 2001 *Bicycling Australia* and raised a number of issues, which I will now address.

I begged off at the time because the pressure of work commitments was high and I had a time-poor life. Rider positioning, like most aspects of the bike business, is seasonal to some degree. It is winter now and I have the time to give Michael the detailed answer his letter deserves.

Michael, I have broken down your letter into the main points and have answered each point in turn.

1. You raised an issue of quality versus quantity and a money back guarantee. As I said in the article, the mentioning of the 14,000 plus people who have been Cyclefitted with a money back guarantee was not an advertisement. It was an attempt to explain concisely why the views I hold regarding bike position have validity. I spend 30 plus hours a week, 49 to 50 weeks

a year, positioning people on their bikes. And while I think I have something to offer, at the end of the day, the only judgements I am interested in are those of the people who are paying the money.

The only objective way I could quantify my own success at positioning them effectively was to institute an unqualified money back guarantee. I charge enough so that if someone is unhappy, I am likely to hear from them. Additionally, I don't sell brand name bikes. All I do is position people, design and sell custom bikes and maintain and repair those bikes. In my case quality and quantity are linked. I would not be able to produce quality without the experience that the quantity of people I have positioned has given me.

Amongst them have been people with half a foot, one leg, no lower legs, seven knee reconstructions on a single knee, polio victims, withered arm and other severe physical disabilities at one end of the spectrum, and State, National, World Champions and Olympic medallists at the other end. In between there have been plenty of 'Joe and Josephine Averages'. They were all paying customers and I am booked further in advance every year as 85% come in through word of mouth referrals. That is what the numbers that did not 'wow' you mean. You mention you can be 'wowed' with a good argument and so I will proceed.

2. You said your thinking has been changed by Dan Empfield of Quintana Roo (www.slowtwitch.com) and his 'rotation around the bottom bracket theory'. I have been aware of this idea for some years and it is full of flaws. At your prompting (I rarely use computers), I looked up the article and did not know whether to laugh or cry at such misinformation and specious reasoning. I will rebut this in answer to your final and similar question at the end of your letter.

3. The other web article you highlighted was by Keith Bontrager 'The Myth of KOPS' at (www.sheldonbrown.com/kops). KOPS stands for Knee Over the Pedal Spindle. This one I had also heard of, but hadn't checked it out until now. Most of what

Bontrager says has merit in my view, but I would take issue with a couple of statements.

His experience varies from mine somewhat in that he feels seat angles between 72° and 74.5° is the range within which most people would find an ideal seat angle. I would say it is 70° to 73°, although I have sold custom bikes with seat angles varying between 68.5° and 74.5°. Such is the variation in humanity and individual needs.

4. You 'Can think of no logical reason why the body position, relative to the central axis of rotation that the bottom bracket axle forms, should affect length or size of power stroke in the long run. That is, once the body has adapted to the position'.

I can think of plenty of reasons, especially once the body has adapted to the new position. Again I will hold back as this forms part of the answer to your final question.

5. Moving forward ensures that weight is carried more on the arms and forward on the pelvis (onto soft tissue rather than bone), which has implications over long races, but no direct effect on power production'.

This is not correct in my view, but as with Point 4, I'll explain later.

6. With your comment that, 'You can spot a rider who has been to see Steve etc ... and John Kennedy puts most riders on 140 or 150 mm stems etc'.

You are right in that this is second hand, incomplete and only partially correct information. People notice what stands out from the crowd. They don't notice what doesn't stand out. Many people enlist my help because their level of structural fitness is poor. They leave in the same shape, but with their bike modified to allow them to ride comfortably, powerfully and efficiently. Sometimes this looks strange to the uninformed.

I have had a laugh many times when some of the riders I have positioned have told me they have had

trouble convincing the 'uninformed' that I had set their position because they looked too 'normal'. The fact that people leave me with a wide variety of 'looks' reflects individual differences in their own structure, function and proportion. As I have been saying in this magazine with regard to position for years: there are only individual solutions. And no, John and I are not rotating people around the bottom bracket.

7. You said that you push yourself backward when really going fast versus what I have written about Ullrich sitting forward.

No, it is unlikely that you are sitting too far back. I can safely assure you of that. There are half a dozen reasons I can think of that would explain this. I see it all the time. They all relate to less than ideal seat position and less than adequate structural fitness. Rather than labour through the possibilities, I can only say that if you let me see you on a bike, I will diagnose and correct.

8. Now to your main concern, the 'Rotation Theory'. I will quote Michael's explanation, as it is as good as any.

'Dan Empfield who founded Quintana Roo (says) ... using the stick figure of an average person on a typical road bike, he rotates the entire person around the bottom bracket until their back is more nearly parallel with the ground. The weight bearing portions of the anatomy and the relationship of the whole with gravity have changed, but the muscles doing the majority of the propulsion are exactly preserved in relation to the bottom bracket'.

The idea apparently is that the lowered upper body position allows better aerodynamics without sacrificing power output. This 'Rotation Theory' has quite a bit of currency among triathletes and time trialists. Michael (correct me if I am wrong) agrees with this view, while I strongly disagree and Michael has asked why.

Michael, it is a question of how many arguments you want to hear. I have a number, here they are:

A) NEUROLOGICAL ARGUMENT

Quote; Andrew Richards, *Bicycling Australia*, July

2001: 'Dr Roger Sperry, 1980 Nobel Prize recipient for brain research, demonstrated that 90% of the energy output of the brain is used in relating the physical body to gravity. Only 10% has to do with thinking, metabolism and healing.'

Now, given that this is the case, what are the muscles most needed to resist against gravity? Postural (anti gravity) muscles. What are the muscles we use to propel a bicycle? Phasic (dynamic) muscles.

The brain will always prioritize postural muscles, hence it is imperative that if, as cyclists, we want to perform to potential, that we sit on the bike in such a way as to recruit the minimum amount of postural musculature. That way the brain can devote more of its energy to switching the phasic musculature that we use to drive the bike (ie quads, glutes and hamstrings and calves: please note that the calves and hamstrings are postural muscles that can act phasically on a bike) on and off in sequence in the most precise and efficient way.

The only way to do this is to sit firmly on the ischiums (sit bones) in such a way that there is the minimum amount of weight borne by the upper body that is consistent with steering and controlling the bike. Obviously this cannot be the case when a rider rotates forward around the bottom bracket and bears more weight than necessary on the arms, because this means the recruitment of upper body musculature extraneous to the job of propelling the bike.

B) THE LOWER CROSSED SYNDROME ARGUMENT

We live in a Western culture where we spend an inordinate amount of time sitting - 13 years for six hours a day at school, at work, in a car, bus or train going to work, watching TV, at the computer, and so on. You get the picture. The result of this is that many, many people, certainly a large majority from what I can see, have tight hip flexors. This is because sitting cramps up the hip flexors (psoas, iliacus, tensor fasciae latae, sartorius and rectus femoris) and very few people stretch them out regularly to offset this. Why are the tight hip flexors, that most people have, important? Because if postural muscles like the iliopsoas (iliacus and psoas) are short and tight, not only will

it mechanically limit the range of its antagonist's movement, in this case the gluteus maximus, but also will neurologically inhibit its action as well. This is called 'Sherrington's Law of Reciprocal Inhibition'.

Why is this a big deal?

Because the gluteus maximus is the largest muscle in the body and the prime extensor of the hip! If you want your femur, your primary lever, to descend efficiently during the pedal stroke then ideally this is the muscle you want switched on and strong, not mechanically and neurologically inhibited and weak. (For more info on this, see the articles, 'Sitting Pretty' and 'Still Sitting Pretty' by Andrew Richards in the July and October 2001 issues of *Bicycling Australia*.)

Furthermore, this tightness of the iliopsoas and weakness of the glutes sets up a chain reaction of postural changes, which means tight spinal erectors and weak and inhibited deep abdominal muscles. The net effect of this is known as Lower Crossed Syndrome. (For further information on this syndrome read anything by Dr Vladimir Janda, a Czech Sports Physician.)

Rotating forward around the bottom bracket reinforces this pattern of muscle imbalance!

Usually, moving the seat rearwards to force the hip through a greater range of extension and lifting the bars to open up the angle between torso and hip can address this syndrome, at least on a bicycle.

How can the success of my approach to this problem be gauged? By greater development of gluteal and hamstring musculature over the three to eight weeks of regular riding at low to moderate intensities that are usually required to effect a change in motor patterns for afflicted people. Often down the track, and particularly if these people act on my advice and take up Yoga, Pirates, Tai Chi or similar, then their position needs to be modified again, from what I would describe as a rehabilitative position, to a performance position, consistent with their abilities and proclivities.

C) THE UPPER CROSSED SYNDROME ARGUMENT

This is the upper body version of the Lower Crossed Syndrome. Again this afflicts many people,

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through poor posture, to some degree before they go near a bike. When, as Empfield suggests, you rotate the body position forward around the bottom bracket so as to have a lower torso, it requires a greater range of movement of the neck to lift the head to see forward. This leaves many triathletes and road time trialists who take the Empfield approach with two choices when it comes to looking forward. Look up occasionally and risk crashing or put the muscles that allow them to lift the head under a lot of pressure just to see where they are going.

Michael, you alluded to your own neck problems with this on your time trial bike when you wrote, '... I had a radical frame built for my own use . . . it has been a successful test of rotating my body forward around the bottom bracket (but oh, my aching neck).'

What happens, to a greater or lesser degree, is that the upper trapezius and levator scapulae tighten and inhibit the lower and middle trapezius, the suboccipitals and sternocleidomastoid tighten and inhibit the deep neck flexors and the pectoralis major tightens and inhibits the serratus anterior. That's the jargon. What's the bottom line? The shoulder complex that radical forward position uses to provide stability because of weight bearing becomes less stable and forces the recruitment of even more postural musculature!

This is at the cost of the power producing phasic musculature!

D) THE RESPIRATORY ARGUMENT

Another side effect of 'Point C' is that the tight upper trapezius muscles have a synergistic relationship with the scalenes and intercostal muscles. This brings about what is known as 'Paradoxical Breathing', where chest breathing predominates over abdominal breathing. The mechanics of this are, as far as I can see, that Upper Crossed Syndrome causes a kyphotic (rounded) upper back position, which in turn is maintained by flexion of the trunk. This requires activity in the hip flexors and rectus abdominus (six pack) as they are flexors of the trunk. This prevents the diaphragm from descending fully. Hence afflicted people, and I see plenty, cannot use their full lung capacity! The implications for performance are obvious.

E) THE PAIN ARGUMENT

To quote your letter, you assume that with the forward position, 'gravity ensures that weight is carried more on the arms and forward on the pelvis (onto soft tissue rather than bone), which has implications over long races, but no direct effect for power production'.

I cannot agree with that at all. Comfort and efficiency equal optimum power generation. Anything that reduces comfort reduces power output. Why? When subjected to pain, the body will protect itself. How? By overactivity of the postural musculature and the reciprocal inhibition of power producing phasic musculature. When a rider is suffering from a sore crotch because he is an Empfield disciple and squirms around on the seat, he has to enlist more postural musculature to stabilise him or herself. In extreme cases, and again I have seen plenty, this involves the shutdown of the phasic musculature involved, which in this case, is the glutes and a plethora of compensatory measures all of which conspire to limit performance. The sore neck that you get riding your radical time trial bike will cause an upper body version of this effect, which I largely explained in 'Point C' above.

F) THE GRAVITY ARGUMENT

The acme of position, in my view, is when any given rider is set up in such a way that: They bear their weight largely on their ischiums (sit bones) at little metabolic cost. They have a passively achieved stable pelvis through the harmonious interaction of the glutes, hamstrings, quads and hip flexors and calves. They have a relaxed upper body and can breathe to their fullest capacity and concurrently reach the bars comfortably and exercise all of their available hand placement options whilst transmitting power efficiently to the pedals.

The individual detail of how to achieve this varies almost unbelievably because individuals vary so much in so many ways. It is because of this that the series of articles I have written to date have been more general than I would have liked and have limited application to any specific person. I can only speak in generalities when writing about everybody and unfortunately, as ever, the devil is in the details. However, there is one thing I can say with absolute certainty. Positioned the way I would set any given rider, they are enlisting the minimum musculature to support their weight consistent with the action of riding a bike.



Sound Reasons. Jan Ullrich was the focus of the first 'Positioned For Success' article in *Bicycling Australia* because he slides forward on the seat when under pressure. Steve Hogg says this is caused by poor bike position. Photo: Graham Watson

If you are rotating forward around the bottom bracket then you must by definition use more musculature to support that weight. This means more heartbeats, oxygen and blood flow that would otherwise be used for propelling the bike are diverted to musculature enlisted in supporting that weight. Again this can be accomplished only by a reduction in performance.

Like the advert said, 'wait there's more', but frankly, what I have said should satisfy your concerns.

Why is radical forward position so prevalent amongst triathletes, particularly in the USA? Because aerodynamics is a great marketing tool! Selling product is the name of the game. (While I think about it, look up The Big Slam by John Cobb on www.slowtwitch.com. Here is someone who has realised the shortcomings of forward position, but qualifies this to death and only explains things in a half baked way so as not to offend the prevailing triathlon orthodoxy on that web site. I saw this while looking up the Empfield article to respond to your letter).

Rearward position and aerodynamics are not incompatible. However, to achieve both requires adequate structural fitness. The average level of structural fitness in our society is appallingly low and the appeal of the Empfield approach is that one can quickly become aero without having to do the hard work and improve their structural function. This is lowest common denominator thinking.

In the August 1998 issue of *Bicycling Australia* I wrote, 'If you are using or contemplating using as your sole or major training and competitive vehicle a bike with a seat tube angle of 75° plus, then educate yourself about how your body works and what your potential for problems is and make an informed decision'. I stand by that still.

Radical forward position causes problems that can take anywhere from 10 minutes to 10 years before the athlete is aware that they have a problem. The time taken will depend on the person involved, but it is a matter of when, not if. I approach the task of positioning any given rider with the idea that riding a bike should improve one's health and quality of life and not cause injury time bombs at some future date. Forward Empfield style position will do this slowly or quickly. I see the casualties on a weekly basis. It is my professional experience that the 'successes' of this approach become casualties over time.

Michael, I really enjoyed your letter and it made me get off my bum and get on a computer for the first time in about five years to look up the articles you referred to. I have got more anti-forward position arguments, particularly in the sense that it hampers athletes running off the bike but I will cover those, and recumbents, and Obree style position, and other things that I think are thrown up to support misguided arguments in future articles.

One last thing. To quote you, I 'need to justify your concluding statement concerning the potential to develop 25% more power from position refinement'. You have misquoted me. What I said was 'a 10 - 25% greater output at the same heart rate is typical'.

I get a lot of sceptics coming in and paying their money to see what it's all about, although less every year. If they are really sceptical, I send them away and tell them to come back after they have had a power output test. I set them up and tell them to have themselves tested eight weeks later. The 10 - 25% greater power output is what the former sceptics tell me is typical. Sometimes less, sometimes more.

On another matter, structural fitness is the greatest reservoir of untapped performance potential that we all have. You don't have to sit forward to be low and aerodynamic. It can be done the way I would position a given rider, providing they exhibit adequate structural fitness. Unfortunately as I said, the level of structural fitness in our society is appallingly low.

Why does forward position exist at all? That will also be the subject of an article, so you will unfortunately have to wait. Michael, to answer your question regarding aero-bar set up, yes that is in the pipeline too. If you are ever in Sydney, look me up for a chat.

Steve Hogg is the proprietor of a Sydney bike shop that specialises in fitting cyclists to their bikes. He bases his opinions upon his own research and results and the study of anatomy.

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