

By ZOË SMITH

THE **BIG** INTERVIEW

# Russell Guire

Russell's work involves analysing the biomechanics of both horse and rider to help optimise performance



© Louise Allen Images

“I’ve always been fascinated by how things work and how things move, right from when I was a child.”

Sports scientist, biomechanist, and founder of Centaur Biomechanics; Russell Guire is on a mission to improve horse welfare through science. *IH Magazine* Editor Zoë Smith finds out more about his ground-breaking research into saddle fit, the importance of rider biomechanics, and the role he played in Team GB's 2012 victory.

**F**lashback a few years to the 2012 Olympics and few can forget Great Britain's victorious sweep at the equestrian events. From the triumphs of Britain's first show jumping gold medal in 60 years, to Charlotte Dujardin and Valegro's record-breaking – and gold medal winning – dressage freestyle; this was for many the moment that British equestrian sports finally broke into the mainstream. For Russell Guire and his

company Centaur Biomechanics, Team GB's Olympic success was even more significant. As a sports scientist and biomechanist, his work behind-the-scenes was deemed so consequential, it was dubbed Team GB's 'secret weapon' and kept a closely guarded secret in the run-up to the Olympics. The 'secret' in question? The Fairfax Performance Girth, a world-first in equestrian equipment design and the direct result of a pioneering science study carried out by Russell, along with veterinary surgeon Rachel Murray, master saddler Mark Fisher, and Fairfax Saddles. It's hard to believe that one piece of equipment could make such a dramatic difference, but at Olympic level, where marginal gains can make all the difference, advancements such as these can be critical. What made the girth so special was its ergonomic shape, designed to release pressure on the horse in a way that actually increased limb protraction and flexion, essentially improving the quality and efficiency of the horse's gait. "This was the first product where we found a correlation between reduced pressure and improved locomotion, and it opened up lots of other research ideas." Russell enthuses. Even more fascinating was that the results went against the common thinking. "The girth research was really iconic, not only because of the Olympic attachment, but because [of its surprising results]," Russell continues. "Even today, people think that girth pressure is on the sternum of the horse and we showed that it is not. There is pressure there obviously, but the highest pressure is actually behind the elbow. To this day, when I present this in conferences and I ask: "where do you think the pressure is?" 50% put their hand up for the sternum. I think that's a real game changer."

Watching riders like Carl Hester, Laura Bechtolsheimer, and Mary King soar to the top of the leader boards using equipment that he had helped design was clearly a proud moment, and it also served to put Centaur Biomechanics on the map. "I think that was probably our big turning point in terms of research, when we went from doing small research projects in the UK to doing peer reviewed research on an international level," Russell agrees.

"And obviously the medals we won, to have the girths that we tested being used... that was pretty incredible for us!"

At the time, this kind of high-level performance analysis and specialised scientific research was largely reserved for 'priority' sports like cycling and rowing, but it was the perfect fit for Centaur Biomechanics. Founded by Russell in 2006, the company had steadily been gaining recognition for

its work, using specialised equipment and software to analyse the biomechanics of both horse and rider. This data can be used to aid in a multitude of areas – from helping riders improve their symmetry and effectiveness in the saddle, to diagnosing lameness and gait asymmetries (often undetectable to the human eye), monitoring the effects of saddle fit and other equipment, and ultimately enhancing performance and increasing equine welfare.

**“I became intrigued by how and why horses became injured, how to communicate with horses...”**



The software captures movement 20 times faster than the human eye

## HOW DOES RIDER AND GAIT ANALYSIS WORK?

**To measure the horse's gait, 2D motion capture markers are placed on the key joints and inertial measuring units on the horse's back, while the horse is recorded on a high-speed 400 fps camera.**

The real-time digital data is then fed into Quintic software, a video-based performance analysis system that allows Russell to compare and contrast the movement of the horse on both sides or between different takes. The same process can also be done while the horse is being ridden or lunged to monitor the horse's way of going and the interaction between the horse, rider, saddle, or other equipment.

The same software is used to record the rider, who wears a Visualise training jacket marked with lines that show up any asymmetries in their position. The video playback and software analysis allows the rider to see exactly how balanced and effective their position is during different gaits, transitions, and school movements, including over jumps and in relation to the horse's movement and saddle.

Developed in partnership with leading human biomechanics specialists and able to capture movement more than 20 times faster than the human eye can see, the software is an invaluable tool for accurately assessing any inconsistencies, asymmetries, or lameness that might otherwise go unnoticed.

experience. One of those years I worked for six months with Tim Stockdale, another one I trained in Germany, and I also managed a rehabilitation centre for 16 months. That is what drove me to set up Centaur Biomechanics; to better understand the demands placed on the modern horse. At all levels, not necessary only elite horses, but also your everyday riding horse." >>

# Russell Guire

>> Of course, taking an idea and building it into an effective and profitable business model is easier said than done and Russell admits it was a leap of faith, albeit one that he is proud of. "I graduated on August 14th and on August 16th, I registered my company. I took out a small loan of around £2,700, and that was it! It was as simple as that, but as scary as that! I had no money, I had no career, everyone around me bar a few thought that I was crazy. [Many of them said] 'go and get a job for a few years and see if you still want to do it', but I was determined that that wasn't what I was going to do."

His determination and belief in his idea paid off. But while Russell admits that "It was crazy, as I tell people now!", he didn't go into it blindly.

"I had the idea and ran with it, but I also set some clear goals. [In the beginning], I worked at a hotel alongside starting Centaur and my goal was to work at the hotel for six months and try to be self sufficient enough to be employed full time. And I remember when I gave the hotel my notice, it was 5 months, three weeks, and two days – so I beat my goal! And that was a big step for me, because you go from having a small amount of reliable income to 'right, now you're on your own'. I'm not going to lie, it wasn't all plain sailing, but my attitude is always 'let's do it' and 'it can happen', and I just had to do it. Overall, it's been a great journey and I've had a lot of luck along the way. Although...", he adds, "people do say if you work hard, you get lucky!"

Working hard seems to be a given for Russell. A typical day sees him getting up at 5.30am and riding his own horses before work, then continuing writing up research or processing data until 11pm at night. With Centaur Biomechanics now one of the UK's leading practitioners of equine biomechanics, his days are ever more varied, and a 'typical day' could be working on a scientific research project, speaking at an international conference, presenting on one of Centaur's courses, or hosting a rider biomechanics clinic.

"Working with elite athletes is a huge privilege and a huge honour," Russell tells me. "Every day you're learning something new and tackling different challenges. But it really is the same principle as for non-elite horses. We are [always working towards the same goal], in that we're trying to optimise the welfare of the horse and at the same time we're trying to optimise performance. We want to make the horses more comfortable and happier, and we know from our research that if we do that, they also perform more efficiently. That's great for all riders. That's our passion."

## RIDER BIOMECHANICS CLINICS

Russell's Rider Biomechanics Clinics have become hugely popular in recent years and a large part of their appeal is that they allow any rider from any discipline the chance to benefit from similar kind of performance analysis as Olympic and ParaOlympic riders.

"We screen riders using our state-of-the-art system and it costs £60 so it's fairly affordable to most riders," Russell explains, although he's keen to point out that riders who can't make it to a clinic can still make progress using the same principles at home.

"We designed jackets back in 2011 with lines on and a lot of riders

are buying them and doing their own sort of biomechanics analysis, just videoing themselves riding. Sometimes they send the videos to us for analysis, but a lot of riders do it on their own. That said, we would push for them to have an on and off horse assessment with a physio or biomechanist in order to fully understand the impact that their position has on the horse."

With years of experience analysing data from thousands of horses and riders, as well as being a UK CC Coach and having competed himself in

.....  
**“...we're trying to optimise the welfare of the horse and at the same time we're trying to optimise performance.”**



To train a horse successfully you have to be in the moment

### **i TRY THIS: RIDING WITHOUT STIRRUPS**

.....  
**Sometimes the old methods are the best!** To get a better feel for how balanced your seat is, Russell recommends riding without stirrups. "Just simply going back to traditional methods of riding without stirrups tells us a multitude of things about the rider," Russell says. "For example, if you are on a circle with no stirrups and your seat is sitting to the outside, then you realise that your seat is slipping to the outside. When you have stirrups, it becomes much harder to feel it and you can lose that awareness."

to ride with reins in one hand in a circle and keep the horse on the circle. Correct training should be inside leg to outside rein and they should be able to ride a 20 metre circle with the reins in one hand. If they can't and the horse drifts out, then that's a sign that the inside rein is keeping the horse on the circle. This has biomechanical effects on the horse as well as being incorrect training mechanics."

Before you start panicking about how terrible your own riding position is, it's important to remember that almost all riders – and horses – are asymmetrical and the importance of pointing out these rider faults is so that we can be aware of our natural tendencies and work towards improving them. But does having all this information sometimes get in the way of just simply riding? Russell says that while he and all of his horses have regular biomechanics assessments, it's still important to find the balance.

"To train a horse successfully you have to be in the moment, using your feel, and then analyse it later. So I definitely apply everything I know to the management and training philosophy, but when I am riding, I have a conscious mindset of what I'm focusing on, which is my position and the horse's way of going, and the training, but I try to not to think about the biomechanical details, like how much force is going through each leg!"

"It is widely accepted that we should have our saddles checked regularly, but people still don't"

“...do horses make riders asymmetric or do riders make horses asymmetric, or is it a bit of both?”



**FIND  
OUT MORE**

about Centaur Biomechanics, upcoming courses, and rider biomechanics clinics, visit [centaurbiomechanics.co.uk](http://centaurbiomechanics.co.uk) or find them on Facebook: Centaur Biomechanics

## THE IMPORTANCE OF SADDLE FIT

When analysing the rider's position and the horse's movement, it's important to not forget the other key factor in riding – the saddle.

"One must be aware of the effect that the saddle has on the horse and the rider," Russell tells me, and he points out that 'rider errors' can often be the result of an incorrectly fitted saddle. "The saddle is the connecting platform between these two components. A common occurrence is a rider collapsing the hip because the saddle is going to the outside. So for example, we're on the left rein, the rider is on a left turn, their feet shift to the right which gives the impression that they are collapsing to the left. What you have to be aware of is: has the saddle gone to the right and the rider has gone with it? Or is the saddle straight and it's the rider shifting? Is it a saddle or rider asymmetry?"

Saddle fit has been a key area of Russell's research and if there's one take away from this interview, it's that we should all be getting our saddles properly fitted, and not just when you first buy it. "It is widely accepted that we should have our saddles checked regularly, but people still don't," he laments. "But I think we've really covered some ground with studies that are really educating the end user. What we've shown is that over the years, if you don't have a saddle that fits, the pressures are of a magnitude that could create gait asymmetry. And that asymmetry could be that the horse is stiff to one side, shortens his stride length, or has reduced movement through its back.

"One of the most significant [discoveries] was that pressure in the area between T10-T13 – the area of the thoracic spine where you sit, which is where the saddle is most narrow – can alter the whole of the horse's spine and locomotion. There's an idea in the industry that if you fit the saddle wide, it will allow the horse's back to come up, but we found it actually had the opposite effect. Fitting a saddle wider than industry guidelines can cause a concavity in the muscular at T13 – just in front of where you're sitting. We found that [this caused] the whole of the horse's spine to alter its movement and become stiffer. [The knock-on effect was that] the rider's pelvis was more anteriorly tilted, which then altered the effectiveness of the rider's aids in trot, and in canter, the horse dramatically altered its stride in response.

"For me, that's pretty crazy, because it proves that this blanket approach of 'we'll just put any saddle on' or 'don't worry about the fit of the saddle', or putting a saddle on that's too wide can have major, major consequences on the horse."

The influence of the saddle is of such significance that it's even the focus of Russell's PhD – 'the relationship between saddle and rider locomotion and thoracic-lumbar pressure in sports horses' – which he is currently close to completing at the Royal Veterinary College's Structure and Motion Lab.

"We've shown that rider asymmetry destabilises the horse and that as a result, the horse's locomotion is altered. [We've shown that] when the saddle doesn't fit, or the girth or bridle is creating pressure, or the rider is out of balance, the horse will alter its movement pattern to adapt to the pressures or imbalances created by the equipment or the rider. And that this adaptation can lead to gait asymmetry... What we're really trying to understand now is: does gait asymmetry lead to injury or loss of performance? We don't know the answer to that yet, but we do know that if you reduce pressure on the horse and get the rider more stable, the horse will move in a more efficient manner, which would be conducive to symmetrical movement or improved performance."

"Over the next five years, the key area that we are trying to address is 'do horses make riders asymmetric or do riders make horses asymmetric, or is it a bit of both?' We believe that the horse is naturally asymmetric and the rider has to withstand the propulsive forces generated by the horse in steady-state locomotion (walk, trot, canter). So the question is: are the riders structurally able to withstand those forces, and if they are, then do they optimise locomotion? But with a rider that is also asymmetric, the argument is that maybe they can't withstand the forces, so what we believe happens is that the horse displaces the saddle and the rider, due to the propulsive forces being generated."

Whatever they find, one thing is clear – there will always be more questions to ask and more answers to seek out. But while the complexities of these studies can seem overwhelming, Russell's mission is to make the results of his research accessible and relatable to the everyday rider. "Biomechanics can sound quite scary to people because everyone thinks of it as physics, but if you simplify it and just discuss movement, everyone has the ability to evaluate themselves and their horses." 