

## Studies show the importance of biomechanics for horse and rider

Separate work on rider position has had interesting results for all equestrians and their horses

By ELEANOR JONES

THE importance of rider biomechanics to horse and rider movement and welfare has come into the spotlight with a groundbreaking recent study, and a separate system based on crustacean vision.

Russell MacKechnie-Guire told *H&H* of his new research projects into the effect of knee block design. In a separate project, Ilse Daly's work with mantis shrimp led to her setting up Blackdog biomechanics.

Dr MacKechnie-Guire said his research, accepted for presentation at the British Equine Veterinary Association 2021 congress, shows that knee block design plays a "crucial role" in allowing the rider's pelvis to stay in the neutral position, which benefits equine movement.

The researchers used three-dimensional motion-capture devices under the saddle to record spinal movement; pressure mats under the saddle and rider's seat; and markers – on the rider to record movement patterns, and on the horse to analyse gait. They compared elite-level dressage riders in a standard block and one with multiple layers, including shock-absorbing material, that allowed the knee more freedom.

They found the restriction caused by the standard block pushed the pelvis back; seat bones moving from the lowest part of the saddle to the rise of the cantle.

"With the knee jammed into a



The Blackdog system tracks riders' positions in 3D

big block, the rider is pushed back, hollowing their back as a result," Dr MacKechnie-Guire said, adding with the altered blocks, there was a 15% decrease in spinal rotation in the key T13 area of the horse's back; increased rotation has been shown in studies to be related to spinal instability.

"The restriction destabilises the horse's back, which makes sense, as the rider's centre of mass isn't aligned with the horse's."

The researchers also found increased lateral movement, or suppleness, of the back behind the saddle, which they believe allows better transfer of power from the hindlegs. The riders all reported feeling more "in sync" with their horses in the altered blocks, which fitted with the fact their centres of mass were found to be more aligned with their horses'.

Dr MacKechnie-Guire said: "Riders and trainers have always known a rider with a neutral pelvis and evenly balanced seat is easier for the horse to carry, and this shows there is a significant effect on equine locomotion. Gait analysis showed an increased range of knee, elbow and hock flexion in the modified saddle."

He added that while riders should not feel they must rush to buy new saddles or knee rolls, they should be aware of the issue when next having a fitting or upgrade.

### COMPENSATION

HE said the study shows again the importance of biomechanics.

"It's essential riders at all levels consider all factors," he said. "I'm forever talking about how horses will develop locomotor strategies to compensate for any pain or discomfort. If you're out of balance, you create an asymmetric rotation around the horse's central axis, it develops a strategy to compensate and that becomes normal. You may lose one bend, pull the rein to try to manufacture it, but your steering wheel is turning the horse the other way."

"People need to work with their teams; vet, saddler, physio, coach, and consider every aspect."

Dr Daly said her speciality is animal vision and that to study that of the mantis shrimp, whose eyes move in all directions, she conceived a system that would track vision in 3D. At the time, she was keeping her horse at a yard with no arena mirrors and

could not afford training, but felt her upper body position needed improvement. She realised she could adapt her shrimp techniques to track her position.

She created chessboard markers, worn by the rider, from which software can track every aspect of position in 3D. A report is generated on the spot, on what the issues are and how severe.

"It's not intended to replace coaches, but to give riders more feedback and coaches help to see more," Dr Daly said, adding that the programme identified an issue she had. Once corrected, her horse moved more freely.

"Positional issues can have such a huge impact," she said. "Even a small shift in position can mean you're not giving your horse the aids it needs."

Dr Daly said she is building a network of human and equine physios, so any issues can be referred, and feedback gathered.

"I think we lag behind some sports in not being as joined up, or using technology as much as we could," she said. "I think tech can start to play more of a role in the equestrian world and I'm really excited about being part of that."