Down to the bare bones

Gillian Higgins believes that, by understanding how our horses move, we'll be able to ride more effectively

The world's best riders don't rely on natural talent and a top trainer alone; they have an extensive support crew, from psychologists to nutritionists, whose expertise polishes their performance. The good news is that this advice isn't reserved for the pros. Over the next few issues, *Horse* will be divulging the experts' secrets to any rider, whatever their level of experience, helping them become the best riders that they can be.

THE EXPERT

Gillian Higgins is a sports and remedial therapist, specialising in assessing and mobilising muscles to improve a horse's performance.

She lectures all over the world in horse anatomy and biomechanics and has a First Class Honours Degree and Human and Equine Remedial Sports Massage qualifications. She is also a McTimoney-Corley Animal Manipulator. Gillian is a BHS Intermediate Instructor and competes in affiliated eventing, dressage, showjumping and team chasing.

For more information visit: www.horsesinsideout.com

Pictures: Gillian Higgins, www.horsesinsideout.com

"The horse must be allowed to drop his neck to lift his forehand"

Gillian Higgins has worked with the British Equestrian Federation's World Class squad riders, but she also hosts demonstrations for all and holds evening lectures in conjunction the British Horse Society. Her aim? To educate riders and trainers in how an understanding of horse anatomy can improve their ability to ride and teach.

Her work highlights just how much the horse has to utilize his whole body in order to be able to jump a single fence. This, in turn, hammers home how important it is for a rider not to interfere with the horse's movement – particularly allowing him his head and neck – on the approach to and over a fence.

Riding instructors tell pupils over and over to "give with the rein" and "let him have his head" when jumping. But how many riders still hang on to their horse's mouths over a fence? By understanding how a horse's body works when jumping, you'll realise why this age old advice really is imperative.

The neck as a balancer

Approaching a fence, the horse lifts his head and neck up in order to affect his centre of mass – to hold his weight off his front end.

Gillian explains: "He needs to move his neck by 10cm just to affect his body by 1cm."

This is why, when a horse gets in deep to a fence, he has to raise his head in order to help his balance. If he's not able to do this, he will go through the fence.

"When the horse lifts his head up, his back comes down and conversely when his head comes down, this pulls on his back ligaments and so the back comes up," says Gillian.

So the "bascule" [the rounding of the back] that we want from a horse when he jumps, is created by the horse lowering his head over the fence and in turn rounding his back.

"He must be able to drop his neck in order to lift his forehand up," says Gillian.

"When he extends his head and neck up, he lengthens his forelimb, whereas the opposite occurs when the horse bascules – his head and neck come down and the forelimbs come up," she adds.

When the neck is short, perhaps being held in by restrictive reins, the horse cannot extend his hip out so far. In contrast, if you look at a

THE PERFECT JUMP

The horse crouches towards the ground like a cat, lengthening his stride. As he comes into the take off, he lifts his head to shift his centre of mass backwards.

His forelimbs extend, and he pushes with his thoracic sling to lift his body off his forelegs.

His flexor muscles contract to bring his hind leg underneath him. He flexes at his lumbar vertebrae, his hamstrings come into play and his strong hind legs act to push his whole weight off the floor – and he's air born.

The horse's hind limbs are designed to 'push'

racehorse allowed to have his neck stretched right out, this allows the maximum extension of his hip joint.

"When jumping, the horse pushes his head forward at the last moment before his hind legs leave the floor," says Gillian. This allows for the same extension of the hip.

What else happens on take off?

Gillian explains how, when a horse takes off, he uses his hamstrings, gluteals and then the muscles over his back. The flexor chain of muscles [see the diagram on page 32] help bring his hindquarters further under his body. "The further they come under, the more easily weight can be taken on his hind legs and so the bigger the jump," says Gillian, advising: "You can use rein back to strengthens these flexor muscles."

It's these muscles that the horse uses to hold himself back off a fence, too, if he is getting too close to the jump for take off.

Once in the air, the horse utilizes his back muscles – to extend his back and help lift his hind legs up – and his flexor muscles to 'round' his back.

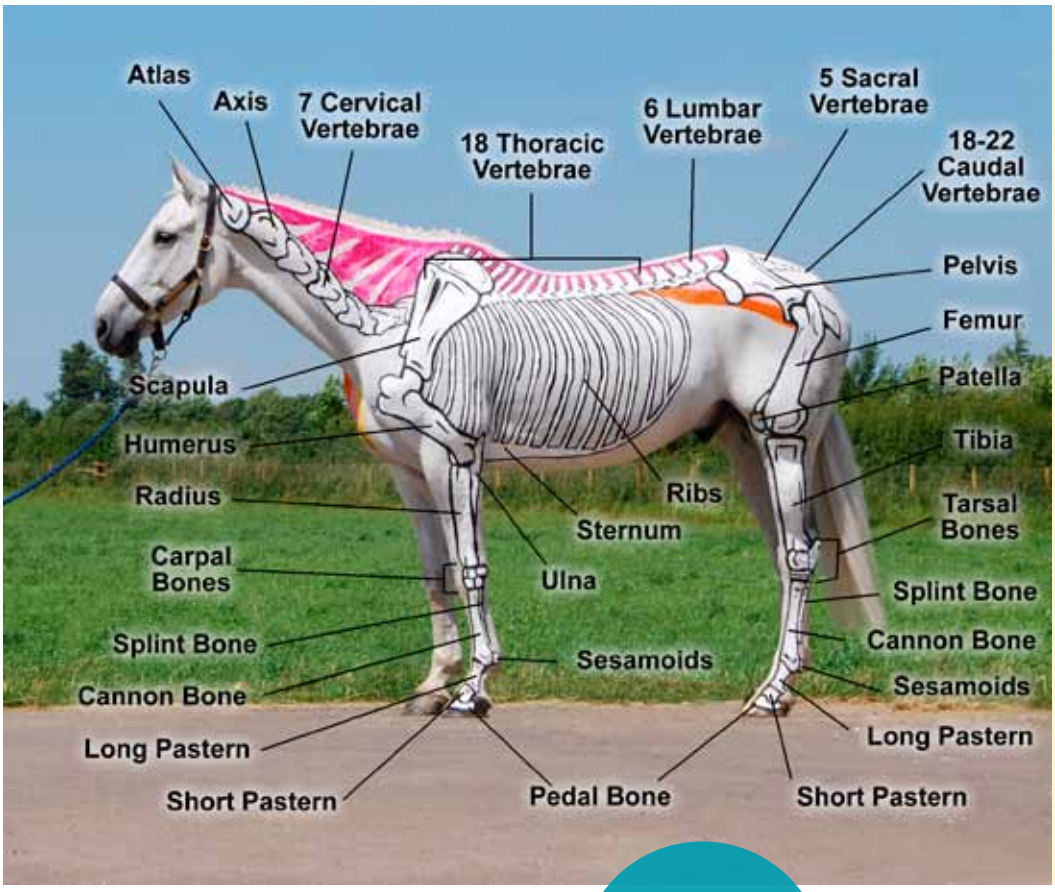
On landing, the forelimbs act like a pole vault. "They are kept straight and the horse's weight is pushed over them," explains Gillian. "The forelimbs are not attached by bone – horses don't have collarbones. Instead, the thoracic sling muscles suspend the thorax between the horse's front legs. When the thoracic sling contracts, the horse's withers come up."

So on take off, these muscles help raise the horse's forehand. And as the horse becomes more toned in these muscles, he will hold himself a little bit taller naturally.

"On landing, the thorax continues down and then up while the horse's forelegs are on the floor – acting like a car's suspension," adds Gillian.

Landing force

Ligaments are what attach bone to bone in the horse. The suspensory ligament, for example, holds up the horse's fetlock, and can withstand considerable strain when jumping. "It can take up to 150kg of weight," says Gillian. "The lower leg as a H))



SKELETON

There is a slight "V" shape in the bones in the horse's neck, which allows him to shorten and extend his neck – as he needs to do over a jump.

The cervical vertebra sits quite low in the horse's neck.

The horse's forelimbs are designed as columns for weight bearing – they don't feature all the angles that you will see in the hindlimbs.

The horse is designed to keep his back as still as possible, in order to protect the spinal cord.

The sacroiliac joint is fixed, and it's the lumbo-sacral junction – the joint between the lumbar vertebrae and sacroiliac – that works as a hinge – moving the sacroiliac, which in turn tilts the pelvis. You'll see this happen in canter pirouettes, jumping, and sliding stops.

The hindquarters are the powerhouse of the horse, made up of big, strong bones designed to create and withstand enormous force.

whole can take a tonne."

On landing after a fence, it's the horse's trailing forelimb that takes the majority of his weight, plus that of the rider. "A horse landing after a 1m10 jump, with no rider, absorbs 2.5 times his body weight through the trailing front leg," explains Gillian. "The joints themselves can't flex to absorb the concussion, so the fetlock and carpus hyperextend." This is when you'll see the horse's fetlock come into contact with the floor on landing. "The more it extends, the more it will then 'ping' back, getting out the way of the hind leg that is quickly coming down behind it in the same spot." The strain put on the horse's ligaments and tendons when jumping highlights the importance of protecting and strengthening these areas in order to avoid injury. "Other than when trauma is involved, tendon injuries are basically repetitive strain injuries," warns Gillian.

The lumbo-sacral junction, which tilts the horse's pelvis, can be made more flexible by riding a grid of bounce fences.

MUSCLES

When the muscles along the top of the neck relax, the ones underneath the neck contract – creating flexion.

When the abdominal muscles contract, the back flexes over. The abdominal and back muscles work together to stop over extension of the back.

The gluteal muscles are big and strong. They create extension of the horse's hip joint and help to extend the lumbar junction.

The extensor muscles are responsible for pushing the horse forward. They help the horse to buck, rear, and generally lift their forehand – the more a horse can bring his hindlegs underneath him, the more he can lift his forehand.

The extensor muscles are stretched and developed by carrying out hill work