Stuck in the past: are we listening to equine back research?

By Jean Luc Cornille | 15 August 2013

Since the inception of the Immersion Programs I have observed that going through the history of equine research studies has better helped riders, trainers and therapists to understand how the horse's vertebral column effectively functions.

This history affords the participants a greater accuracy as well as an evolution from the simplicity of past theories to the complexity of actual knowledge. Studying the past reveals the origin of theories that still promoted today, and just how long it has been since they have progressed.

This text is, of course, just a brief summary of the original lecture.

It is true that the fascicles of the main back muscles are inserted obliquely on the dorsal spines. The fascicles of the longissimus dorsi muscles are oriented oblique, down and forward while the fascicles of the spinaleus dorsi and more exactly the multifidius, are oriented oblique, down and backward. Their action induces rotary forces on the dorsal spines and correspondent vertebrae.

This was explained by E. J. Slijper in 1946.

The Dutch scientist also described the horse's vertebral column functioning as a "bow" that can be flexed by the action of the "string", which is composed of pectoral and abdominal muscles. The theory was referred to as the "bow and string concept."

With some variables, this is basically the concept behind most actual riding techniques as well as the concept supported in the video that started the discussion.

The problem is that the concept was presented in 1946. Scientific findings and therefore knowledge has greatly evolved since 1946. In 1964 Richard Tucker explored the thought that acting on the dorsal spines, the back muscles were allowing the vertebrae to transmit the thrust generated by the hind legs into horizontal forces, (forward movement), and to create vertical forces resisting gravity and therefore permitting balance control.

Tucker furthered Slijper's description explaining how, through their insertion on the dorsal spines, the muscles were compressing the vertebrae against each other favouring forward transmission of horizontal forces, (forward movement.) Simultaneously back muscles are inducing rotary movements of the vertebrae creating vertical forces, (resistance to gravity and balance control.)

Tucker moved away from the simplistic idea that the thoraco-lumbar column was flexing and extending as a whole. The Polish scientist pointed out that due to the curvature that characterizes the shape of the horse's thoracolumbar spine, the vertebrae and muscles situated on the ascending side of the curvature were working in the opposite way than the vertebrae and muscles situated on the descending side of the thoracolumbar curvature.

In 1969, James Rooney demonstrated that the work of these muscle groups, which are arranged in mirror images, has to be perfectly synchronized to ensure proper locomotion. If the fascicles of the longissimus muscles contract first, the thoracic spine extends. If the fascicles of the spinaleus dorsi contract first, the lumbar spine stiffens.

Rooney basically demonstrated the damage created by the shifts of the rider's weight, which is a theory that is still emphasized in modern days. If the rider's weight is acting back to front, as emphasized in the driving seat theory, the rider stiffens the horse's thoracic vertebrae. By contrast, if the rider's weight is acting front to back, the rider stiffens the horse's lumbar vertebrae.

Rooney's findings suggested an equitation based on a rider's body maintained constantly on a neutral balance, which is exactly vertical over the seat bones.

One of the defenders of the long and low theory referred to "Pilates." If this person really knew Joseph Pilates' approach, she would have realized that maintaining the rider's body in perfect neutral balance and therefore with the vertebral column almost straight is Pilates' real teaching. Her perception of Pilates for the horse is that the abdominal muscles flex the thoraco-lumbar spine.

This is not Pilates' teaching. The real Pilates idea is to balance the work of both abdominal and back muscles to straighten the spine.

Rooney's work also suggested that the real relation between the horse's vertebral column and the rider's back was more at the level of subtle movements of the rider's back instead of shifts of the rider's weight. In relation to the work of the back muscles, Rooney's explanation differed from Tucker's view.

However, understanding how the horse's vertebral column converts the thrust generated by the hind legs, which is basically a horizontal force, into forces resisting gravity, which are vertical forces, is easier to visualize mentally with Tucker's explanation. This does not mean that Tucker's explanation should be taken word for word.

All these explanations are attempting to describe forces, which is an abstract concept. True understanding demands several ideas aiming toward the same concept. Rooney's insight was that the creation of upward vertical forces through the spine was achieved by the direction of the muscles' work without inducing much movement of the vertebrae.

The pathologist explained that in order to create horizontal forces, (forward movement,) and vertical forces, (resistance to gravity and balance control), two muscles are needed, one acting horizontally and one acting vertically, or, a single muscle acting in an oblique manner. Such insertion allows the same muscle to create both horizontal and vertical forces. This is exactly how the fascicles of the main back muscles are oriented and function.

This was the beginning of a long series of research aiming toward a functioning of the horse's back muscles based on the subtle management of forces instead of increasing the movements of the vertebrae.

This was 1969 and we were, at that time, already far away from the infantile idea that a single action such as lowering the neck could flex the whole thoracolumbar spine and also that gaits and performances can be improved by increasing the range of motion of the horse's thoracolumbar column.

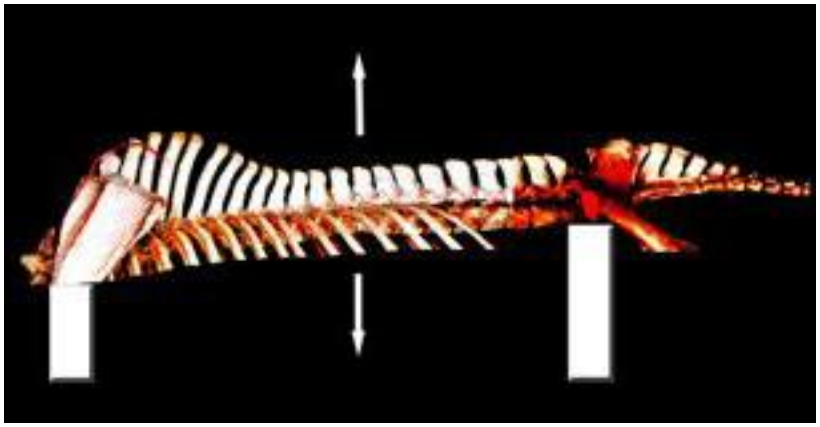
Rooney also questioned the veracity of the bow and string concept. As a pathologist, Rooney observed firsthand the discrepancy between the large mass and power of the back muscles and small mass and limited power of the abdominal muscles. We have recently published a picture showing a cut-away of the back muscles and by comparison a cut-away of the abdominal muscles executed at the same vertical plain. Rooney basically demonstrated that abdominal muscles do not have the capacity to flex the back muscles. Longitudinal flexion of the horse's thoracolumbar spine is instead, created by the precise coordination of the main back muscles that are situated above the vertebral bodies.

Rooney's work suggested that the contraction of abdominal muscles would assist the flexion of the back but not create it. Instead of lowering the horse's neck and stimulating hind legs engagement, the flexion of the horse's thoracolumbar column is more likely to occur through harmonic motion of the rider's back influencing the work of the horse's back muscles.

Three and half decades later, uneducated trainers and riders are promoting the lowering of the neck as a new way to engage the horse's back. Even if equine research studies were brought to a complete halt, the practical application of available knowledge would considerably enhance the horse's performances and in particular the horse's soundness.

Very few of today's advanced scientific discoveries benefit the horse through better training and riding techniques. The reason is that instead of questioning old ideas in the light of new findings trainers, riders and judges are integrating new discoveries to old beliefs.

Considering the cost of raising, maintaining and training a horse, it is incomprehensible that the practical application of modern science, which could greatly prolong and further the horse's career, preserve the horse's soundness and consequently cut the vet bills, is rejected in favour of archaic but familiar approaches.



The horse' vertebral column functions within the limits of a very limited range of motion.
In1976 Hans Carlson demonstrated that the main function of the back muscles was not to increase the range of movement of the horse's vertebral column, but at the contrary, to protect the vertebral column from movements exceeding the thoracolumbar spine's possible range of motion.

Uneducated riders argue that the study was made on cats. Carlson's study was effectively effectuated on cats, which demonstrates that visual impressions can easily lead to the wrong perception.

Multiple studies have then been done duplicating the same protocol and the findings were similar with horses and most terrestrial mammals.

Basically, all the theories promoting better performances and gaits through stretching and greater amplitude of the horse's vertebral column movements are in direct contradiction with the way the horse's vertebral column and surrounding muscles are designed to work.

In 1980, Leo Jeffcott measured the range of possible movement of the horse's vertebral column. Many studies after Jeffcott found differences in the location of vertebral column movements but they all found a limited range of motion.

Basically, the back muscles do not increase the vertebral column range of movement but, at the contrary, resist forces induced on the horse's vertebral column in order to maintain the vertebral column movements within the limits of its possible range of motion. This was 1980 and it was already demonstrated that theories such as the swinging back and stretching were in plain contradiction with the way the horse's vertebral column and back muscles operate.

At this point of knowledge, the thought that the horse's thoracolumbar column was flexing longitudinally and laterally as a whole was totally blown away.

All investigations clearly demonstrated that while greater movements were possible between T9 and mostly T14, while some horses show mobility until T16, the rest of the horse thoracolumbar spine was quite rigid. Movements occur but within the limits of a restricted ranged of motion.

In 1999, Jean Marie Denoix published a comprehensive study on the functioning of the horse's vertebral column. Among the pertinent discoveries was the way each vertebra rotates in relation to the other. Denoix's research presented a work of the back muscles quite different than previously believed.

Tucker for instance, theorized that lateral bending induced pressure on the inside side of the vertebrae. Denoix demonstrated that in fact lateral bending was created by a rotation of one vertebrae around the other. He was the first to present a comprehensive study about the fact that lateral bending is always coupled with a movement of transversal rotation and that rotation is, also, always associated with lateral bending. In line with James Rooney, Denoix's work demonstrated that gaits and performances were the outcome of back muscles creating and orchestrating forces instead of inducing greater range of motion of the vertebrae.

Before the birth of the 21st century, scientific research had already demonstrated that all forms of equitation based on increasing the horse's vertebral column range of motion was not only antiquated but contrary to the way the horse's vertebral column effectively works.

Muscle function and architecture is now also understood at a much deeper level. The involvement of the horse's vertebral column into gaits and performances is more about muscles creating and orchestrating forces than muscles moving vertebrae.

For centuries, horses have been forced to execute movements of the back that their vertebral column was not designed to create. In fact, they did not increase the range of motion of their vertebral column for the very simple reason that their vertebral column mechanism does not allow greater movement. Instead, they found ways to compensate for the incongruity of their riders' demand. The best horses did not increase the amplitude of their vertebral column's movement

but instead, the subtle coordination of forces, giving to the rider an impression of ease that the rider interpreted as relaxation, stretching, swinging back and other misconceptions.

Some horses have succeeded to figure, within the incoherency of the rider's stimulus, how to orchestrate more or less appropriately their physique for the athletic demand of the performance. Many others have tried as hard as their talented peers but nature did not give them the same athletic and mental abilities and they succumbed to lameness.

One of the most common deceptions is the belief that the lowering of the neck flexes the lumbar vertebrae and increases their range of motion. The optical illusion was explained in 1986 by Jean Marie Denoix. The lowering of the neck reduces the mobility of the lumbar vertebrae. This is true for every horse. Stiffening of the lumbar vertebrae hampers proper dorso-ventral rotation of the pelvis and therefore sound kinematics of the hind legs.

In order to compensate for the stiffening of the lumbar vertebrae, the horse increases the work of the iliopsoas muscles, which swings the hind limbs forward. Since the iliopsoas is placed under the lumbosacral junction, increased work of the iliopsoas muscle does induce greater rotation of the lumbosacral junction. This lumbosacral rotation does give the optical illusion that the whole lumbar region moves. In fact, the lumbar vertebrae do not flex. Instead, the horse compensates for the rigidity of the lumbar spine, which was created by the lowering of the neck, with greater intensity in the lumbosacral junction that is situated behind the lumbar vertebrae.

The theories of relaxation, stretching and greater mobility of the vertebral column are naïve interpretations of a mechanism which in fact, is working exactly the opposite way.

Today's knowledge allows returning the favour to the horse. The practical application of advanced scientific knowledge permits us to understand how the horse's back effectively functions and how the rider can guide the horse's brain toward efficient coordination of the vertebral column mechanism. This is done by reducing the range of motion of the rider's back and matching the range of motion of the horse's back.

Through a subtle body language, the rider guides the horse's brain toward the body coordination appropriate for the effort. This is classical training.

In the 17th century The Duke of Newcastle talked about the stability of the rider's pelvis. The classic author uses the terms "unmovable pelvis."

The practical application of pertinent scientific discoveries commences by questioning old theories in the light of new knowledge. It is astounding that instead of upgrading their training and riding techniques to the findings of modern research studies, trainers deliberately refuse new knowledge under the name of tradition. They submit their horses to the same incongruities and suffering as the horses of previous generations. It is equally astounding that riders follow and even protect these primitive ideas.

Fortunately, there are also trainers who evolve, upgrading their techniques with true knowledge. In the same line of thought, there are riders who do not let their horses be damaged by submissive and uneducated training techniques.

One of the great horses that we have in training right now had the luck to belong to a rider who refused poor training techniques. The rider stood up for her horse and the horse, which was born as a good horse has evolved into a great horse. We have today, the capacity to prepare efficiently the horse's physique for the athletic demand of the performance. We owe this knowledge to the horse.

Refusing progress and perpetuating old and heretic beliefs is not classic; it is archaic. If one wants to protect the horse from rollkur, draw reins, deep work and other exploitations, one needs to evolve from the common denominator of all these poor training techniques, which is ignorance. A real classic trainer learns how the horse's body effectively works and then applies the motto of the most classical school of riding.

"Respect for tradition should not prevent the love of progress." (Colonel Danloux, Cadre Noir de Saumur, 1931)

Simplistic representations illustrate the longissimus system as a long and thick bungee cord stretching from the sacrum to the fourth cervical vertebra. Based on such schematic illustration simplistic thoughts deducted that the lowering of the neck elongated the horse's whole top line.

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About the Author
Jean Luc Cornille M.A. (M.Phil) has gained worldwide recognition by applying practical science to the training of the equine athlete. Influenced by his background as a gymnast, Jean Luc deeply understands how equine training can be enhanced by contemporary scientific research. A unique combination of riding skill, training experience and extensive knowledge of the equine physiology enables Jean Luc to "translate" scientific insights into a language comprehensible to both horse and rider. This approach has been the trademark of his training.