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Core Training Works!

A little unmounted exercise can produce a big payoff in the saddle

By Hilary M. Clayton, BVMS, PhD, Diplomate ACVSMR, MRCVS

Regardless of the type of activity they participate in, athletic horses benefit from performing exercises that improve their flexibility and muscular strength. For dressage horses, we believe that core-training exercises are particularly important for developing the type of strength needed to perform correctly with the back rounded, and to protect against the development of back pain due to instability of the intervertebral joints.

The results of a recent research study of the effects of regular core training have recently been published in the *Equine Veterinary Journal*. The results show that core training is, indeed, an effective type of exercise to strengthen the muscles that stabilize the horse's back during athletic performance.

Muscles That Benefit from Core Training

Before I describe the research results, let's take a step back and review the structure and function of the muscles that affect the horse's back.

The "bow and string" theory indicates that the horse's spine acts like a bow that can be flexed by contraction of the muscles below the spine. These include the sublumbar muscles and the abdominal muscles. The abdominal muscles, which are arranged in layers, surround the horse's belly, supporting and protecting the internal organs.

The innermost layer, which is closest to the internal organs, is the transverse muscle (*transversus abdominis*). It acts like a belt around the abdomen and, when contracted, increases the pressure inside the abdomen. When you pull your own belly button to your spine, you activate the transverse muscle and use it to stabilize your core. A horse should use his transverse muscle in the same way to stabilize his core in preparation for and during locomotion.

Two layers of oblique abdominal muscles (internal and external) surround the transverse muscle. They assist in stabilizing the core, rounding the back, and bending the back. The *rectus abdominis* muscle (the "six-pack" muscle in humans) runs lengthwise underneath the horse's belly. When it contracts, it helps to round the back and tuck the pelvis.

The sublumbar muscles are inside the horse's abdomen, where they run from the underside of the vertebrae in the area behind the saddle to the front of the pelvis and femur. Because these muscles are inside the abdomen, they're not visible from the outside. Contraction of the sublumbar muscles pulls the front of the pelvis forward (tucks the pelvis) and pulls the femur forward (flexes the hip). These actions engage the hind limb under the horse's body.

The back muscles lie on either side of the spine. We can divide them into two groups: the long back muscles and the short back muscles. The long back muscles (*longissimus, iliocostalis*) have long fibers spanning the entire length of the back. When these muscles contract together on the left and right sides, they hollow the back. When they contract on one side, they assist in bending the back. The long back muscles are not able to isolate their effect to a specific segment of the spine.

The short back muscles (Figure 2) are underneath the long back muscles, adjacent to the vertebrae. These muscles connect adjacent vertebrae so they can act on a specific joint or series of joints; therefore, they have a much more localized effect on specific parts of the spine than the long back muscles.

As the horse moves, the short back muscles act together with the transverse abdominal muscle to stabi-

FIGURE 1. *Examples of the dynamic mobilization exercises used in this study. From left: chin-to-chest, chin-between-fetlocks, and chin-to-hock. Note the activation of the abdominal muscles to bend the spine and the muscles around the hip joint that stabilize the horse's hip and pelvis in the photo on the right. This exercise is equivalent to a lateral crunch.*

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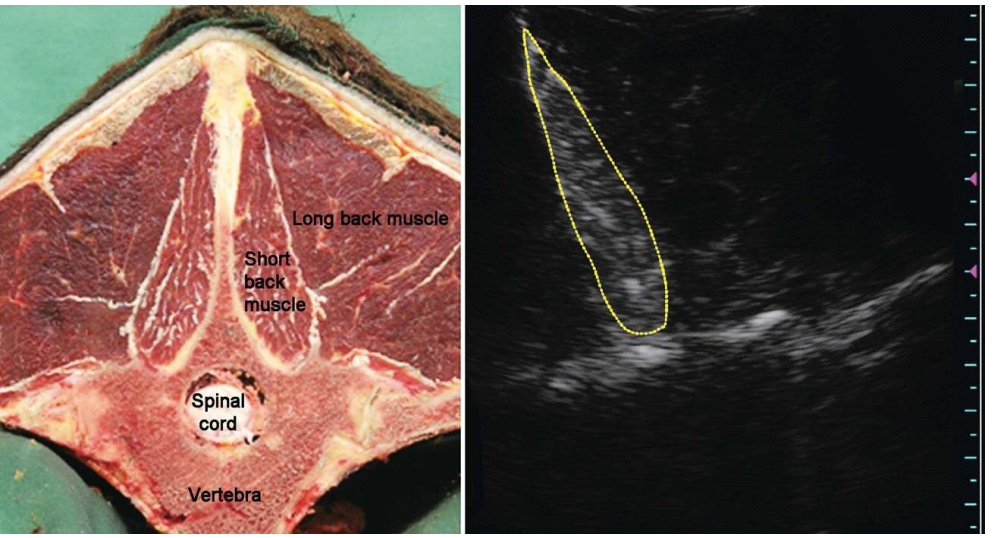

FIGURE 2. *Left: anatomical cross-section of the horse's back showing the short back muscles on each side of the spine of the vertebra, with the long back muscles around them. Right: ultrasound image showing the short back muscle (multifidus) outlined in yellow. On both images, the short back muscle has a more fibrous composition than the adjacent long back muscle, which gives it a whiter, more grainy appearance on the ultrasound scan.*

lize his back, especially during highly collected movements and in movements such as flying changes, in which the back must provide stability when the limbs are moving in different gaits and coordination patterns.

Back Movements

The horse's back is supported by the forelimbs at the withers and by the hind limbs at the croup. Between these supported areas the back tends to sag because it is pulled down by the weight of the internal organs. The extra weight of a rider makes the back sag even further. One of the challenges of training is to teach the horse to use his muscles in such a way that he can stand and move at different gaits with his back rounded, even under a heavy rider. This implies that the horse uses his abdominal and sublumbar muscles to overcome the natural tendency of the back to become hollow.

At the same time, the transverse abdominal and short back muscles stabilize the intervertebral joints in the rounded position. The horse needs to learn when and how to activate these muscles to create roundness, and then must strengthen the muscles so that the roundness can be maintained throughout the training session.

A horse naturally turns by leaning his body to the inside and swinging his neck to the outside of the circle line as a counterbalance. We see this when a young horse falls onto his inside shoulder rather than lifting the shoulder and bending to the inside. Through correct training, the dressage horse learns to make a turn or circle with the body and limbs vertical and the spine bent to match the curvature of the line of travel. The smaller the circle, the more bending is required and the harder the muscles (oblique abdominal and long back muscles) have to work to create that bend. This is why we start working on large circles and then decrease the diameter as the bending muscles become stronger.

Dynamic Mobilization Exercises

Dynamic mobilization exercises are a subset of the core-training exercises that are used to activate and strengthen the horse's core musculature. The term "dynamic" indicates that the horse is actively using his muscles to move his body. "Mobilization" implies that the exercises require stretching

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A Core-Training Testimonial

I am a firm believer that our horses' posture is inherent to their ability to perform. There are ways we can help our horses, both before and after riding, to have the best posture possible.

Before tacking up my horse, I use a series of core-strengthening exercises that enable me to read my horse's flexibility and comfort level before starting work that day. They also begin the process of helping my horse come into optimal performance readiness. These exercises stimulate lowering and rounding of the croup, lifting of the back, and rounding of the neck. After the work is over, I repeat the series of exercises.

I have found that the use of these exercises to encourage good posture and flexibility goes a long way toward making our horses more comfortable when they work for us each day.

—Susanne Hassler
Trainer and international FEI competitor
Director of marketing and breeding,
Hassler Dressage, Chesapeake City, MD

and therefore have a suppling effect. However, we believe the main benefit of these exercises lies in their ability to activate and strengthen the muscles that are used to round, bend, and stabilize the horse's spine.

In these exercises, the horse is taught to make a controlled movement pattern by following a bait (usually a piece of carrot) or a target through a specific movement pattern that involves rounding and/or bending the neck and back. Rounding exercises move the chin to the horse's chest, between the knees, or between the fetlocks; a neck-extension exercise stretches the neck forward; and bending exercises take the chin around to the side toward the girth, the hip, or the hock (Figure 1).

In order to achieve and maintain these positions, the horse must move his neck to the required position while at the same time moving and stabilizing his back and limbs to keep his balance. A large number of muscles are recruited. If you watch closely as a horse does these exercises, you can see contractions in the abdominal and back muscles as well as in the pelvic, hamstring, and chest muscles.

For more details on the dynamic mobilization exercises, see "Sport-Horse Connection: Oh, My Aching Back," June.

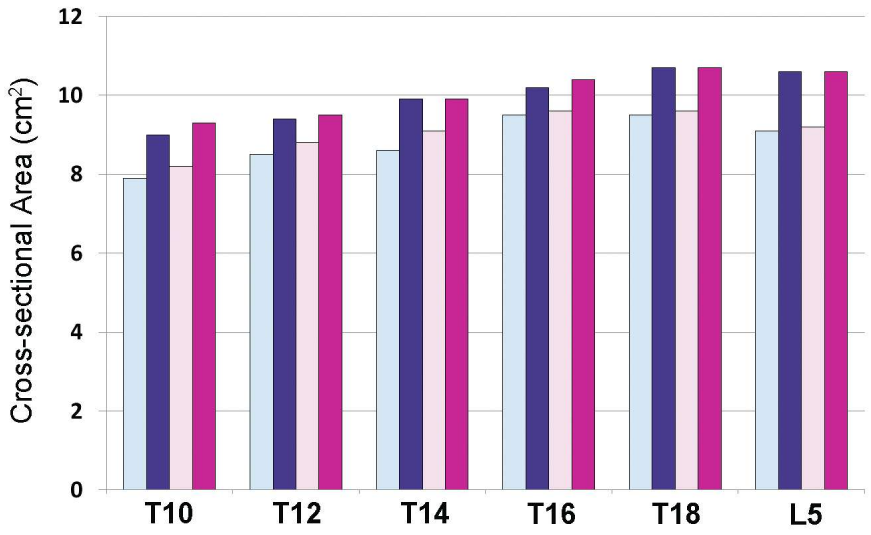

FIGURE 3. *Graph showing the average cross-sectional area of the short back muscles on the horse's left (blue columns) and right (pink columns) sides at the levels of the tenth thoracic (T10), twelfth thoracic (T12), fourteenth thoracic (T14), sixteenth thoracic (T16), eighteenth thoracic (T18), and fifth lumbar (L5) vertebrae. Light colors represent measurements at the start of the study; dark colors represent the end of the study. Note that the dark columns are always higher than the corresponding light columns, indicating that the area of the muscles is larger after doing the dynamic mobilization exercises for three months at all six spinal levels and on both the left and right sides.*

The Research Study

Although we can see many muscles being activated when horses perform the dynamic mobilization exercises, we wanted to prove that these muscles were strengthened by regular performance of the exercises.

In humans, the short back muscles become inactive after an episode of back pain. Even after the back pain resolves, these muscles do not resume their normal function of stabilizing the back in preparation for and during different types of exercise. Our previous research has shown that horses respond similarly because the equine short back muscles become smaller (atrophied) in association with certain causes of back pain. The long back muscles attempt to compensate for the loss of back stability by going into spasm, but this is ineffective in stabilizing the individual joints between the vertebrae.

In order to measure the effects of the dynamic mobilization exercises on the short back muscles, we set up a research study involving a group of eight school horses that were on summer vacation from their regular lesson program. Such horses would be expected to have episodes of back pain during their careers.

During our study, the horses were stabled at night and turned out in small paddocks during the day. They

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The Next Step

REHAB: *Core-training work may benefit horses recovering from colic surgery*

Based on our findings to date, we believe that core-training exercises will be very useful in rehabilitation of horses that have had colic surgery. Many of these horses lose tone in the abdominal muscles, which allows the belly to sag. By introducing core training at the appropriate time in the rehabilitation period, it should be possible to reactivate and strengthen the abdominal muscles and restore their normal function.

We are proposing to design a complete physical-rehabilitation program for horses that are recovering from colic surgery. The program will incorporate core-training exercises along with exercises performed from the ground, in hand, or on the lunge, using therapeutic equipment to activate the abdominal muscles during exercise. This work will be followed by a progressive exercise program under saddle.

The goals of the colic-rehabilitation program are to limit muscular atrophy in the post-operative period and to retrain the core musculature so that the horse can return to full athletic performance as quickly as possible. The time at which different exercises are introduced will be based on knowledge of the rate of healing of the abdominal wound and the muscular response to exercise. Horses will be monitored physically and ultrasonographically through the first year after surgery to assess the benefits of the exercises and, if necessary, to modify the training recommendations.

We are looking for sponsors to support the cost of this study. All donations are welcome. For further information, contact the McPhail Equine Performance Center's physical therapist, Dr. Narelle Stubbs, at stubbsn@msu.edu.

were fed to maintain the same body weight throughout the three-month study period. Each horse performed a series of dynamic mobilization exercises five days per week for three months—long enough to stimulate muscle hypertrophy (increase in size) in response to exercise. The exercises performed were three rounding exercises (chin-to-chest, chin-between-knees, chin-between-fetlocks), one extension exercise, and three bending exercises (chin-to-girth, chin-to-hip, chin-to-hock). Each exercise was repeated five times per day, and the bending exercises were performed five times on each side. We used ultrasound scans to assess the effect of the exercises on the short back muscle (*multifidus* muscle), measuring the muscle's cross-sectional area at the start and end of the study.

After doing the dynamic mobilization exercises regularly for three months, all of the horses showed an increase in size (hypertrophy) of the short back muscles. At all six spinal levels where measurements were made, the ultrasound images showed significant enlargement of the short back muscles on both sides of the spine (Figure 3). In other words, these muscles had increased in size in horses that were effectively on "bed rest" except for performing the dynamic mobilization exercises. Based on data from human studies, it seems very unlikely that these muscles would have increased in size as a result of resting.

This is an exciting result because it is the first scientific proof that core-training exercises have beneficial effects. These exercises are equivalent to those used by physical therapists to restore muscle function and back stability in human patients with back pain. We anticipate that the beneficial effects of core training will also improve dressage performance by making it easier for the horse to round and stabilize his back, and that the risk of injury will be reduced because the short back muscles will prevent micro-motion at the intervertebral joints—which predisposes the horse to the development of arthritic changes. ▲

Digital Edition Bonus Content

Read the scientific summary of the McPhail Equine Performance Center's research study on the benefits of core training for horses.

Meet the Expert

Hilary Clayton, BVMS, PhD, Diplomate ACVSMR, MRCVS, is a world-renowned expert on equine biomechanics and conditioning. Since 1997, she has held the Mary Anne McPhail Dressage Chair in Equine Sports Medicine at Michigan State University's College of Veterinary Medicine, East Lansing. The position focuses on dressage- and sport-horse-focused research. Dr. Clayton is a USDF gold, silver, and bronze medalist and a member of the US Equestrian Federation Dressage Committee.

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