# Core Training and Rehabilitation in Horses

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**KEYWORDS**

• Horse • Back pain • Core training • Dynamic mobilization exercises
• Balancing exercises

**KEY POINTS**

- The central body axis or core is a key component in controlling body posture and providing a stable platform for limb movements and generation of locomotor forces.
- The superficially located, mobilizing muscles control global movements of the spine and transmit locomotor forces from the limbs to the trunk.
- The deep stabilizing muscles have short fascicles that provide postural support, move localized areas of the spine, and provide spinal stability before and during locomotion.
- Persistent dysfunction of the deep stabilizing muscles seems to be common in horses indicating a need for core training exercises to restore normal function.
- It is recommended that core training be performed throughout the horse's athletic career to maintain a healthy back as well as used therapeutically when back pain is identified.

## CORE ANATOMY, FUNCTION, AND DYSFUNCTION

The horse's body consists of a series of axial segments (the head, neck, and trunk) and the 4 limbs that support and move the entire body. The core is the axial skeleton together with the soft tissues that have their proximal attachment on the axial skeleton, which includes the spinal ligaments, epaxial and hypaxial musculature, together with the extrinsic limb musculature of the thoracic synsarcoses and the pelvic girdle that transfers locomotor forces generated by the limbs to the axial segments.

Based on the orientation of the articular facets Townsend and Leach[1] divided the thoracolumbosacral spine into 4 functional regions: T1-T2, T2-T16, T16-L6, and L6-S1. Movement at each intervertebral joint is small except at the extremities;

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cranially the first thoracic (T1-T2) joint contributes to neck movements, and caudally the lumbosacral joint (L6-S1) allows pelvic tilting that contributes to protraction and retraction of the hind limbs.[1] Movement of these joints is facilitated by having wider intervertebral disks at T1-T2, T2-T3, and L6-S1 and restricted, in part, by the orientation of the articular facets.[1]

According to the bow and string model,[2] the equine thoracolumbar spine acts like a flexible bow that is maintained in a slightly arched (rounded) position by tension in the string, formed by the abdominal and sublumbar muscles. Concentric contraction of these muscles rounds the back by flexing the intervertebral joints. Insufficient tension in the string allows the weight of the viscera to extend the intervertebral joints, and the back contour becomes more lordotic. It is desirable for horses to work in a rounded posture to maintain separation of the dorsal spinous processes, so the use of conditioning exercises that recruit and strengthen the hypaxial musculature is an important part of athletic training. In horses that have poor natural posture or weak, inactive hypaxial muscles, for example, following colic surgery or foaling, the rehabilitation program should target activation and strengthening of these muscles. Appropriate exercises include core training from the ground as well as specific types of locomotor exercises.

The epaxial and hypaxial muscles have many similarities across species.[3,4] The long mobilizing muscles are located superficially, which increases their leverage at the intervertebral joints. They cross many vertebral levels and have a global effect on entire regions of the spine, but they cannot confine their action to a single joint or a localized area. The deep stabilizing muscles cross only one to a few intervertebral joints, which allows them to have a more localized effect that stabilizes individual joints or changes the shape of the neck or back in a specific area. They lie adjacent or very close to the vertebrae, so their moment arms are short, which gives them less leverage than the long mobilizers but facilitates their role in providing stabilization when the joints are loaded during locomotion.[3] Without this stability the joints undergo micromotion between the articulating surfaces during locomotion, which predisposes to the development of arthritic changes. A characteristic of the deep stabilizing muscles is that they have a lower activation threshold than the long mobilizing muscles,[5] so they are preactivated in preparation for locomotion. Consequently, the intervertebral joints are stabilized before the onset of an intentional movement or during a perturbation of movement.

The abdominal muscles surround the belly in layers. Their functions include dorsoventral flexion, lateral bending and stabilization of the back, respiration, support and protection of the viscera, and pressurization of the abdominal cavity, which also aids in stability. The two deepest layers, the transverse abdominal muscle and, to a lesser extent, the internal oblique muscle, function as deep spinal stabilizers and they are activated in anticipation of movement to provide proactive (feed forward) control of spinal stability.[5] In the standing horse, the transverse abdominal muscle shows low-amplitude tonic activity that increases in the terminal part of expiration, whereas the activity of the internal abdominal oblique varies between horses, with some showing tonic, low-amplitude activity unrelated to breathing, whereas others have phasic activity during the later stage of expiration.[6] In dogs it has been shown that the internal, but not the external, oblique muscles contribute to sagittal plane stabilization that opposes hollowing of the back, especially when extra weight is added to the midback.[7] The more superficial musculus (m) rectus abdominis and external abdominal oblique muscles are global mobilizers that contribute to flexion and lateral bending of the back. During quiet standing, m rectus abdominis shows either no activity or low-amplitude tonic activity.[7] The