HELLE KATRINE KLEVEN

Physical Therapy for Horses

A Visual Course in Massage, Stretching, Rehabilitation, Anatomy, and Biomechanics

OVER 300 IMAGES

The Limbs

The horse's limbs are equipped with bones that are long, but light in relation to their body weight. The big, strong muscles are found near to the trunk. The farther you get from the middle of the body, the less mass and weight the limbs have. From the knee and hock downward, you'll find no more muscles, but rather just tendons and ligaments. This construction gives the horse the possibility to move efficiently in terms of energy and elastically. Through the long muscles, and tendons and ligaments in the lower limbs, the mechanics work like a spring.

The horse's forelimbs are aligned for a supporting function and, thereby, are not generally much involved with forward movement. To be able to fulfill their supportive role, the forehand functions like a high-performance spring, which absorbs and stores energy in order to then set it free again.

The hindquarters possess massive muscles, which are responsible for forward movement. So, figuratively speaking, the horse does not have "all-wheel drive," but rather has "rear-wheel drive."

The Hindquarters

A racehorse is led into the start box. The signal is given, the door opens, and the horse can gallop off. But for a split second, the horse shifts more toward the back, instead of galloping forward. First, he lifts his head, thereby moving his weight from forehand to hindquarters, flexes all of the upper joints of the hindquarters, as if he's going to sit down, but then catapults himself forward with an insane amount of power. From 0 to as much as 37 mph (60 km/h) in three gallop strides, and that's only with a one-horsepower "engine"!

Riding can be like driving a Porsche. Both—horse and Porsche—have a motor at the back, and both have tremendously powerful motors. I'm now going to take the horse's "turbo motor" apart and look at it very precisely.

Because the horse is a flight animal, he needs speed and power to survive. The "motor" is comprised of big, fast, and strong muscles. (You'll feel this when you massage them!) It's not only muscular strength that helps the horse to develop his full ability, it's his entire hindquarters that are responsible for his fast and powerful flight.

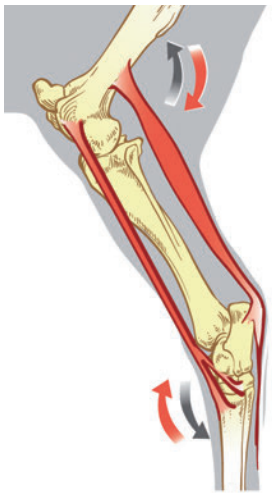
Fact: The hindquarters have the job of moving the horse forward.

When you look at the skeleton of the hindquarters, you can see that it's built differently from the forehand, where some bones stand vertically.

In the hindquarters, the cannon bone stands straight, but all other bones are angled. The angles of the bones are important to the hindquarters' ability to develop power and absorb shock. In addition, they are disposed with a fantastic apparatus of muscles and ligaments. One more difference from the forehand: the hindquarters have a joint connection to the trunk via the pelvic-sacral connection.

An essential construction for keeping the hindquarters upright is the two tendons that stretch between the stifle and hock joints, one in front and one along the backside. This construction is like a "frame saw" in design (see illustration, p. 66).

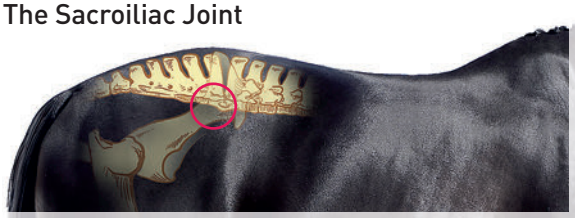
When a flexing of the stifle joint takes place, there's automatically also a flexing of the hock joint. Or vice versa, when there's an extension of the stifle joint, there will be extension of the hock. This means, you cannot stretch the knee and hock joints separately from one another. This can make it so difficult—for example, during a lameness exam—to determine in which joint the lameness is originating.



Because of this frame-saw design, the horse can support his hind limbs in an upright position.

The "flexing of the haunches" refers to an increased flex in the hip, stifle, and hock joints, which is a prerequisite for the development of power and has an important shock-absorbing function. Without the "frame-saw design" the horse would not be able to maintain flexion of the haunches. During flexion, the horse gets "smaller" in the hindquarters and, thereby, can take more weight onto his hindquarters. Only in this way is it possible for the horse to have a quick and powerful reaction when he encounters danger or to collect himself under a rider, which is what you ask from the horse at the highest level of the Training Scale. Unfortunately, this is also the hardest part of training for every horse as the flexion of the haunches principally takes place through muscular strength. This means it takes a lot of power and effort from your horse. Try moving 10 meters in a squat position yourself. You'll notice how strenuous it is! The same is true for your partner, your horse.

The Sacroiliac Joint



Biomechanics of the Sacroiliac Joint

From a mechanical perspective, the sacroiliac joint has the most difficult job of the entire musculoskeletal system. On the one hand, it must carry lots of weight, while on the other hand, it must absorb, compress, and deliver forward all the power that is developed in the hindquarters. For these two mechanical functions, the joint must be stable on one hand, mobile on the other.

The sacroiliac joint is, as its name implies, the joint articulation between the sacrum and the pelvis. The joint is also vulnerable to problems in other

The higher the jump, the more the horse must flex his haunches in order to "catapult" upward and forward like a spring.

locations: this means, in this joint, you often see secondary blockages. Therefore, for you as a rider, the sacroiliac joint is one of the most important joints in the body, and you should keep an eye on it. I'm now going to explain the construction of this important mainstay of your horse's body.

During a sliding stop, the sacroiliac joint is subjected to high stress.

• The Sacrum

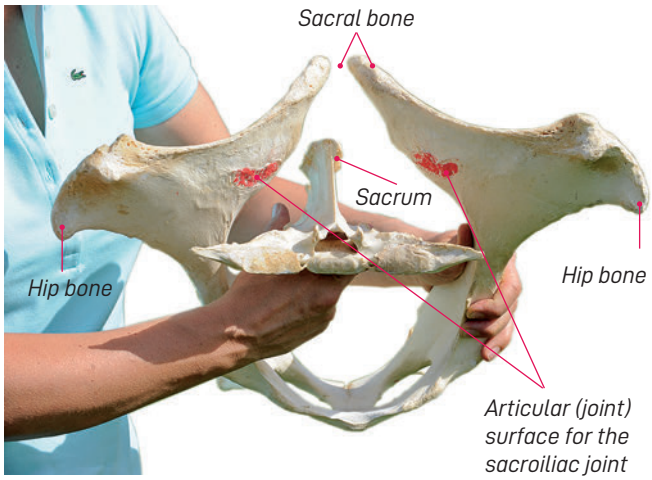
You'll find the sacrum at the end of the lumbar spine. It forms, so to speak, an extension of the spine. The bones look like a cross—in fact, in German, these bones are called "*Kreuzbein*," which translates literally as "cross bone." The sacrum consists of five vertebrae, which fuse together when the horse is approximately five years old. The spinous processes of the sacrum tilt toward the back, which means in the opposite direction from the spinous processes of the lumbar area (see illustration on p. 66). Thereby, with the help of the long supraspinous ligament, the sacrum is well-formed for lifting, which is important to the horse's ability to lift his back like a bridge and, in turn, to carry weight.

• The Pelvis

The pelvis is formed by three bones, which only become fixed and resilient in the full-grown horse. The meeting point of these three bones (ischium, pubic, and iliac) forms the socket of the hip joint.

Fact: Because the sacrum and pelvis only stabilize very late in the horse's development, riders of young horses must be careful not to overdo it with the young horse's body.

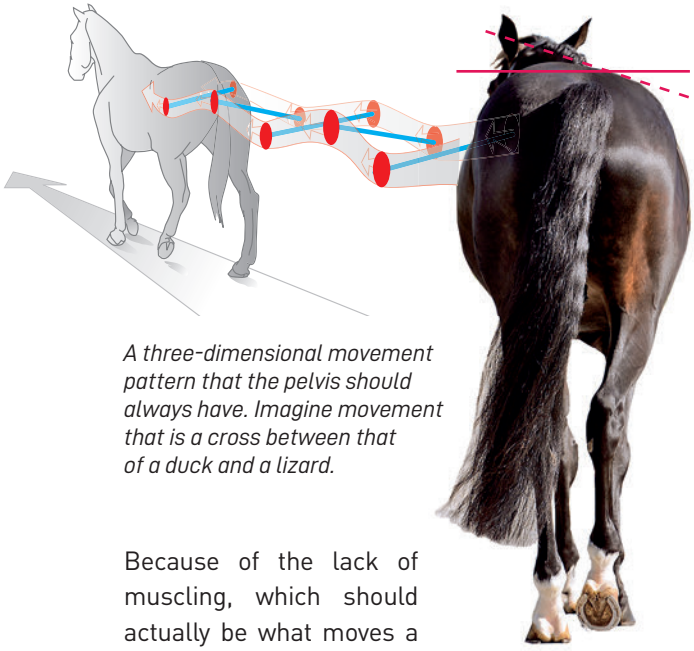
Together, the pelvis and sacrum form the sacroiliac joint, which forms the bony connection between the haunches and the horse's trunk.



The sacrum and iliac bone photographed from below. The red point on the pelvis is the small flat articular/joint surface of the pelvis. The sacrum sits between and the two "wings" of the sacrum form the articulated joint.

When the horse develops strength in his hindquarters, the sacroiliac joints become the center of forward movement. From this center, the pushing power travels over the spine in the direction of the forehand.

Observe this joint closely and you'll recognize two special characteristics. First, the joint surface of these two bones is really small in comparison to its function. Second, it's a flat joint, which means the joint does not get any stability from its construction. This differs from other joints, such as the hip joint, which has a pronounced ball and a socket. The flat, small sacroiliac joint is held together only by fixed ligaments. What exacerbates the situation further is that the sacroiliac joint has no muscling that directly support its stability and move directly with it.



A three-dimensional movement pattern that the pelvis should always have. Imagine movement that is a cross between that of a duck and a lizard.

Because of the lack of muscling, which should actually be what moves a joint, as well as the large and tight ligaments, many experts have claimed that the sacroiliac joint is rigid and inflexible. This belief must be contradicted. It's in fact a very mobile joint, which you can well observe when your horse walks away from you. The whole pelvis makes a three-dimensional movement. Imagine movement that is a cross between that of a duck and a lizard: it's both a rolling and forward-moving way of going. Thereby, the iliac bones move opposite from the sacrum—over and under—independently of one another. You should be able to see this movement combination on both sides of the pelvis. If it's not there in either direction, you'll no longer have three-dimensional movement.

You can read more about how to better monitor and observe the mobility of the sacroiliac joint in chapter 5, "Observation" (p. 92).

Disorders of the Sacroiliac Joint

In practice, you often find injuries and blockages in the sacroiliac joint. They can have a primary source, for example, from trauma or injury. However, it's also unfortunately very common for the sacroiliac joint to be affected when there are blockages or disorders in other locations of the musculoskeletal system. The symptoms can result in a reduction of movement between the sacrum and the pelvis and/or pelvic misalignment.

When there's a blockage in the sacroiliac joint, the transmission of power from back to front is weaker. It's reduced and, thereby, the forward impulsion is greatly weakened. The horse does not carry through correctly with his hind end. So, too, can collection and tracking up of the hindquarters be reduced, which can cause uneven rhythm and eventually lameness. The pelvis then moves as a whole—no mixture of duck and lizard gait. To compensate for this loss of three-dimensional movement, there's more pressure on the lumbar vertebrae. In addition, these horses can't hold their true canter lead and often spring into a cross-canter. These horses also don't like to back up. They lose the longitudinal bend in the direction where the hip is lower. A further sign of a disorder in this joint: your farrier will find it difficult to bring the horse's back leg toward the back.

A misaligned pelvis changes the mechanics of the whole horse. When the horse's pelvis is misaligned on the right side, his whole pelvis on this side is lower, often also with a turn of the whole pelvis. This automatically will change the position of the hip socket and, thereby, also the fit of the femur in the socket. As a result, all the remaining joints of the hind limbs will also be falsely positioned. So, too, the engagement of the soft tissue is changed. The soft tissue will either have too much or too little engagement.

The spine is also harmed by a misaligned pelvis. It turns in the same direction as the lowered hip and the spinal column is blocked. Here again, the engagement of the soft tissues is altered. Most often, it's the lumbar spine that's affected, but a misaligned pelvis can also have a negative influence on the spine all the way to the horse's head.

Still another disorder of the sacroiliac joint is the twisting of the sacrum in relation to the pelvis. You

When you look at your horse's croup from behind, the topline should almost form a heart. (You can see this really well with draft horses.) Ideally, the gluteal muscles form the highest point of the croup with the two iliac tips (as in the photo on the left and see photo p. 101, right). With horses that have a problem in the sacroiliac joint, there's often a swelling. In the photo to the right, the iliac tips are the highest point because of swelling.

may not immediately be able to see this false positioning, but you will be able to feel it. The sacrum and the first cervical vertebra are connected, via a membrane called the *dura mater*, inside the spinal canal. A practical example will make this clearer: If the right side of the sacrum is lower, then the wing of the C1 vertebra on the right side is also lower. You probably won't recognize the source of the problem: the twist in the sacrum. However, you do notice a problem with positioning in the poll. The horse won't want to be positioned through the right side of his jaw!

Fact: Disorders of the sacroiliac joint are always accompanied by muscular atrophy of the croup muscles on the affected side.

A final example of a disorder of the sacroiliac joint is that the peripheral nerve cords become affected. Through a blockage and/or an incorrect position of the sacroiliac joint, and the resulting changes to the affected engagement of ligaments and muscles, nerves can become pinched. For example, the sciatic nerve, which is as thick as a finger and supplies the hindquarters, can become compromised due to the tightening of the ligaments and muscles. Horses try to relieve the nerve, in that they push away through their back and thus tip the pelvis downward. As a result, the croup appears flat. The limbs are positioned toward the back or the horses stand with an extremely round back with their legs positioned far under the belly. Either way, they are trying to avoid the pull on the nerve. And, obviously, their way of going will be changed due to the inflammation of the nerves. Those among us who have lived through sciatic nerve pain know best what I'm talking about here!

My Tip

Few horse owners realize that their horse has a misaligned pelvis. Observe your horse regularly in order to be able to respond quickly when unevenness occurs (see chapter 5, "Observation," p. 92).

When to Stabilize

The following stabilizing exercises constitute a continuation and progression of the mobilizing and stretching exercises described in chapter 8 (see p. 140). You should practice mobilizing exercises for about four weeks before beginning the stabilizing exercises. The following specifically strengthen the muscle groups responsible for posture and weight-bearing (trunk, shoulder, and pelvic-girdle musculature). They are uniquely suited for horses in rehabilitation as well as horses with weak abdominal muscles and horses with swayed backs.

I am convinced that most of us have seen a horse lose muscle mass very quickly due to an injury. We also know how long it takes to rebuild muscle strength. In cooperation with the treating veterinarian, the stabilizing/strengthening exercises (following the mobilizing phase) can be practiced during rehabilitation: they are in fact indispensable as they maintain mobility, strength, and stability. Studies have shown that horses were able to gain muscle mass through these exercises, even when they were not being ridden. With regular practice, horses will emerge in a better condition from a break in training and the rehabilitation phase will be shorter.

In addition, these exercises are very helpful for young horses. We know through experience that focused administration of exercises helps young horses to balance the rider's weight. They don't just help the horse carry the rider, they also benefit the horse's coordination and balance. These stabilizing exercises are also very well-suited for horses being schooled at a very high level. These horses have to perform but should not be overwhelmed. Especially when the collected exercises are not yet confirmed, stabilizing exercises can lead to improvement. You will see the difference even after a short time!

How Often and for How Long?

If you have the opportunity, you should do these exercises regularly and, if your horse is particularly weak, even several times a day. I know that most of us don't have the time to get out to the barn more than once a day. My advice: always do the exercises after riding the horse. This will guarantee that the horse is warmed up and well-prepared.

With a very unstable horse, it is worthwhile doing the exercises before riding.

My Tip

Daily training is recommended, which is not always possible, but the more, the better. Even if you only get to the exercises three times a week, it is still so much better than nothing!

When *Shouldn't* Strengthening Exercises Be Applied?

- When ataxia or other neurological disorders are present (poor coordination).
- In the case of severe trouble with balance—for example, when the horse needs to lean against a wall to pick up one foot.
- In the case of fresh injury or after surgery. When your horse has an injury affecting his musculoskeletal system, please clarify with your veterinarian and physical therapist as to whether or not you should do the exercises.
- Should you observe that your horse gets worse from the exercises, rather than improving, please contact your veterinarian. A secondary problem may be present that has not yet been diagnosed.

Safety

- As with all exercises in this book, it is important to practice on non-slip footing.
- Until you and your horse are familiar with the exercises, you should ask an assistant to hold him.

Implementation

You already stabilized your horse by practicing the mobilizing and stretching exercises, since it is not possible to mobilize or to stretch without stimulating other areas.

You can easily test how effective the next exercises are: ask another rider to "push" you in different directions, while you stay upright and still like a tree. Do you feel how much muscle strength you must activate? And you probably also feel how many different muscle groups are working all over your body to maintain your balance. This is the positive aspect of these stabilizing exercises: they are effective.

Through this simple exercise, you can experience how many muscles have to be activated to stay stable and avoid losing your balance.

Important Hint!
All exercises should be done slowly; the horse's movements need to be smooth.

Every position within the individual exercise can be held for up to 20 seconds. Here too, a variety of signals should be administered. Sometimes the signals can be given in shorter intervals to activate the horse's reaction.

Hint: You will realize that the basic positioning in many of the following exercises is the same as in the mobilizing and stretching exercises.

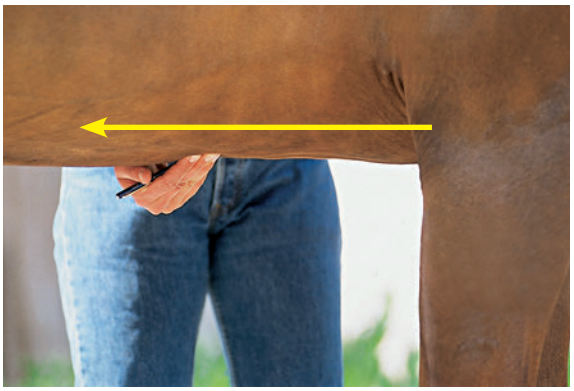
Exercises for Stabilization and Strengthening

Stabilizing the Forehand

These exercises serve to strengthen the shoulder girdle and abdominal musculature. There are two variations.

■ Lifting the Withers

Stand next to the front leg, looking at the hind leg. You achieve the lifting of the withers by activating the reflex at the abdominal midline with your fingertips. This causes the front part of the back to slightly rise and the rib cage to move upward between the shoulder blades (compare to the exercise on p. 156).



Variation 1

With continuous light pressure at the sternum and lifted rib cage, the horse is being positioned back and forth with short signals with the other hand at the withers (as shown in the pictures above). The intensity and scope of the movement should be varied. This exercise stabilizes the shoulder-girdle musculature. Make sure that the withers stay lifted between the shoulder blades during this exercise. That means that you must repeatedly give a signal at the sternum.

When the horse does not cooperate during these exercises, only perform the easier ones, the mobilization exercises that are described on page 149 and the following pages.

Variation 2 (Medium Degree of Difficulty)

The basic position is the same as in Variation 1, but you lift one front leg with your hand closest to the horse's head and hold it in a relaxed manner. Your other hand activates the reflex at the sternum. The horse has to shift the rib cage to the other side using his shoulder-girdle musculature. This is a great strengthening exercise for the forehand!

Variation 3 (Medium Degree of Difficulty)

An even more difficult exercise is the lifting of one front leg (as shown in photo p. 173, top left). At the same time, you can activate the reflex at the sternum. The standing on one leg and the activation of the reflex at the same time causes the horse to lift his trunk, and stabilizes the shoulder musculature on the side of the supporting leg.

Shifting Weight to the Forehand

Starting Point
Stand to the side of the hindquarters.

Implementation
Push the horse forward using light pressure. When shifting his weight to the forehand, he has to activate his shoulder-girdle musculature.

This exercise can also be modified: an assistant can activate the reflex at the sternum and the horse will lift his rib cage at the same time.

Fact: Many horses that appear to be built "downhill," are actually weak in the forehand. As a result, their trunk is lowered between their shoulder blades.

Stabilizing the Hindquarters

Strengthening the Abdominal and Upper Thigh Muscles

Starting Point
Stand to the side at the hindquarters and stimulate the reflex found to the right and left of the hindquarters (see photo p. 157, bottom left) so that the horse lifts his back. This will stimulate a reflex of the hindquarters, which activates the abdominal muscles and stretches the upper thigh. The upper-thigh muscles as well as the abdominal muscles are being strengthened and the topline is being stretched. In addition, this activates the shoulder-girdle musculature as the horse shifts his weight forward.

Variation (Medium Degree of Difficulty)
This is a great exercise for improving your horse's bending. Again, position yourself to the side of your horse's hindquarters. With a bent pointer finger, draw a line from the direction of the opposite hip point over the croup in the direction of the tail. The spine will react with a lift and sideways bend in your direction. Caution, the horse could take a step in your direction to regain balance—watch your feet.

Among others, this exercise strengthens the *longissimus dorsi*, the *intercostals*, and the *abdominal* muscles on the side the horse is bending toward.

My Tip

If your horse does not enjoy the lift stimulated by your finger, try using a brush.

Pulling the Tail

This exercise can improve stability and strength of the hindquarters.

Starting Point

Stand to the side at the hindquarters.

Variation 1

Your horse is standing square. Now, pull the tail in a 90-degree angle slowly toward you, until tension in the upper thigh becomes visible. Hold the position for up to 20 seconds. You can give different signals: sometimes hold the tail longer, sometimes for a shorter time.

Variation 2

In this exercise, you can increase the difficulty by using one hand to create pulses (small pushes) away from you as you release the pull on the tail. In this way, both hind limbs are stabilized and you avoid the horse simply leaning into the pull on his tail. Important: The pulling motion should never be choppy, but rather always applied with caution and by slowly increasing and decreasing pressure.

Hint: Please make sure that the horse is not twisting his fetlock joint. If this is the case, you are pulling too hard and the horse cannot withstand the pressure.

Shifting Weight to the Hindquarters

Starting Point

Stand to the side of your horse.

Implementation

Give the horse a push backward at the sternum. The horse will shift weight to his hindquarters and has to activate the pelvic-girdle musculature.

Many horses will step backward during this exercise, as the input you're giving is one he recognizes as a signal to back up. Should that be the case, you can position the horse so that his hindquarters are in a corner. This way, he will quickly learn to stand when you apply pressure to the sternum in this context.

This exercise can also be made more difficult: a second person can pull on the tail at the same time (see photo p. 174, bottom left), causing the horse to stabilize himself even more.