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Myofascial Stretching

You are probably familiar with some method of stretching, either for yourself or your horse. I want to introduce you to way of stretching, that will improve the ROM of the horses you use it with. You may find this way of stretching to be new or you may already be familiar with it.

Before we start, we need to cover a little background Anatomy and Physiology of the *neuro-myofascial network*, to assure that we have the same vocabulary.

The Basic Locomotor System

All mammalian bodies have a the same basic scheme for movement, *locomotion*. The muscles cross joints between bones. The contraction of the muscle either flexes or extends the joint, with these two movements being opposite each other.

The muscles are arranged on either side of the joint, with flexors on one side and extensors on the other. These muscles are labelled as antagonistic to each other.

The muscles on the same side of the joint, i.e. extensors, are labelled as agonists to each other since they produce the same joint movement.

From the movement scheme of

things bones are pretty stupid, they have no control over where they go. In fact they are simply fascial bags, periosteum, filled with inert mineral salts. (In the larger view bones are much more complicated and alive.)

The muscles, aren't much more intelligent than bones, they are a fascial bag, myofascia, filled with an electrical jelly.

In a very simplistic model, this electrical jelly is hooked up to the nervous system by a *motor nerve*. The motor nerve is like an electrical wire that turns the muscle on like a switch that turns on a light. When the nervous system wants the muscle to contract it sends a signal down the wire and the electrical jelly contracts. The muscle contracting moves the bone it is attached to at the joint.

Muscles can only *actively* contract, let me repeat that; muscles can only *actively* contract. Therefore, when the nervous system wants the muscle to lengthen, it turns off the signal to it, and at the same time turns on the *antagonist* muscle causing it to contract. (The muscles are arranged in antagonist pairs across the joint.) When an antagonist muscle contracts it *lengthens* the muscle on the other side of the joint.

One problem with this control system becomes apparent when

a muscle doesn't return to its original length when the antagonist contracts. This can happen for any number of reasons. One of these is a *nervous system latency* that allows the muscle to retain some of its contraction. (In electronic terms this is called *hysteresis*.) With each contraction of the muscle there is a slight retention of that contraction which the antagonist's contraction can not remove.

This is where stretching normally enters the equation. We stretch the muscle to return it to its original length. At least that's the theory. In practice what happens is that we might be able to stretch the muscle to more closely approximate its original length. However, if there is still an electrical charge turning on the muscle, we won't be able to return the original length through normal stretching. (In this case normal stretching would be analogous to taking the light bulb out of the socket to turn off the light.)

Myofascial stretching differs from normal tug and pull type stretching. It helps turn off the nervous system charge to the muscle. Please read on.

Motor System Physiology

The body's basic muscle contracting unit is called a *motor*

unit. (By now you have seen that the body has a great deal of redundancy built into it.) A motor unit is: the motor nerve (the electrical wire) and all of the **muscle cells** (jelly filled bags), that the particular motor nerve innervates. When a motor nerve turns on, all of the muscle cells it innervates contract with all of their contractile strength. This is called an *all or nothing contraction*. If the motor nerve is on, then its innervated muscle cells are in contraction. If it is off then they are relaxed and can be stretched.

A muscle is made up of many muscle cells and many motor units. If the muscle is required to do precise work, like the lips of a horse, than there are many motor units to allow for precise movement. In this case, one motor nerve innervates fewer muscle cells. If the muscle does imprecise work, such as the quadriceps, it's made up of fewer motor units, with one motor nerve innervating many muscle cells.

In other words, in a precision muscle there are a lot of nerves controlling few muscle cells allowing a precise contraction of the muscle's motor units. In a workhorse muscle there are fewer nerves and less control. (A general rule is that a muscle that crosses one joint is more precise, and a muscle that crosses more than one

joint is not.)

When a muscle is activated there has to be a mechanism for turning off the antagonist. Otherwise the muscles will oppose each other, and prevent limb movement. This mechanism is called *reciprocal inhibition*. Reciprocal inhibition occurs at the motor unit level, not the muscle level, so motor unit one of muscle X inhibits motor unit one of its antagonist muscle Y. When motor unit one of X is on, motor unit one of Y is off.

Unfortunately there are times when the nervous system gets confused about who's on and who's off. In these cases we can get a motor unit in a muscle that's supposed to be off but is actually *locked on* (it's also possible for a motor unit to be *locked off*).

Normal stretching can not change this nervous system confusion. We have to involve the nervous system itself to sort out who's supposed to be on and who's supposed to be off.

When you look at the pictures of myofascial stretching you won't see anything that looks too different from normal stretching. The legs are picked up and look like they're being pulled to a new length. This is what most people think stretching is. However, in myofascial stretching the legs are picked up, but rather than being pulled to a new length, they are

This confusion can occur when a horse slips in mud or acts up when being shod.

If the horse is running in mud and slips the nervous system can be confused by the feedback it is receiving from its movement receptors in the joints.

Another example:

A horse is being shod with the farrier holding the rear leg off the ground. The horse decides to put the leg down pulling it back; but the farrier doesn't let go. The muscle spindles fire and the nervous system recruits more motor units than is usually necessary to move the leg, and "forgets" to turn them off.

It's fairly prevalent. In fact, if you have a horse that stumbles a lot this motor confusion may be the cause.

positioned at the first place of tissue resistance. The therapist then waits for the horse's nervous system to release this resistance before positioning the leg at the next point of tissue resistance. The feeling, for the therapist, is like the horse is pushing their leg into them. They are actively releasing their leg. For the horse, it's a resetting of their nervous-motor-system to a non-contracted neutral state.

Why is this different? By holding the leg at the tissue barrier we get the active participation of the horse's nervous system, which resets its motor nerve.

More importantly by the therapist only taking the leg to the first resistance it doesn't cause a *muscle spindle fiber* to fire. (Muscle spindles are the nervous system's feedback mechanism informing it about how much stretch there is in the muscle. The spindle fiber prevents the muscle from being overloaded by reflexively recruiting more motor units.) If the muscle is stretched too quickly or beyond the tissue resistance, the spindle may fire and cause the nervous system to activate more motor units within that muscle. This causes a stronger contraction which is the opposite of what we want. Often this recruitment is hidden from the person stretching the horse's leg by the movement of another joint e.g., the shoulder rotates when the front leg flexor's spindle fibers fire—seemingly creating more length in the flexors. Rather than effectively stretching the flexors we just caused a compensation further away.

You can find a video of this technique on my web site www.equinesi.com.

The Australian army did a study on the efficacy of stretching and it's effect on injuries in basic trainees. There were over 10,000 participants in the study—they had no choice—some stretched before a workout, others didn't. The results were disheartening for stretch fans, those who didn't stretch had fewer injuries than those who did.

*The only saving grace for stretching was that they used the conventional style of stretching and not what I've described here. ('A Randomised Trial of Preexercise Stretching for Prevention of Lower-Limb Injury,' *Medicine and Science in Sports and Exercise*, vol. 32(2), pp. 271-277, 2000).*

Foreleg Triceps Stretch

Start the stretch by taking the leg upwards and towards you until you reach the first tissue restriction or barrier. Stay at this barrier until the horse lets it go by relaxing the muscle. It will feel like they are pushing into you.

The black arrows in **Figure 1** show the direction to take the leg to put tension on the triceps. The black lines give a relative idea of how much stretch occurs after each barrier is released.

The leg is not being pulled, it is being positioned at the barrier, upwards and out, and held there until the release is felt. Once the release is felt the slack is taken up until the next barrier felt. The leg is held at the barrier until a release is felt..

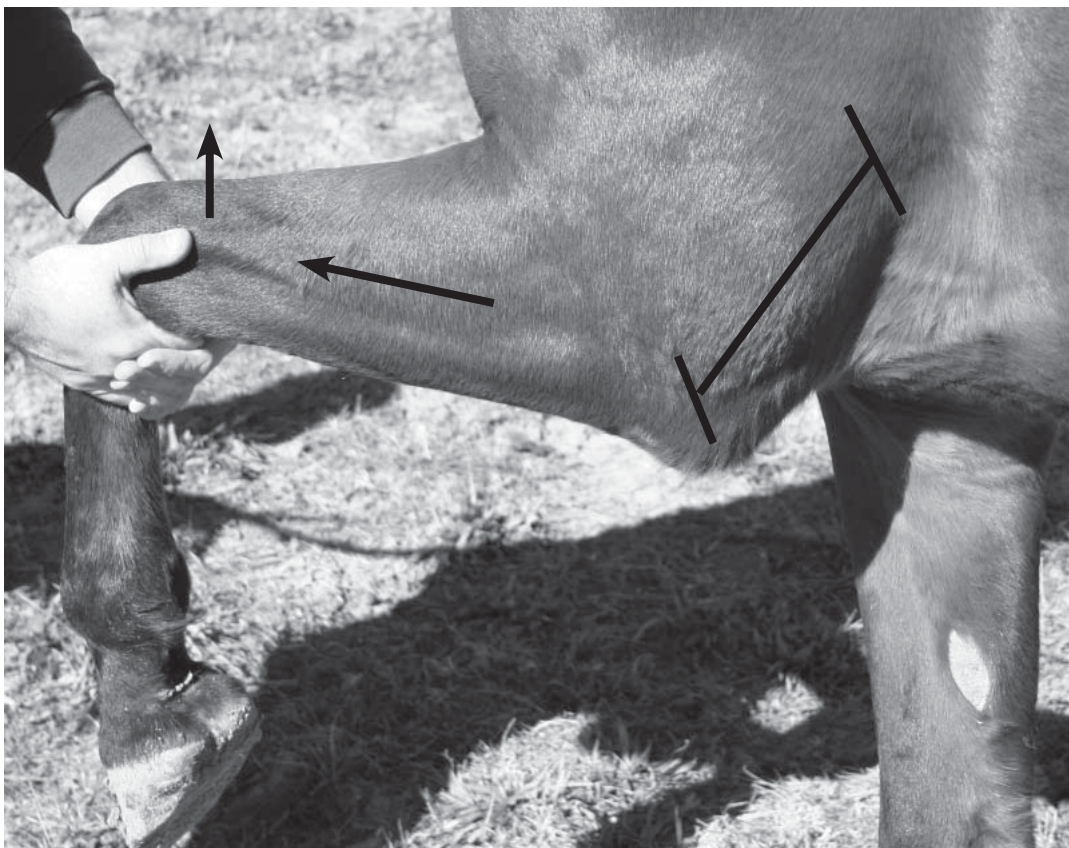


Figure 1 *Foreleg Stretch. Start the stretch by taking the leg to the first barrier.*

Foreleg Triceps Stretch 2

After the first barrier is released the leg is taken towards the therapist to engage the next barrier, **Figure 2**. The leg is held at this barrier until the leg releases.

Once again, this is not active pulling of the leg, it is held at the barrier waiting for the horse to relax/release into the new position.

Notice that the leg hasn't moved forward but that the elbow has dropped while at the same time the leg has become more horizontal, indicating a relaxation of the triceps.

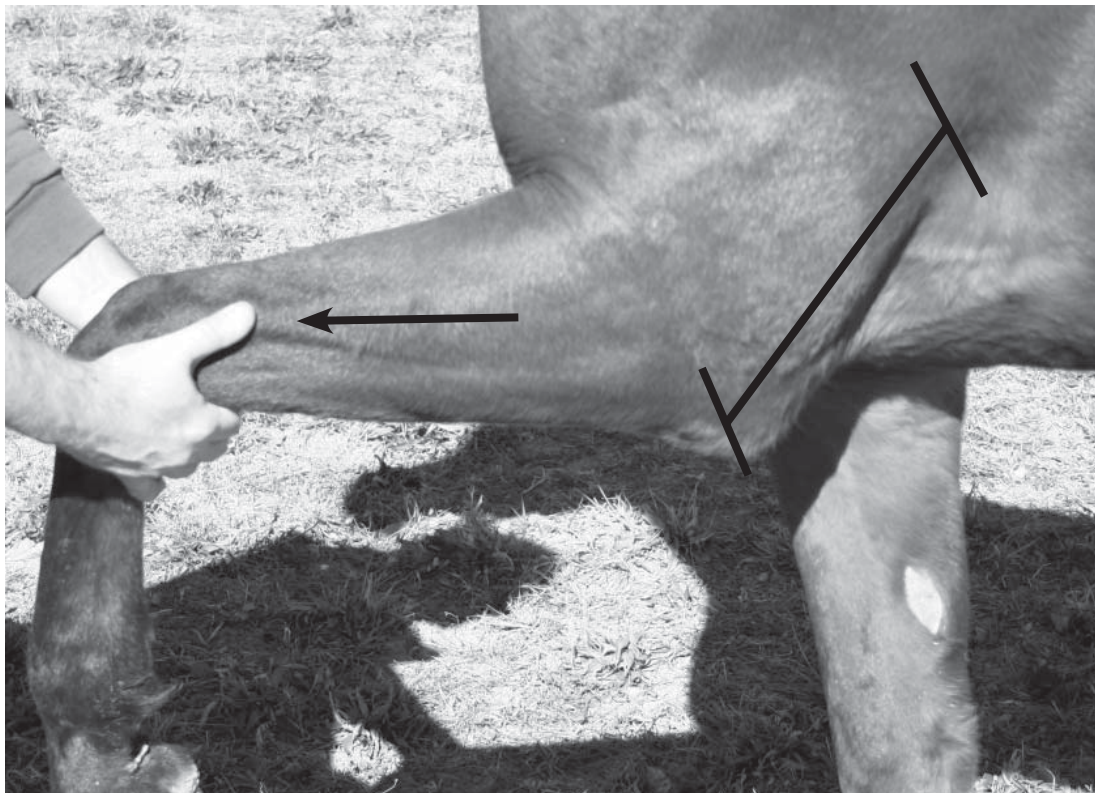


Figure 2 *The second barrier is engaged and held after the first release.*

Foreleg Triceps Stretch 3

In this final release, the horse is pushing his leg out into the barrier rather than having it pulled out. The nervous system can reset and regain motor control over the muscle's action.

“Motor control over the triceps action” means that the motor system has turned off the motor units that were locked in an “on” position. The antagonist muscle can now fully contract.

You may also feel the resetting of motor units that were locked off. This will feel like small tremors or contractions with the leg being pulled slightly away from you. Motor control reset in general feels like a wobbling or shaking in the tissue. You'll see this in muscles that are coming back into use or whose use is being learned by the nervous system. Across joints this will occur when the one joint muscles regain control from the two or more joint muscles.



Figure 3 *The final release.*

Foreleg Deltoid Stretch

When you are done with the foreleg forward you can move around and take the leg to towards the rear. You don't have to put the leg down to do this. I usually do this stretch in the opposite order than is shown here when I am picking my horse's foot out. I'll do this one while I'm cleaning the foot and then reverse it to the previous one before putting the leg down. Using a verbal cue, like "stretch" seems to better connect the horse with what I am doing.

You've probably figured out that the technique for this stretch is the same as the first one: take the leg to the barrier and hold it. Then follow the release to the next barrier.



Figure 4 *Foreleg Back Stretch*

Rear Leg Hamstring Stretch

The next four figures show the rear leg forward stretch. The technique is the same as earlier: find the barrier and hold it there. Take up only the slack that is given, there's no pulling, rather the leg position is held until released. The release will feel like the horse is pushing into you. Be ready for the foot to extend past the front leg.



Figure 5 *Rear Leg Stretch First Barrier hold.*

Rear Leg Hamstring Stretch 2

The hock has dropped down. The second barrier is being held without pulling on the leg. If the horse resisted and pulled the leg back I would let it have the leg and then slowly start over again. This kind of resistance often indicates a place where the motor system “thinks” it is going to experience a negative event. Taking more time and moving slowly to reset this, is all that is required. The reptilian brain pulls away from these assumed *noxious events*. Fortunately it doesn’t have much cognitive capacity and will let go of the reaction fairly quickly.

Notice in **Figure 6** how far the foot has moved towards the front leg.



Figure 6 Rear Leg Stretch. Second barrier hold.

Rear Leg Hamstring Stretch 3

The third barrier is engaged. The hands are cupping and supporting the fetlock. The leg is held at the barrier until the barrier is released.

These things that I've been calling barriers should not be confused with soft tissue adhesions. They are actually only a barrier in that the nervous system "thinks" that this is as far as the leg can go; the reset happens in the nervous system not the tissue. The nervous system program is reset by simply presenting a new sensation to it in a non-threatening way. If we were to pull the leg out to where we thought it should be we could threaten the system and re-enforce the holding pattern.



Figure 7 Rear Leg Stretch. Third barrier hold.

Rear Leg Hamstring Stretch 4

There is no pulling on the leg. The stretch comes from the resetting of the motor system.

Give this a try with your horse or dog or a friend. You can try this type of stretching on yourself, by taking your leg to a tissue resistance and holding it there while waiting for the release and the accompanying slack.



Figure 8 *Rear Leg Stretch. Fourth barrier hold.*

Rear Leg Quadriceps Stretch

You can transition from taking the leg forward, the hamstrings stretch, to taking the leg back, quadriceps stretch, without putting the leg down. I usually start in this direction while I am cleaning the feet.

As mentioned before, I like to use a verbal cue to help integrate this feeling into the horse's brain. I say "stretch" while doing this.

When I do this while cleaning feet, I rest the leg on my thigh. I don't like to bend over to work on the feet; when the horse can just as easily bring them to me!



Figure 9 *Rear Leg Back*

Working with Joints

To often joints are ignored in a stretching routine. This is unfortunate because the joint receptors provide the majority of the feedback to the motor system. In early chapters we talked about the problems that occur when a compressive force is not distributed over the entire joint surface. (Figure 8, page 25.) There is a possible wearing of the joint's hyaline cartilage, in the area where the force is borne.

Hyaline cartilage is avascular—it has very little blood supply—and depends on the compressive force to move waste products and bring in nutrition to the synovium.

Another issue that occurs with this off balanced distribution of force is that the nervous system receptors in the joint—which report to the Central Nervous System (CNS) the position and acceleration of the limb—will not be completely active. The receptors—pacinian corpuscles and ruffini end organs—are pressure sensitive and if not in line with the compressive force will stop reporting and be “turned off” by the nervous system. The result of this scenario is that the muscle motor units that are controlled by these receptors, now turned off, will also be turned off and putting more of a workload on the remaining motor units.

Taking this off balance compressive force one step further; horses who spend most of their time on flat surfaces will not have the opportunity to move the joints through their complete range of motion—which would normally be encouraged by uneven terrain. This lack of movement in the joint has to be countered with our stretching of the joint.

There are three movements that we need to encourage in the joint: compression, distraction and rotation. These three movements, done passively, will wake up the joint receptors, help to flush out metabolic waste products and increase the delivery of nutrients to the joint cartilage.

After years of boarding our horses, my wife and I bought our own acreage to keep the horses at home. The places where we had boarded had wonderfully flat pastures for turn-out, flat runs off the stalls and flat rubberized arenas. All of this was to prevent horses from having joint problems. When we got our horses home, I noticed that they were very sore after a couple of days in our undulating pasture. I realized that what was happening was, their new environment required their joints to move more, and that this was waking up long asleep motor units that were not used to the work. These now available muscle cells were sore from having to work again!

Joint Distraction

Before I describe this stretch, try an exercise: Stand up and weight each of your feet equally. Now lift one leg up and rotate the foot at the ankle, one way then the other. Stand on both again. Does one feel more alive than the other? Is it the one you rotated? This is the sensation of the joint receptors reporting to the CNS again. This exercise is a combination of joint distraction—the weight of the foot distracted the joint—and rotation.

By doing this with our horses we will be: waking up the joint receptors, making available more motor units to distribute the muscular work load and increasing the health of the joint.

Joint distraction is a fancy way of saying, “pull it apart”, when two ends of a joint are pulled away from each other they are distracted. When they are pushed together they are approximated.

What you are going to do here is gently and slowly pull the canon bone away from the pastern. You want to grip the bones, not the joint. Take the two away from each other, slowly, until you reach the end of range. The horse may sigh as it resets its nervous system.

When you have reached what you think is the end of range hold there for at least a couple of breaths by the horse and then slowly release the joint back into its normal length. Don't just let go of the stretch. Too often people will do leg stretches with their horse where they distract the fetlock and then they just let it go, plop, to the ground. This is problematic in that the joint capsule could be “caught” in a distended position. We want to go slow to allow time for the body to adapt.

Horses spend so much time with their feet in compression that this distraction, de-compressing action is really a new and welcome experience.

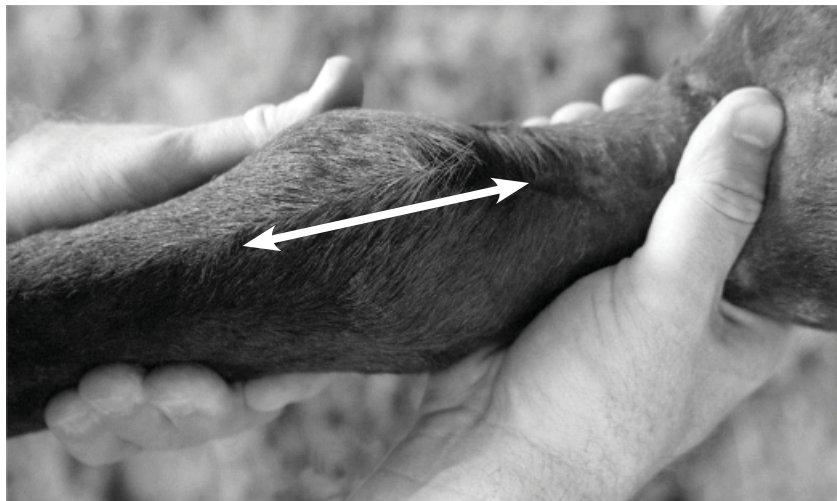


Figure 10 *Joint distraction*

Joint Compression

Compression is the opposite of distraction. Here we want to take the two bones towards each other. The other name for this action is “approximating”.

It has been shown, in humans, that simply doing these two actions of distraction and approximating will help the recovery in people who have had joint surgery. It’s these two actions that create the pumping action required to move the joint fluids.

What we are trying to do is not only move this joint fluid but also re-awaken the joint receptors.

To accomplish this stretch you slowly and gently bring the two bones closer together—cannon and pastern bones. When you arrive at the end of motion, there’s no more joint space, you can add a gentle rocking motion. Often the horse will sigh or even moan when you do this. You want to move slowly to allow the nervous system to process what’s happening and to not alarm the horse.

Where letting go of the stretch too quickly in the distraction phase is potentially problematic, I don’t think that’s the case here. After all horse compress this joint all the time while walking or running.

However, this is not simply a compressing of the joint space, it is a compressing exploration of this space.

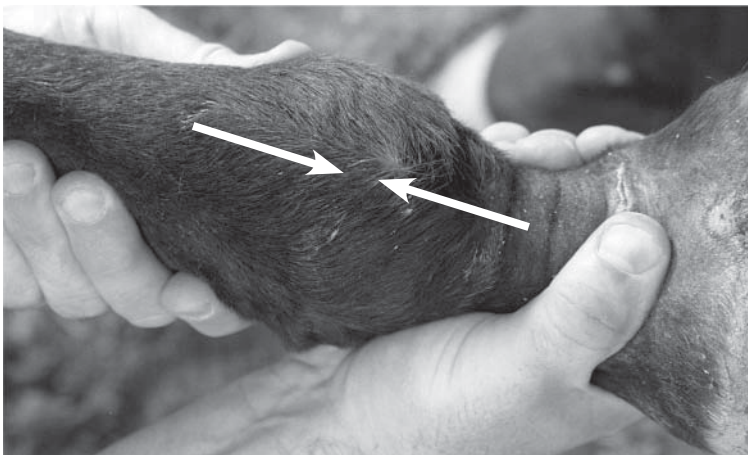


Figure 11 *Joint compression*

Joint Rotation

This is a combination of the last two stretches. The rotation starts by very slowly taking the joint through its available passive ROM. It's not important to increase the ROM while doing this, your intention is to wake up the joint. I like to do this whenever I clean the horse's feet. I have the fetlock and pastern joints readily available on my thigh.

If I have the time then I will combine this with the last two stretches. So, there are actually three components to this:

1. With the joint completely passive and only a rotational component added by you. The rotation is as shown by the arrow.

2. You add a little distraction and explore the joint capsule's ability to move. When you add a rotation as well as distraction into the joint capsule it is important that you very slowly return the joint to the starting point. I suggest that before you do this you assure that your body position is comfortable for you.

3. Add compression and rotation.

You can also, move between these three to help move the fluid and wake up the joint receptors.

I continue these three with the joints in the foot. I haven't had much success with the joints above the fetlock. Mostly because of my body position being to awkward or compromised.



Figure 12 Joint rotation.