

**LONG-TERM
COMPENSATORY STANCE
AND
ITS EFFECT
ON
PROPRIOCEPTION REHABILITATION**

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It happens. Your horse pulls up lame in the front. A short period of rest and all is fine. This is followed by more lameness and finally a chronic lameness issue is diagnosed. Your vet prescribes long-term stall rest of up to one year followed by rehabilitation.

During this time the horse is in pain and as a result he learns to stand and walk in a new way. The walk is not normal; the leg is picked up and it looks like the horse is swinging it in an arc away from his body from the knee down. He limps and looks to be in pain. To get the weight off his front end, the horse now leans back so his hindquarters can take the weight off the front. Now his head and neck carriage has changed, becoming lower and straighter. And it looks like the body is crooked. Now his muscles are tight and sore. How can muscles get tight and sore from doing nothing, you wonder?

Finally, the vet says the limb is healed. Huh? If the limb is healed, why is the horse still walking funny? Why isn't he walking like he used to? What can be done to help my horse? You do some research and find out why the healed limb isn't performing normally and you discover the term *proprioception*. You also discover why equine sports massage will probably assist in the recovery process as will horse and owner participation.

DEFINITION

The term that describes limb awareness, range of motion and movement of a limb is called proprioception. There are interesting examples of equine and human proprioception, such as the newborn foal and human toddler taking their first steps, a horse sailing over a jump and landing and a dressage horse executing precise, rhythmic and balanced movement.

Just think about how humans and equines move; their bodies and brains connecting as they learn and relearn movement until it is so ingrained within the neuromuscular system that movement and placement of limbs in motion becomes automatic.

Sometimes proprioception goes awry. We have all experienced the foot or leg that has gone to sleep and then we try to get up and walk, having to suddenly think about where the limb is and how to figure out how to use it again, even if the sensation lasts momentarily. And some of us might have experienced a leg injury followed by rehabilitation, with the goal being the retraining of our body and brain so that the healed leg can be used properly again, without pain. The same thing can happen with a horse when he has a leg injury; but he can be difficult to rehab

because there is no verbal communication to help him nor can he tell us what he feels.

Before determining how to restore limb movement as well as range of motion in an injured equine limb through the practice of equine massage, one should know the definition of proprioception. Below is an excerpt from an Internet article which best describes proprioception and the affect an accident has on a horse:

“Proprioceptors are found in tendons, muscles, ligaments and joints and provide information to the brain regarding the adjustment of posture and movement. They influence the responses required for the body to correct imbalance due to tension in muscles or ligaments caused by a twisted foot or unforeseen stretching movement. The spinal cord and brain centers are made aware of the situation and respond accordingly. When these are working properly, a horse has the ability to gallop on uneven ground and retract his leg from a hole if one occurs.

After an accident, proprioception is affected by the new sensations of pain causing lameness. The body progressively organizes itself to cope with biodynamic messages by adjusting its behavior. When the horse experiences this pain, it will limit the range of motion of the joint or compensate by using other muscles or both. Therapists must take this into account when treating a lesion, making sure the treatment considers the muscles, ligaments and tendons that might be affected.

Once a horse has traumatized an area, it takes some time for them to feel able to use the limb, so often the horse can be sound and still show lameness. A convalescing horse must be allowed to regain its confidence by a closely supervised program of exercise and therapies.

Remember, that the older the horse with a fully developed mechanism of response and control, weight, genes and conformation will also be factors to consider.” (Russell and Becker).

RETRAINING THE BRAIN, THE LIMB AND THE HORSE

One can agree with Russell and Becker on the mechanical process of retraining the brain, the limb and the horse but one should also consider his psyche. Horses thrive on support and confidence gleaned from his handler and trainer. Giving appropriate positive verbal feedback should help in the retraining process.

Rogers (World Wide Web) suggests that “real” pain may not be completely gone. He explains that pain may indeed exist even when complete tissue and ligament healing is present. He states that one muscle unit might still be longer than normal and the opposing antagonistic muscle is hyper-shortened. In relation to proprioception and central nervous system, the hyper-extended muscle may send greatly increased information back to the CNS, while the hyper-shortened one sends little or no proprioception information of value to the movement process. The net result is proprioception confusion and this alone may cause the onset of “real pain” in the spastic muscle.

A large amount of material states that the best way to restore movement is with movement by walking over varied terrain and introducing small, non-threatening movement. Halstead and Cameron (2000) relate that it also takes “conscious awareness” during a given moment to affect a change in how it is performed. To better understand this concept one can refer to the Feldenkrais Method (Awareness through Movement), Sally Swift (The Alexander Technique), Mary Debono (S.E.N.S.E.) and Linda Tellington-Jones (The T-Touch).

MASSAGE AND PROPRIOCEPTION REHABILITATION

Halstead and Cameron (2000) use a combination of fascial release and new “correct” movement as a method of retraining the now healed equine limb. Their findings suggest that fascial releases change the messages being sent by the nerve endings in that damaged area. The new messages go to the brain to keep it informed as to position, length and tone of muscle, etc. They also report that when holding a fascial release, that if the tissue springs back, the message hasn’t had a chance to get to the brain and therefore any change is going to be less permanent. Only when the brain gets a clear message can the retraining of the muscle proceed.

Now that we have a clearer understanding of proprioception, movement, injury and retraining, let’s look at our case horse to determine what has worked and why.

“ENDEAVOR”

Morgan Gelding, 15 yrs. Old. Cross-trained pleasure horse: Drives and rides. **Injured 5/2006**. Possible cause-stepped into a soft spot while running in pasture. **Diagnosis**: Left-front leg; Lesions and tears of the deep digital flexor tendon and suspensory ligament. Stall-rest for 1 year recommended.

Prognosis: “Cannot become more than a fixture in a round pen and will need to be destroyed soon.” (Medical Veterinarian.)

“He has life in his eyes and they are saying that he is not ready to give up yet.” (Holistic Veterinarian.)

Observations: Exaggerated limp on left fore. Horse tends to pick leg up and swing it laterally before putting it down “splay-footed.” Pain observed in eyes. Prescribed 1 gram bute/day for pain by medical veterinarians; continued by holistic vet. Ordered 10 minute walking straight line by holistic vet. Same vet ordered shoes for front and sent her farrier to trim for angle and install shoes.

Endeavor’s owner, not ready to put her horse down, consulted a holistic vet after traditional veterinary medicine ceased to be a viable option for the horse. The initial visit with the holistic vet consisted of the presence of the equine massage therapist. After acupuncture proved unsuccessful in restoring movement and relaxing muscles throughout the body, the therapist was directed to begin performing bodywork. During the course of the massage therapy, Endeavor also went through a regimen of Chinese Herbal Medicines in this order: Hot Hoof, Hot

Hoof 2, Tendon and Ligament, Equine Du Huo. He is now taking Devil's Claw and Yucca as prescribed by his holistic vet.

Following are excerpts from the massage therapy sessions that began March 22, 2007 and have continued weekly or bi-weekly since then:

3/22

- **Initial discovery and treatment. Transverse pectorals tight-increased circulation noted due to sweating of area after performing cross-fiber friction. Spasm caudal to left scapula. R. longissimus very cold w/spasms. Some release but no increase in warmth in this area after effleurage, compression and friction. R. rear gluteals cold but did release. L. intercostals have spasms. Still severe limp pre/post massage.**

3/28

- **L/R longissimus very sore from withers to croup. Micro-spasms felt R. triceps. Deep spasms in pectorals when R. triceps worked. Intercostals, latissimus very tight L/R. Deep work caudal border of L. scapula caused horse to paw air with that leg. Work at T17-T18/tubercosae caused horse to cow-kick release? L/R longissimus still sore but warmth felt in R. side. Muscle jostling performed all corners as well as neck/crest. Slow deep effleurage applied to longissimus. Severe limp pre-post massage.**

4/6

- **Has a good walk before session. Left fore can be placed flat at times with no head bobbing. Has an occasional loss of balance with bad leg.**
- **Heavy cross-fiber work at transverse pectorals performed: L=leg extension, R=sweating and leg extension. With vet's permission, began leg stretches, but client unwilling to pick up good leg due to soreness/lack of confidence by horse?**
- **Compression/squeezing L. brachiocephalicus at base (origin/insertion point)=quivering into R. pectoral region and down right leg. Trigger points worked at poll area. Deep muscle/tissue work at L/R scapula, trapezius with releases of yawning and licking.**
- **Compressions/cross-fiber work at L/R longissimus=yawning. R. rear fascial lines stripped between semitendinosous/semimembrinosous with yawning. Still cannot pick up good front leg.**
- **After session walk exhibits more limp but this was expected.**

4/18

- **Owner reports stumbling from long toes? Or muscle issues? Evaluation shows R. front not extending and R. hip and R. hind has a short stride. Head-bob present but not extreme.**
- **Long, heavy effleurage to neck, back and loins with compression and cross-fiber. Fascial stripping (?) applied between tendons each front leg. Fascial stretching applied to "armpits". Releases as many areas but mostly at R. rear gluteals. Horse allowed deep work above/behind R. hip.**

- Fast walk performed for 5 minutes with good reach. R. hind movement restored. Slight head bob.

4/30

- Horse exhibits unexaggerated limp. Short strides in rear limbs. Is trying to carry more weight on rear according to walk posture.
- Micro-spasms released in transverse pectorals. Worked rope-like trigger points in front of L/R scapula on neck. Small releases at latissimus and intercostals. Large releases at tuber coxae's. Longissimus and gluteals feel supple. Client assists with leg stretches-followed by releases. Still cannot raise good front leg in order to put weight on bad leg.
- After session shows a balanced walk on all limbs. Better reach with hind legs at a fast walk. Owner shown where to apply ice on neck, back, pectorals and for how long in order to facilitate release of deeper spasms.

5/9

- Has a lurching walk and large "gimp." Setback due to farrier visit or ??
- Fascial releases performed along neck and back. Fascial stretching performed cross-fiber with heel of hand from rib heads to top of vertebrae resulting in many releases.
- Leg stretches performed on 3 legs. Horse has a hard time performing belly lifts and pelvic tilts due to bad posture acquired during layoff. Some release with belly lift and tail pulls.
- After session has less limp. Did walk faster over varied terrain. Bad leg is pulling in and is not as splayed. Owner shown how to perform belly lifts on a daily basis in order to improve posture as well as back strength/flexibility.

5/11

- Pre-session observation evaluation of walk and length of stride. Bad leg still limps but has longer stride. Good front leg appears to have shorter stride and is perhaps favoring it. Is the good leg and related muscles getting fatigued?
- A "feel good" massage session. Some deep work with antibrachial fascia. Muscle jostling and cross-fiber work performed to help relieve stress.
- Appears freer moving at the walk. Horse will not allow lifting of right front as yet.

5/28

- Pre-session observation shows the client swinging the bad leg as well as lifting it. Scapula not rotating? Not much flexion below the knee observed.
- Released stress build-up in cranially/caudally to scapulas. Some release along the longissimus, superficial and middle gluteals. Belly lifts easily and spine has increased suppleness as well as lateral movement. Extended leg stretches performed with 3 legs with client participation.
- Owner directed to back the client down a small incline and therapist finally lifted the good leg twice, followed by the client performing this on cue. Owners

shown how to lift the good front leg so that therapist can begin performing stretches on the limb in order to relieve long-term stress.

6/2-6/5

- Therapist asked to perform 10 minute walking sessions while owners are out of town.
- Sessions extended to 15 minutes but are interspersed with small breaks and training sessions. Therapist's intent is to perform movements discussed in various literature.
- Client asked to stand square in order to bear weight equally on all limbs. When client insisted on standing splayfooted he was asked to back in a straight line and then asked to stand square.
- Walking performed with therapist holding the client's head in a "proud" position during the walking periods. Therapist used long, reaching steps to encourage the client to mimic the walk, straightness of body, posture and proper placement of the legs. Excessive praise given when client is halted and he stands square.
- Stretches performed on the good leg!
- On 6/5, therapist removed the client from his stall for his walk. He walks like a normal horse! There is no sign of limping, leg swinging, being splayfooted, etc. Weight is being distributed on all limbs properly and equally.
- Will the upcoming farrier visit cause a setback?

6/9

- Yes. A setback has occurred. Extreme soreness, excessive head bob, very splay-footed again.
- Horse has many trigger points along the brachiocephalicus and rhomboids, in the triceps on the left side, tightness along the longissimus. Difficulty in moving the spine laterally with suppling exercises. Resistance to having the belly lift and pelvic tilt performed.
- After session walk shows better movement but horse begins excessive stumbling and pain after 10 minutes.

Analysis: Endeavor exhibits stance and walk patterns consistent with a long period of stall rest. Posture adapted during this layoff is compensatory: Head and neck held low and straight, injured left leg with a splay foot stance and not 100% weight bearing, rocking back in order to put more weight on the rear quarters and finally, a crooked posture from head to tail from putting the majority of his weight on 3 limbs for an extended period of time.

Weekly explorations and body work reveals musculature consistent with an extended layoff and compensatory stance such as rigid rhomboids and brachiocephalicus in the neck from keeping the head and neck low and straight, spasms in the pectoral region (ascending and descending) from constantly adjusting and assisting the rear quarters when the limbs are locked in a stay position,

elongated and contracted triceps on opposing sides from carrying weight or not bearing weight at all, trigger points at the cranial border of the scapulas from bad posture as well as the cranial and thoracic trapezius near the scapular cartilage, tight longissimus, gluteals, femoral biceps, semitendinosus and semimembranosus.

Bracing, present at the beginning of the work is no longer present. This was exhibited in the left longissimus and continued diagonally over the longissimus/gluteal junction to the right rear quarters. Transverse bracing also occurred in the horse, traveling up and over the front quarters of the horse from the injured left front limb to the weight bearing right front limb and musculature.

Consistent bodywork with the horse, in the form of effleurage, compression, cross-fiber friction and fascial release, resulted in the release of bracing. The bracing diminished starting with the rear quarters with subsequent release and suppleness occurring until it reached the forequarters. The neck areas are still with bodywork still being concentrated in this area.

It should be noted that as the horse became supple in the rear quarters and back areas, therapy could commence on the support structures of the legs, pelvis, hips and spine. Belly lifts and leg stretches assisted the muscles and tendons in retaining their pre-injury, natural balance. From here, the horse began to stand in a straighter line from head to tail as well as have increased proper limb movement and placement. Walking over varied terrain and being turned out in a secure area to practice walking, trotting and running is also helping to restore confidence and limb placement. Shoes will no longer be worn after another 6 weeks and the horse will go barefoot again. It will be interesting to see if the barefoot horse regains proprioception and movement faster than when he was shod. Therapy is on-going.

Addendum: As of 6/30, Endeavor is walking almost normally. He is turned out each morning for a few hours in a large but confined area that has a slope, trees and best of all, a former pasture mate. Mutual grooming occurs which in turn stimulates fine motor control in the neck, back and limbs. One can assume from the literature that proper stance is being mimicked by watching the pasture mate. Grazing with the head down stretches the nuchal ligament in the neck and the supraspinous ligament in the back. Eating Mesquite leaves from low hanging branches encourages balance while the head is raised, the neck stretched and the back muscles fully engaged. The owner wants a pasture horse when healing is complete. The therapist has higher hopes.

CONCLUSION

Having no way to gauge pain in the client, one has to assume that Endeavor does experience real muscular pain and possible proprioception confusion as discussed by Rogers because motion does increase after the horse receives a dose of Bute. What massage does for the horse is increase his muscle memory.

Muscles memorize particular movements, especially when carried out over a long period of time. Movement becomes implanted in the muscle and mind and it is very difficult to change them (Sue Morris. 1998). Morris relates that people do this with sitting posture. A better sitting posture can be consciously worked at but as soon as we are not thinking about proper posture, we revert back to the previously learned sitting posture. She also states that equines are the same way. They have their own idea of what “normal” is and will try to revert to it in the same way. In our example, the posture, stance and walk of the injured horse is now the “new” memory and it must be “unlearned.”

Because horses mimic one another, the best therapy for rehabbing the horse and improving proprioception could be turning them out in pasture with their friends. The rehabbing horse will imitate good posture and stance, move over varied terrain while grazing and experience other random sensation which increases the body’s overall neurological stimulation (Barbara Chasteen, World Wide Web). Chasteen also says that this assists in the relearning of independent decision making while restoring sensory motor awareness. Placement in a small paddock at night can give the body a chance to review the day’s activities and hard-wire in the new movements and subsequently retrain the muscles.

Because each horse recovering from a limb injury is different, work with the client’s veterinarian and owner will dictate how each case horse will respond. Improvement may plateau and regress or improvement may be steady and positive. One can expect a longer rehabilitation period for the muscles and limb the longer the horse is stalled. Consistency will be the key to ultimately helping the equine to learn how to walk properly again. Proprioception, muscles and the horse’s way of thinking will have to change before success can be noted.

END NOTES

Some things to consider as you refer back to the horse in the article:

“The proprioception sensory system is carried out utilizing proprioceptors in the muscles that monitor length, tension, pressure and noxious stimuli. The muscle spindles, the most complex and most studied of the proprioceptors, informs other neurons of the length of the muscle and the velocity of stretch. The density of muscle spindles within a muscle increases for muscles involved in fine movements, as opposed to those involved in larger, course movements. The brain needs input from many of these spindles in order to register changes in angle and position that the muscle as accomplished. There is also more spindles found in the legs; muscles that must maintain posture against gravity.

Another proprioceptor, the golgi tendon organ, is found where the tendon meets the muscle. They send detailed information about the tension occurring in specific parts of the muscle. There are also proprioceptors sending information to the nervous system from joints and ligaments. Depending on the amount, where in the body, and from what proprioceptors the different input is coming from, determines if the information will be made conscious or processed unconsciously. All of the input coming into the nervous system is processed and then depending on the state of the muscle, there are commands sent back to the muscle (Shannon Lee, 2002).

Lee (2002) cites Ronald Melzack’s idea of an existing “neuromatrix,” which is to say that the brain has a particular matrix, or map of the body, genetically installed in the brain the both responds to stimuli from proprioception and continuously sends impulses to different parts of the body to check on the condition and location of body parts. The matrix can be altered due to experience such as storing memory or changing synaptic connections, but the overall connection is set from birth.

“Proprioceptors can be awakened and enhanced by stretching, bringing the ligaments, muscles and tendons to a state of readiness. Stretching can be active or passive. Active is on top of the horse while riding. Passive is done on the stall or in the barn aisle. Stretches improve balance and frees up the range of motion without being invasive.” (Russell and Becker).

“The back, a complex system of vertebrae, muscles and ligaments, is responsible for protecting joints, recycling energy and controlling proprioception (the ability of the horse to control the placement of his feet). The main ligament, the supraspinous ligament, is responsible for pulling the vertebrae of the back into flexion and creating pelvic tilt that pulls hindquarters under the horse. Small, type I muscle fibers responsible for proprioception control subtle spinal movements and postures. These fibers fatigue very quickly when the horse is tense or does repetitive movement and set the horse up for muscle and ligament injuries. When the horse is tense, frightened or not properly using his jaw, neck and shoulders properly (even from layoff), the main ligament supporting the back fails to work and tiny muscles responsible for

proprioception fail. As this happens, larger type II muscles of the hindquarters, back, etc. take charge to propel the horse forward. The result is a loss of control and proprioceptive awareness for the horse as well as sore back and hindquarter (Scott, Tracey 2007).

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