Equine Rehabilitation

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Rehabilitate (v) - To restore or bring to a condition of health or useful and constructive activity.

The concepts of rehabilitation have remained the same since 1958 when Dr. Howard Rusk, one of the early promoters of rehabilitation in the US, stated that its objectives were to eliminate the physical disability if possible; to alleviate the disability to the greatest extent possible; and to retrain the person with a residual physical disability to live and work to the hilt of his capabilities.

To achieve this then and today the human industry has provided a team of experts versed in restoring function to various areas of the body. Occupational Therapists, Physical therapists, Speech Language Pathologists, Kinematic specialists, etc. are called upon in various cases to address the needs of the patient. This team approach is increasingly popular in the animal rehabilitation world.

Any good rehabilitation program needs to start at the beginning. What are the possible reasons for the injury? While this can be a difficult question to answer in a specific case the overall concepts are straightforward and should be considered when constructing a rehabilitation program.

Concepts of Injury

Across species and outside of the equine disciplines 'injury' can be classified into some general categories – primary trauma, conformational, sports specific or functional.

Primary trauma or accidental injuries are often severe and rarely have an underlying cause. They include slips and falls as well as tack malfunctions etc. These tend to be simple and straightforward traumas with a variable prognosis based on the location and severity of the injury. The rehabilitation program in these cases should focus on improving the expected outcome of the injury and supporting the rest of the body during the rehab process.

Conformational injuries occur secondary to the anatomy of the horse - for example a bench kneed horse developing an injury in the medial splint bone. Injuries and degenerative disease secondary to the horses own conformation can be very difficult to rehabilitate. Some conformational faults (poor topline muscling) can be improved upon. Others (severe toeing out at the fetlock) cannot be corrected but may be supported through various methods. The focus in these cases should be on the best way to support and minimize the abnormality during the injury rehab and then the more long-term focus should be on the muscle development to support the conformational

fault and hopefully prevent reinjury. These horses are prone to reinjury due to their anatomy.

Sports specific injuries are injuries that a horse may incur due to their specific career or training patterns. Racehorses are more likely to develop a tendon injury than a jumping horse. A cutting horse is more likely to develop a hind end injury than a front end one. There are some interesting research studies looking at the injury trends in various disciplines.[1] These injuries are wholly preventable and as professionals in the equine industry our best line of defense is education of horse owners and other professionals.

A good rehabilitation program takes into account what sport the horse will be expected to perform at the end of it. For example an endurance horse may be more successfully rehabbed on a trail than in an arena. Or a jumping horse may improve faster if he is walked over poles as a regular part of their program.

However – if a horse is suffering from a repetitive injury due to something they do as a part of their sport – the program will be most successful if other areas of his body are focused on and treated to support the weakened area. For example a cutting horse sustains a mild stifle injury – while antinflammatories will help him regain soundness – an exercise program to further develop his quadriceps, biceps femoris, gracilis and vastus mm. will help prevent the injury from recurring or worsening.

Functional injuries are the most preventable and the most complicated. These injuries tend to form slowly in response to excessive stresses or compensations from discomfort. In other words they arise secondarily from a primary dysfunction of a part of the musculoskeletal system. Muscle imbalances (i.e. asymmetric muscling) lead to altered motor control. Neural or joint pain (i.e.- chiropractic pathologies) leads to altered motor control. Conformational imbalances (i.e. high/low syndrome) lead to altered motor control. Altered motor control leads to uneven strain and stress on various structures. This uneven strain and stress creates micro-traumas; these wear and tear injuries in the soft tissues and bones are healable in a rapid fashion by the horse up to a certain extent. Micro-traumas will in time create pain causing more asymmetry and will most likely result in a more severe acute injury.

The key to rehabilitating these injuries is finding the primary functional issue. This is often not apparent or not feasible in the acute stages of a severe injury. So our whole body treatment options may be limited by the injury itself. In these cases it is helpful to go back to basics and focus on the basic steps of rehabilitation. Once the animal is cleared for some return to function the goal should be to uncover the primary cause of the dysfunction and address it before they return to full work.

Whether the injury is accidental, conformational, sports specific or functional identifying and addressing the underlying cause of the injury will help heal the injury

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[1] Dabareiner et al 2005; Scott 2008

itself. It will also help with developing a prognosis and a future plan to help prevent reinjury.

Steps of rehabilitation

Once the cause of the injury has been determined the goal should switch to achieving the basic tenets of rehabilitation. Remove the pain, restore range of motion and add strength. These steps are most successful if done in this order however in many cases the steps overlap quite a bit. Rehabilitations benefit from consistent reassessments and redirections as needed throughout the program.

Remove pain

The inflammatory period of most injuries is about 30 days long. So the discomfort from most injuries severe enough to require rehabilitation can be expected to remain for at least this length of time. The limiting factor during this period of time is the risk of the injury getting worse instead of better. Because of this it is important to address pain with a team approach. The veterinarian should provide systemic and local medications. Massage, chiropractic, acupuncture and other bodywork skills are extremely effective pain relief tools. Therapeutic tools such as ice, heat, ultrasound, cold laser, magnetic or ceramic wraps and blankets should be used aggressively during this time. Therapies such as a vibration plate, a cold saltwater spa or an underwater treadmill can offer effective pain relief[2] as well as stimulating healing locally and systemically. The core of the regenerative treatments such as stem cells, PRP, IRAP or shockwave is to decrease inflammation and therefore decrease pain. Another method to remove pain is therapeutic shoeing or trimming. A veterinarian and farrier versed in how to manipulate the horse's feet to support the injury is an invaluable tool.

By decreasing pain you encourage the body to heal itself and improve the outcome of the injury. One of the biggest reasons rehabilitation programs fail is a lack of initial 'rest' time or lack of pain control immediately following the injury. For moderately severe or severe injuries 30 days is likely not long enough to achieve total pain relief – being realistic about this goal from the outset will prevent pushing the horse too fast, too soon.

Restore range of motion (and therefore function)

Step two is restoring range of motion. There are a number of ways this can be achieved depending on the area of the body. Simple standing manipulation or food bait exercises are an extremely effective and low stress way to improve range of motion. Massage, chiropractic, myofascial release and other hands-on techniques come in useful again. Controlled exercise using the horses own weight (i.e. handwalking) as physical therapy can improve range of motion. The underwater treadmill is one of the most effective and recently proven methods of improving range of motion.[3] Some injuries

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[2] conversation with Dr. Melissa King, DVM, PhD, ACVSMR

[3] conversation with Dr. Melissa King, DVM, PhD, ACVSMR

benefit from external support, which allows an injury to heal while normal range of motion continues (i.e. therapeutic shoeing, kinesiotape).

As the animal improves their range of motion they should be continually assessed for any discomfort that may arise as the movement increases. Owners, trainers, bodyworkers and/or veterinarians involved in the case should be looking at the horse on a biweekly basis to make sure the pain doesn't worsen or return.

The length of this stage is highly variable. For a younger horse this stage might be very quick and the limiting factor to their return to work is strengthening the injury itself. For some middle-aged horses this period of the rehabilitation will continue until the very end of the process. As they build strength their bodies will want to reform old habits and the goal of the rehabilitation should be to minimize or prevent this. For these cases novel tools are often the most successful. A hard working dressage horse that has been ridden in an upper level frame for 8 years may respond much more quickly to relaxing works without a rider up. An inherently lazy horse may benefit from a rider correcting his strides every stride at a walk more than doing what he pleases on a free-flow exerciser. Once again a teamwork approach is an important concept for this stage to proceed smoothly. Once a normal range of motion is achieved the next step is to focus on restoring strength.

Restore strength

Once the injury is on the road to healing, the horse is out of pain and the areas of interest have regained normal range of motion the focus should shift to restoring normal strength. So what does that mean? That means the movement of the animal should be looked at and asymmetry of movement should be addressed accordingly. If the first 2 steps have been achieved then the asymmetry is most likely from weakness. Building strength is not only for the injury to heal but also for the rest of the body to become strong enough to prevent it from happening again. Simple techniques such as shorter more frequent workouts will help build stability and strength. Longer less intense works will help build endurance. Here is where building a program that is specific to the horses asymmetry and future career is very helpful.

Restoring strength should be done slowly with an eagle eye on the primary injury to assess it's response. A gradual 5% increase in workload is recommended for most soft tissue injuries. Many bony injuries can move along a bit faster than that. Workload can be increased via time or via intensity. Intensity can be increased using weight (rider) or difficulty of movement.

Some tools to consider when building a program are:

1. Core exercises
2. Underwater treadmill or swimming
3. Undersaddle and in-hand exercises
4. Varied footing options (soft vs hard vs uneven)
5. EquiBands
6. Kinesiotaping
7. Activators or weights

8. Ground poles/Cavalettis
9. Hills
10. Speed work

Similarly to stage two – while the horse is proceeding up through the stages of restoring strength the must be a regular assessment of his comfort and range of motion in his body. Any setback must be addressed and dealt with promptly for the program to be able to be successful.

Concepts of rehabilitation

Conventional rehabilitation in the equine athlete has primarily focused on a speedy and economical return to the previous level of function with the smallest chance of reinjury. However, in the last 10 years there has been a gradual shift in attitude in many levels of competitive and pleasure riding. Amateur riders are becoming more interested in their horse's welfare and quality of life. There is greater owner, veterinary and equine professional education available. The diagnostic technologies as well as the treatment technologies have jumped forward in leaps and bounds.

Historically after the 'injury' was diagnosed it was left to the trainer and the owner to bring the horse back up into work. The success or failure of the program often rested on the experience of the trainer and the patience of the owner. Only the most competitive barns used rehabilitation professionals as a part of the program. All of the focus was on the 'lameness causing' injury rather than on the whole horse. Many horses with an injury would get less care and attention from their trainers and owners than when they were in full training. While there is minimal research in this area what little there was showed only 50-60% of 'lameness causing' injuries could return to the previous level of function without reinjury. The silver lining in a rehabilitation program successfully carried out by the owner is the increased connection between the horse and owner that often develops from spending so much time together.

The limitations of the classic rehabilitation program are many. There is the boredom of handwalking around and around. Boredom for the horse, boredom for the owner and boredom for the trainer and their staff. Boredom leads to a poor compliance rate. If a little bit of rest is good a lot is not necessarily better. A lack of compliance can lead to insufficient or overstimulation of the injury. A change in the horse's exercise program can lead to obesity if not carefully monitored. A loss in condition via prolonged rest may be insurmountable for some older horses.

Of special note is the connection between lower limb injury and atrophy of the muscles in the back. If the spinal muscles that atrophied during the period of injury are not directly stimulated through targeted exercises they will be unlikely to recover full function.[4] Back pain is a common sequelae to lower leg injuries and this is a likely source.

[4] Hides etal 2001

Professional rehabilitation – or rehabilitation under the guidance of and monitored by someone versed in rehabilitative techniques can improve the outcome of the injury and decrease the likelihood of a recurrence.

Professional rehabilitation offers a large number of benefits; both emotional and technical – to the trainers, owners or whomever is primarily responsible for the care of the injured horse. When the goal of the program is a successful rehabilitation rather than a return to the show ring or trail there is a much higher compliance rate. These programs are often able and willing to get these horses out of their stalls more than once a day. They often have access to newer and a larger variety of therapeutic technologies. A professional handles the horses and that leads to less behavioral issues and a closer monitoring of the injury. Their day-to-day condition is more closely supervised. The focus is on the whole horse well being so these programs may offer targeted core exercises for those atrophied back muscles.

The primary limitation to professional rehabilitation is money. The equipment and manpower to run an effective rehabilitation program is substantial. Therefore the cost to the client/owner is substantial. The loss of income to the trainer is often a factor as well.

Through the varied rehabilitative techniques discussed later in this chapter a professional program can ensure a sounder, happier horse at the end of the program.

Rehabilitative techniques

Controlled exercise

The cornerstone of a good rehabilitative program is controlled exercise. The simplest form of controlled exercise is hand-walking. Hand-walking is a dirty word in many barns – instead of punishment for the owner and horse it should be viewed as physical therapy. Hand-walking should not be wandering about and grazing. It should be marching forward with a well behaved horse walking briskly and paying attention. Special attention should be paid to the footing they are working on – most injuries heal better with more firm footing – less than 4 inches of soft dirt in an arena. If the horse is poorly behaved or really lazy in-hand it is sometimes beneficial to walk him in tack or with a rider up to encourage good forward movement.

A step up from hand-walking is the free-flow exerciser. A common brand name is the 'Eurociser'. It is a powerful tool in the rehabilitation process. From the management side it allows more than one horse to be exercised at a time. From the horses perspective it allows them to move about in a group. This soothes their social needs and often aids in calming them down. It is especially powerful in very young and older horses. Young horses may not be trained enough undersaddle or in hand to achieve consistent good forward movement without misbehavior. However the 'follow' instinct is ingrained in almost every one of them. The older horse will often benefit from the ability to move more freely with no one on his back. There is less pressure placed on a horse in this situation and this encourages relaxation rather than stress.

The concern for many years has been the repetition of the circling movement and was it too much stress for the injury. There is ongoing research that is pointing out

that while circle circumference plays a role in increasing strain on a horse's legs the key factor appears to be speed.[5] So for most injuries walking in a 6-horse eurociser or bigger will carry minimal risk.

Underwater Treadmill & Swimming

Horses were probably swimming before human's ever laid a hand on them let alone put a saddle and bridle on them. Swimming an injured horse in the ocean has been known to have beneficial effects for hundreds of years. Still today true swimming whether in a pool, pond or the ocean is considered excellent conditioning for a young equine athlete.

So why didn't pools for horses get popular for the average joe? Cost is certainly a big issue – probably the number 1 limitation. The second limitation of swimming a horse is there is a lot of risk and little known about how an injury may respond to the stress of having to swim. Swimming is hard work for a 1000lb animal.

Enter the underwater treadmill. Its popularity is on the rise as a usable and safe method of maintaining or improving condition in an injured horse. It has been shown to increase range of motion and comfort in post surgical cases.[6] By allowing the horse to work hard with less strain on the injury the behavior improves dramatically. There is a core strength improvement for many horses over handwalking alone or resting in their stalls. There are a number of concerns over the use of the underwater treadmill in specific injuries. As with any other modality – the frequency and intensity of how you use it is important. It is a powerful tool in a good overall rehabilitative program.

Ice and cold water therapy

From the first skinned knee or fat lip we are forever being handed an ice pack. Cold therapy is a hallmark treatment for inflammation anywhere in our animal's bodies and ours. Heat is associated with inflammation – inflammation is associated with tissue damage. Therefore if you can control the heat – you are likely helping to minimize the tissue damage. For the first 30 days while the injury is still going through the chemical processes of the healing process the goal of the cold therapy is to decrease the inflammatory mediators and provide pain relief. Thereby encouraging good healthy healing. During the rest of the rehabilitative process and beyond cold therapy can be used to minimize inflammation whenever a big jump in exercise intensity is made (i.e. – walk to trot).

The latest in cold therapy is the 'cold spa'. It is a swirling bath of very salty water that is chilled to 35deg F. It serves to cool the tissues immersed in it – stimulate lymph flow via agitation – remove swelling by creating an osmotic gradient and when the horse exits the cold spa there is a rush of oxygen to the tissues allowing for greater healing ability. It can be used to decrease soft tissue inflammation in acute or chronically inflamed tissue – then it can be used to keep that inflammation away while the work and strength of that tissue is increased.

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[5] conv. with Dr. Hilary Clayton

[6] in conversation with Dr. Melissa King, DVM, PhD, ACVSMR

Heat therapy and therapeutic wraps

In acute cases of injury we rightfully reach for the ice pack first. As we have discussed there is often a preexisting or underlying issue that led to the acute injury. Here is where heat therapy and therapeutic wraps shine. Simple heat in the form of warm water or a heating pad is an effective – if unwieldy- way to relieve tightness or discomfort associated with a chronic injury before a horse exercises.

Magnetic wraps or blankets and ceramic infused products are targeting the animals' own heat waves. These wraps or blankets modify the emitted heat wavelength and reflect it back on the horses body. This modified heat is purported to cumulatively over time have a relieving effect on chronic pain and swelling. These are a convenient method of heat therapy prior to exercise for most horse owners. They are also beneficial for horses who are not yet allowed any exercise as they seem to improve circulation in the areas they are used.

Methods to increase core muscle strength

Yoga and pilates have taken the exercise world by storm. They have shined a bright light on human 'core' muscles. Functional movements are highly dependent on the core, and lack of core development can result in a predisposition to injury.[7] The major muscles of the core reside in the area of the belly and the mid and lower back and peripherally include the hips, the shoulders and the neck. When we put a saddle and rider on a horse we change their natural balance. Then we ask them to be incredibly and amazingly athletic despite that. Core muscle strength should be the primary focus of most conditioning programs. Most programs – even dressage programs – focus more on perfecting the movement than on strengthening the core.

So how do we do yoga or pilates on a horse?[8] Treat based exercises are an excellent start. They encourage a horse through positive reinforcement to engage his core muscles at a standstill. If he can't do them at a standstill we will be disappointed when we ask him while moving. A routine of core exercises over 6 weeks has been shown to significantly increase the multifidous muscle size along the horse's back.[9] These same exercises have been shown to improve the range of motion in the spine and the limbs as well as improving proprioception and balance.[10]

Most amateur riders do not have the balance or the reflexive speed to support a young horse learning to balance a rider throughout the varied gaits. The situation is often the same in a horse coming back from injury. A professional rider is more likely to have success 'retraining' that horse than an amateur. Engaging a trainer or a professional rider to help with the transition back into work is an important piece of the puzzle. They may have other tools in their toolbox such as ground-driving which can be very beneficial for the rehabilitating horse.

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[7] Karageanes, Steven J. (2004). *Principles of manual sports medicine*

[8] "Activate your horses core" by Hilary Clayton and Narelle Stubbs

[9] Stubbs, et al 2011

[10] Clayton et al 2010

Other tools that can increase the intensity of a workout and help a horse strengthen their core muscles without working harder are a weight belt, the Equiband system from Equicore concepts, kinesiotaping and the use of activators. Each of these tools has a specific target. The weight belt increases intensity without the interference or need of a rider. The Equiband system targets the abdominal muscles, the multifidous muscles and the biceps femoris and therefore encourages the development of stability and balance. Kinesiotape is an elastic tape that is applied to targeted muscles to draw the bodies awareness to them and to therefore improve their function. It is also thought to have some pain relieving effects. An activator is a lightweight tool that uses the horses extreme skin sensitivity to flies – it will stimulate a horse to pick up it's legs higher and therefore can minimize toe drag, retrain muscle patterns and strengthen weaker areas.

Vibration plate

Vibration therapy is a training method employing low amplitude, low frequency mechanical stimulation to exercise musculoskeletal structures for the improvement of muscle strength, power, and flexibility. It has been used in many applications since the late 1800's for overall well-being and to stimulate muscle and bone development when exercise was impossible or impractical. It is extremely useful for horses that are stall bound or as an overall well being treatment for horses in rehabilitation. It appears that it can be used to challenge core strength in humans and athletes report a greater result when working out on a vibeplate. There is no significant research in horses to support its use but despite this has become quite popular at barns in the US.

Chiropractic, acupuncture and massage

As previously discussed chiropractic, acupuncture and massage should play an integral role in the team approach to rehabilitation. They have a large affect on pain relief and improving range of motion in injured horses. These modalities can also be a great monitoring tool during the rehabilitation process. It is much more effective to catch an injury or a compensation before a lameness appears. Another role these equine professionals can play is educator. Educating owners and trainers about the good that these bodywork techniques can do.

Hyperbaric chamber

Hyperbaric oxygen therapy (HBOT) is the medical use of oxygen at a level higher than atmospheric pressure. The equipment required consists of a pressure chamber, which may be of rigid or flexible construction, and a means of delivering 100% oxygen

For many conditions, the therapeutic principle of HBOT lies in its ability to drastically increase partial pressure of oxygen in the tissues of the body. The oxygen partial pressures achievable using HBOT are much higher than those achievable while breathing pure oxygen at normal atmospheric pressure. A related effect is the increased oxygen transport capacity of the blood. Under normal atmospheric pressure, the oxygen binding capacity of hemoglobin in red blood cells limits oxygen transport and very little oxygen is transported by blood plasma. Because the hemoglobin of the red

blood cells is almost saturated with oxygen under atmospheric pressure, this route of transport cannot be exploited any further. Oxygen transport by plasma (the fluid outside the red blood cells) however is significantly increased using HBOT as the stimulus.

Recent evidence notes that exposure to (HBOT) mobilizes stem/progenitor cells from the bone marrow.[11] This mechanism may account for the patient cases that suggest recovery of damaged organs and tissues with HBOT. This is also the rationale behind using it in horses for soft tissue injuries.

The cost and the risk behind HBOT treatment are significant enough that it has not gained in popularity as some of the other treatments. But the rationale behind the treatment is sound.

Therapeutic sound waves – Ultrasound, Shockwave

Ultrasound waves – sound waves above the normal audible range – have been shown to enhance the metabolic activity at a cellular level.[12] It has been extrapolated to therefore have a beneficial effect on soft tissue injuries. While this has not been proven there is anecdotal evidence to support the claims.

There are three primary benefits to ultrasound. The first is the speeding up of the healing process from the increase in blood flow in the treated area. The second is the decrease in pain from the reduction of swelling and edema. The third is the gentle massage of muscles tendons and/ or ligaments in the treated area because no strain is added and any scar tissue is softened. Relatively high power ultrasound can break up stony deposits or tissue, accelerate the effect of drugs in a targeted area, assist in the measurement of the elastic properties of tissue, and can be used to sort cells or small particles for research.

Shockwave – or extracorporeal shockwave therapy (ESWT) – uses a high frequency ultrasound wave to target injuries in a more specific manner than therapeutic ultrasound. The cellular effects are more substantial and the pain relieving effects are longer lasting. This high frequency also has a stimulating effect on the surface of the bone and thus is often used on injuries occurring at the soft tissue/bony interface.

Overall ultrasound's uses are expanding every year – the potential for abuse with this modality exists due to its potent pain relieving ability. This is something to remember when incorporating it into a rehabilitation plan.

Therapeutic light – cold laser (Low Level Light Therapy or LLLT) and red light therapy

"The use of low levels of visible or near-infrared (NIR) light for reducing pain, inflammation and edema, promoting healing of wounds, deeper tissues and nerves, and preventing tissue damage has been known for almost forty years since the invention of lasers."[13] However the mechanisms behind LLLT – despite extensive study – are not well

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[11] Thom SR, Bhopale VM, Velazquez OC (April 2006)

[12] Kerry G Baker, Valma J Robertson and Francis A Duck, Journal of Physical therapy.2001

[13] MECHANISMS OF LOW LEVEL LIGHT THERAPY Michael R. Hamblin Department of Dermatology,

understood. What is known is that there is a therapeutic window between 600 and 900 nm wavelength – this incorporates most of the NIR, red light, and cold laser therapeutic treatments out there.

It is accepted that it has a beneficial even antiseptic effect on skin diseases however it is not as well accepted that it has an effect deeper than the skin. The accepted applications for use therefore include wound healing, skin repair, prevention of tissue death, and relief of inflammation, pain, or edema associated with the skin. The proposed applications include similar effects on the deeper tissues, relief of neurogenic pain and neurological problems – similar in effect to acupuncture.

Cold laser therapy and infrared light therapy are valid therapies for relief of pain and reduction of swelling in areas of injury. Currently there is not sufficient evidence to prove anything more substantial.

Summary

A teamwork approach to rehabilitation of an injury has long been successful in human sports medicine. This approach is gaining in popularity in equine sports medicine and should be fostered by veterinarians and equine professionals alike. The goal of a good rehabilitation program should be to first heal the injury but of equal importance is the goal to discover and treat the underlying cause.