The benefits of regular exercise abound in a multitude of texts and research journals. (1,2,3,4,6,8,9,10,11,12,13,14,15). These findings provide supportive evidence that therapeutic exercise can promote healthy recovery of the damaged musculoskeletal and neuromotor systems recovery after injury or disease. In the human it is known that exercise also promotes positive psycho-emotional wellbeing in regards to stress relief, mental relaxation due to the endorphin release providing a general sense of wellbeing. One could conclude the same benefits from exercise would be true of quadrupeds, even more so, being that their existence and lack of extinction, depends mostly on their dynamic ability to move and run to or away from prey or predator. Equines if given the proper atmosphere, would most optimally stay moving, in a constant state of walking/running exercise, for example roaming expansive lands, foraging for pastures and water. It is domestication that has limited the equines’ abilities to exercise at will. If domesticated animals, equine specifically, were allowed to remain free and roaming, their connective tissues would apt to stay in superior tensile tissue strength such as tendon and ligaments with adequate muscle bias to maintain biomechanical function for the actions required of them to maintain movement and agility, with probable less injury than how the artificial imposition of ridden work has caused them to acquire. Therefore the premise to rehabbing or restoring the equine’s ability to return to optimal functional performance, whether it be to draw carriages, jump 4 foot fences, or race at high speeds, is the element of controlled exercise. Therapeutic exercise specifically controlled and applied, can assist the healing process of the damaged neuro-musculoskeletal system back to optimal restored function.

The overall benefits of exercise are commonly known as increased cardiovascular efficiency, increase in muscle strength, improved coordination and endurance, promotion of tissue and joint flexibility, weight management, increase in metabolic demand and maintenance, joint lubrication and articular cartilage maintenance, endorphin release, strengthening of connective tissues, increased pulmonary function, aiding in digestion peristalsis, along with emotional release of stress reduction and general relaxation. When returning a horse back to overall health the goal is to maximize all of these benefits. For purposes of this article and presentation, the use of therapeutic exercise will focus on the recovery of structures of the neuro-musculoskeletal system, addressing joints, tendon, ligaments, proprioception and muscle function.

The term therapeutic exercise, defined according to Dr. Barbara DeLateur, distinguished service professor of John Hopkins Physical Medicine and Rehabilitation, states that “therapeutic exercise is bodily movement prescribed to correct an impairment, improve musculoskeletal function, or maintain a state of well-being.” (1). Three major categories of exercise are as follows; focus on gaining flexibility, resistance training for strengthening and endurance training. Each of these can then be further broken down into subcategories specific to the level of which the individuals deficits require focus of.

Prescribing therapeutic exercise should be carried out after a full evaluation by the diagnosing veterinarian and then again by the rehab practitioner to determine the area of deficit and determination of the best treatment plan approach. Each equine presents with specific area of injury, medical history, conformation, prior level of fitness, and goals for return to performance. Thus, utilizing a licensed professional practitioner, such as rehab veterinarian or physical
therapist, may be most skilled at deciding and implementing the best treatment of therapeutic exercise to prescribe and carry out instruction of proper application and progression of each exercise program and overall rehab program specific for the each individual and injury.

Horses endure a variety of injuries originating from the frog of the hoof, through out the delicate structures of their limbs, onto the axio-skeletal system, all the way to their temporomandibular joints. For the purposes of this lecture, focus will be on the following areas of musculoskeletal problems such as inflexibility, poor core strength, back pain, poor hind impulsion, stifte dysfunction and neuro-muscular deficits often resulting from neurological diseases or nerve injury, to provide a variety of treatment approaches of therapeutic exercise currently being utilized successfully in equine rehabilitation.

Stretching Exercises

Equestrians of all disciplines will often complain that their horse is “stiff” going in one direction or another or at certain movements, etc. The idea of therapeutic stretching has been well utilized (2) and studied more recently in the equine (3). Joint stiffness can occur from a variety of ailments, from osteoarthritis to joint capsule restrictions to ligament desmitis. To restore joint flexibility, the ability of the joint to go through its full physiologic range of motion (ROM), a practitioner can encourage the horse to move through its available ranges of motion by providing treats such as baited carrot stretches (active motion done by the horse) or by passive movement. Passive movements can be accomplished by a practitioner applying external force specific to the bones with in the joint, limb, body part or structure of the horse in forms such as joint mobilizations, chiropractic manipulations done by high velocity/low amplitude thrust technique, or by slow applied stretching by externally applied movement of the lever arms involved with the joint, such a limb or long bone.

True passive stretching is questionable in that to achieve real tissue elongation of the desired soft tissue, such as the muscle-tendinous unit, the horse has to have relaxation of that muscle to allow lengthening of the fascicles to occur. Due to the horse’s nature of almost always standing in weight bearing positions, it can rarely totally relax muscle in respect to maintaining balance to stand. More likely, it has been suggested that we are getting some “passive mobilization” as suggested by Narelle Stubbs PhD., PT, (4) when moving for example the thoracic limb forwards into shoulder extension. This maneuver may promote passive mobilization, or elongation of the triceps and latissimus dorsi musculature. But with out the horse being able to understand verbal command to “relax” it is unclear as to how much passive stretching to full elongation of full muscle structure length we are truly able to achieve. Expertise knowledge as to proper hand placement is required as to not over stress the joint capsules and supporting structures. There is a specific art as how physical therapist are taught proper stretching techniques to avoid injuring vulnerable tissues, as to not over-stretch specific structures that could result in undue harm or stretch-weakness of structures. This concern over proper stretching approach has been slow to catch on in the equine world.

The benefits of a proper stretching program abound as: increasing the strength of tensile forces (5) decrease of pain (6) along with improved ROM and tissue extensibility. The importance of frequency and repetitions (7) are often overlooked in the equine literature but have recently been suggested to be done every other day, specific to the equine, as proposed by Rose’s 2009 study. (3) Based on these findings it is important to hold stretches for 30 seconds or longer if tolerated, repeated a minimum of three times for each stretch, and repeated every other day.
Strengthening

Resistance training known for its benefit for strengthening muscle, has a specific progression of methods of exercises based on the condition of the patient or state of atrophy or hypertrophy of the specific muscle. The most applicable initial approach to strengthen an atrophied muscle is by applying isometric exercises. Isometrics aim at tensing the muscle without shortening the muscle nor asking for movement of the lever arm or limb. This achieves a toning effect in that specific position by stimulating the Golgi tendon organs and muscle spindles receptors within that muscle-tendon unit. This is often a good method to start strengthening when there is pain or inflammation around a joint to prevent further pain due to movement and prevent further atrophy of muscles. In the horse, this can be achieved by a lateral tail pull to shift the horse on to a weakened pelvic limb, that he may prefer to rest. Bandy suggests that isometrics are most successful if held for 6 seconds or more, for physiological biasing to occur. (7)

Once the horse is less painful and achieving some muscle tone from isometric strengthening, the next progression would be towards “moving” exercises known as isotonics. This is the basic movement we do daily at walking and moving about, against gravity. It involves shortening and lengthening of muscles, for example to bring a cup of coffee up to one’s lips. A shortening contraction would be the bicep shortening to flex one’s elbow to bring the coffee up.

DeLorme and Zinovieff were two of the first proponents of isotonic exercise determining a method for muscle strengthening protocol for progression of weight resistance. (8, 9) DeLorme recommended gradually building up to the 10 repetition maximum (RM); the maximum amount of weight lifted with correct technique for 10 repetitions, for each exercise with percentages of the 10 RM (ie, 50%, 75%, and then 100%). (8) This method is thought to increase muscle fiber due to the nature of high intensity repetitions and the progressive recruitment of muscle fibers. Reaching the RM is a crucial part of a resistance training program, but this is difficult to determine in the horse in regards to number of repetitive movements or number of cavaletties done, for example.

Another aspect of isotonic exercise is the opposite of muscle shortening concentrically but rather a lengthening contraction, referred to as an eccentric. An eccentric example is when the bicep goes from its shortened state (elbow most flexed to bring the coffee to the lips) to a controlled lengthening contraction of the bicep muscle to control the cup down into gravity to be placed on the table. It is the eccentric control that allows for downward transitions in the horse. Weak horses will have trouble with these. Eccentric contractions are responsible for the most force development with in muscle.(10) Therefore, for muscle strength development a program of eccentric exercises are often developed later in the therapeutic exercise progression before moving on to endurance training.

Progression of exercise and timing are very critical to successful rehabilitation and is dependent on the type of injury, the tissue healing phase and level of fitness of the horse. All variables of resistance training need to be taken into consideration to be used appropriately, such as the contraction style, the amount of the load, warm up and cool down periods, addressing large versus small muscle groups, allowance of rest periods, repetition velocity, and frequency. Many of these variables have been yet undetermined as per a finite prescription per injury in each horse.
Putting it all together for the Equine

There are a variety of exercise approaches that have been developed by trainers, veterinarians, exercise physiologists, and now physical therapists. Unfortunately not all of them have been put through rigorous experimentation of double blind clinical trials for specific identification of optimal protocols for optimal outcomes. Many approaches have been adapted to equine protocols taken from studies conducted on lab animals, dogs and human studies. Several studies done by Kathmann et al, reported that a protocol of daily gait exercise, passive joint movement, and hydro-therapy, seemed to be the most important factors in preserving ambulatory status and survival time in dogs with suspected degenerative myelopathy by an average of 255 days. (11)

Many of these therapeutic exercise programs are now becoming more widely explored and accepted in practice due to the positive clinical outcomes. Treatment for equine back pain by utilization of core strengthening programs that originated from work shown to be successful for humans who suffered with low back pain, has now been developed by Stubbs and Clayton for treatment of horses struggling with back pain and poor core control. (12) Stretching programs to address hind end inflexibility have been proposed by Brooks (13) and by Rose for increasing stride length (3). A progressive strengthening program for horses lacking in hind end strength and propulsion, a condition that often contributes to the presence of intermittent upward fixation of the patella, has been well outlined and described by Brooks. (13) The use of the underwater treadmill as a modality to perform therapeutic exercise is an excellent modality. The buoyancy, resistance, and warmth of water decreases compressive forces, promotes pain reduction, flexibility and strengthening to rehabilitate equine (14).

Incorporating these approaches of stretching, progressive strengthening and utilizing a neuromotor relearning approach, is well proven to have successful outcomes in human clinical practice and research (15) along with many small animal studies, that are now proving successful in the equine. Once the equine injury is healed, lameness subsided, and the horse is considered recovered, a cross training approach is optimal for returning to peak performance. This approach should utilize a varied protocol of in-hand work of stretching, core facilitation, and strengthening techniques, moving towards ridden work, along with introduction of gentle hill work and gradual jumping. These activities combined exemplify optimal therapeutic exercise methods to maintain flexibility and muscle tone. Utilizing a variety of turf, terrains and obstacles is key in stimulating the proprioceptive feedback system to maintain and promote the best outcome towards functional return to equine athletes.

Bibliography


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