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Equine Hydrotherapy: Recent Trends

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Abstract

Aquatic Physiotherapy is physiotherapy practised in warm water and can help relieve aches and pains, mobilise stiff joints and strengthen weak muscles. The water in the pool is approximately 34^{0}C, allowing your muscles to relax and easing the pain in your joints. The buoyancy of the water unloads the weight of the body, reducing stress on joints and allowing freedom of movement. Aquatic Physiotherapy can accelerate healing and provides a general sense of well-being. The underwater treadmill mightbe useful for rehabilitation of horses because such exercise increased the overall range of motion of joints of the distal aspects of the limbs. Water depth also affects the amount of flexion and extension of various joints differently.

Keywords: Equine Hydrotherapy; Underwater Treadmill**.**

Introduction

Aquatic exercise is awell-known rehabilitation method for humans, (Valtonen A. et al, 2010) small animals, (Gandini G et al, 2003) and horses (Adair HS, 2011). Due to the various physical properties of water it might be beneficial for animals in rehabilitation programs. Water can diminish the amount of weight placed on the joints, exert constant pressure on submerged portions of the body or limbs, and helps in venous and lymphatic drainage of the tissues. Amid exercise in water, perception of pain might be decreased due to phasic stimulation of sensory receptors, furthermore, muscle strength and cardiovascular fitness might be improved (Levine D et al, 2010). It has also been suggested that aquatic rehabilitation might also permit humans (Konilan C, 1999) and animals (Steiss JE, 2003) with orthopaedic problems early use of limbs after injury or surgery and might help in minimizing the risk of re – injury.

Equine investigations including hydrotherapy focuses mainly on the horse's physiologic responses to exercising in water (Voss B et al, 2002). Swim training programs has shown improvements in cardiovascular endurance, reductions in musculoskeletal injury (eg, tendonitis), and increases in fast-twitch, high-oxidative muscle fibers, which reflects enhanced aerobic capacity (Misumi k et al, 1994). Recently, changes in stride parameters have been seen while horses walked in various profundities of water (Scott R et al, 2010). Water treadmills have been utilized widely in rehabilitation centres for horses with poor performed due to stiffened back. Water provides buoyancy and assists the horse to lift the limb in the vertical plane, however it might also create resistance to the movement of the limbs in the sagittal plane (King et al, 2013). Scott et al (2010) demonstrated that stride frequency is reduced and stride length is increased as horses are trained on a water treadmill at increasing water depths.

Furthermore, swimming is considered to be a high – intensity activity for horses; amid swimming, horse's heart rate may reach as high as 200 beats/ min. Such kind of high – intensity exercise is not ideal for horses with orthopaedic problems promptly after injury or surgery or amid a period of prolonged rest. Underwater treadmills can be utilized as an alternative to swimming for exercise of horses; such exercise is also beneficial for humans with limb injuries (Cureton KJ, 1997). Utilization of underwater treadmills presumably has some of the benefits of swimming for horses, such as reduced concussive forces on distal aspects of limbs and aerobic exercise amid the early period of rehabilitation; horses exercising on underwater treadmills have heart rates up to 78 beats/min while walking and 120 beats/ min while trotting.

Information concerning the effects of underwater treadmill exercise and treadmill water depth on ROM of joints of distal aspects of limbs of horses would be valuable for clinicians and physical therapists who plan rehabilitation programs for horses.

Methods

Search Strategy

Google Scholar and PubMed were used to retrieve the studies for this review. Key words utilized across the databases were equine physiotherapy, hydrotherapy, water treadmill exercise and hydrotherapy for equine athletes. As subject headings varied between the databases, various combinations of the key words were used.

Results

Mooij M.J.W. et al 2013, conducted a research to find out the biomechanical responses of the back of riding horses to water treadmill exercise. The aim of this study was to determine the effects of water treadmill exercise on axial rotation, lateral bending and pelvic flexion in horses. Twelve riding horses were include in this study which had no previous experience of water treadmill training. Out of these twelve horses, five were mares, six were geldings and one was stallion. The mean age of horses was 7.4 (± 2.1) years and the mean height was 1.66 (± 0.08) metres. In a period of 10 days, horses were trained four times at varying depths of water. Recordings were taken on day 1 and 10 and the horses walked in the water treadmill at a speed of 0.8 m/s on a belt at varying depths of water. For recordings, spherical markers with a diameter of 40mm were placed at seven defined locations along the vertebral column. These areas where these markers were placed are as follows: highest point of the withers (T5 – 6), lowest point of the withers (T10 – 11), thoracolumbar junction, tuber sacrale, right tuber coxae, left tuber coxae and the tail base. The water treadmill was filled with water till the level of the shoulder joint and recordings were conducted over a period of 20 minutes, the water level was held constant for 2 minutes at each of the 5 selected depths, namely, midline of the shoulder, elbow, carpus and the fetlock joints and at the level of coronary band of the hoof. Recording was taken over a period of one minute at each depth of water with the help of two high speed video cameras and an artificial light source. They found out that there was an increase in the axial rotation range of motion at each successive water depth, however, lateral bending was decreased significantly at the level of water depth of the elbow and shoulder joints but this was not seen at the level of fetlock or carpal joints. Furthermore, pelvic flexion was increased significantly at each level of water depth. In a compendium, axial rotation, lateral bending and pelvic flexion did not change much over time and there were no significant differences in lateral bending or axial rotation over the left and right hind limbs. In addition to this, lateral bending range of motion was slightly higher at day 10 as compared to day 1, but these differences were not significant after Bonferroni correction.

Mendez-Angulo, J. L. et al, 2013 conducted a research on the effects of water depths on amount of flexion and extension of joints of the distal aspects of the limbs in healthy horses walking on an underwater treadmill. The aim of this study was to determine the maximum amount of flexion and extension at the carpal, tarsal, metacarpophalangeal, and metatarsophalangeal joints and the percentage of the duration of stance phase and swing phase of the stride of horses waking on an underwater treadmill at varying water depths. Nine horses were included in this study out of which 8 were Quarter Horses and 1 was Thoroughbred; mean age was 8.1 (±4.3) years, mean body weight was 486.6 (± 26.3) kg; mean height was 150.1 (± 3.2) cm. All horses that were included in this study had previous experience of exercise on a standard treadmill. In the present study, horses walked on an underwater treadmill during 6 training sessions, before the data collection. Xylazine was administered for the first two training sessions, if the horses developed signs of anxiety or if they were hesitant to walk on the underwater treadmill. Initially, horses walked on the treadmill in less than 1 cm of water to allow acclimatization. Amid the subsequent training sessions, horses were acclimatized to walking on the underwater treadmill at various depths of water. The speed of treadmill was set at 0.9 m/s during training session and data collection. Zinc oxide markers were positioned on the forelimbs and hind limbs of the horses. Video recording was done and the maximum amount of flexion and extension at different joints, range of motion, and the percentage duration of the stance phase and swing phase of the stride were measured with 2 – D motion analysis software. The result of the study was that the range of motion was greater for all the joints that were evaluated in varying amount of water level versus range of motion for joints in the baseline conditions. The greatest amount of range of motion for the carpal joints was observed during walking in a tarsal joint water depth, for the tarsal joints in a stifle joint water depth, and for the metacarpophalangeal and the metatarsophalangeal joints in metatarsophalangeal and tarsal joint water depth respectively. With the increasing water depth, the percentage duration of the stance and swing phases of the stride considerably decreased and increased respectively.

Hunt E. R., 2001 conducted a research on response of 27 horses with lower leg injuries to cold spa bath hydrotherapy. In this study, 27 horses with included out of which 15 had bowed tendons, 4 had suspensory ligaments, 3 were the cases of "jarring up" in the training, one had chronic fetlock synovitis, one was the case of two weeks post-surgery following arthroscopy of the MCP joint for bone chip removal, one which received antibiotics for two weeks and a bandaging for the penetrating wound of the digital flexor tendon sheath over the middle of the 2^{nd} phalanx and two were event horses who had contusion injury resulting from being cast in wooden rail yardsand were presenting with oedema, severe stiffness and reluctance in moving 3 days prior to competition. All the horses were inspected for obvious signs of lower limb injury, and ultrasound examination was implemented if severe tendon or ligament injury was suspected. The spa was given 3 times a week for a period of 3 to 4 weeks depending upon the severity and response. Ultrasound examinations were conducted every 7 to 14 days for evaluation of healing. Each horse then commenced or continued training in accordance of the decisions of the owner, sometimes based on planned loading recommendations of the author and the responses were obtained from the owners/trainers through follow up contact or the result of the race. 15 of the horses with grade two or three superficial digital flexor tendon damage and 4 with suspensory ligament injury treated for 10 min, 3 times a week responded with improved ultrasonographic echogenicity along with fiber re-alignment of the injured tissues. Except two of the horses all were placed back into training and finally returned to compete successfullywithin six months without re-injury. Two of the equestrian sports horses who had traumatic contusion injury were treated twice daily and were able to compete successfully 72 hours post injury without supportive drug therapy. Six individual horses also responded to hydrotherapy faster than expected.

Discussion

The study performed by Mooij M.J.W. et al, revealed that water treadmill training with water depth at the level of elbow and shoulder joints lead to movement patterns that were in contrast to water depths at the level of hoof, fetlock and carpal joints. At every water depth, axial rotation and pelvic flexion were significantly higher than at the control hoof water level. Lateral bending range of motion was significantly lower at water depths at the level of elbow and shoulder joints than at the control hoof water level.

The study conducted by Mendez-Angulo, J. L. et al indicated that walking of horses in water increases the range of motion of the carpal, tarsal, and fetlock joints, primarily because of an increase in the amount of joint flexion, however, these effects varied with water depth. Moreover, an increase in amount of joint extension was seen in some depths of water. These findings upheld the hypothesis that the ROM of joints would increase amid walking of horses in water and supported the conclusion of other authors that walking on an underwater treadmill will lead to an increase in joint range of motion of horses. Conversely, the hypothesis that joint flexion and extension and the percentage interval of the swing phase of the stride would escalate with increasing water depth was not completely supported because the amount of joint flexion and extension didn't consistently increase with increasing water depth for all evaluated joints.

Hunt E. R, found out that in all cases reduction in paratendinous and tendinous fluid and any hematoma appeared to boost the healing process. Agitated cold water is denser and contains a very high amount of dissolved oxygen in comparison with warmer motionless water and it is, therefore, believed that the combined effect of hypertonicity, massage effect of agitation, cold, and the effect of pressure from the depth of water, in combination, aids in fluid dispersal and minorskin and subcutaneous tissue wound repair more than any single component.

Conclusion

Water treadmill training of horses with water at the level of the elbow and shoulder joints resultsin a different movement pattern as compared to training with water at the level of the hoof, fetlock and carpal joint; axial rotation and pelvic flexion were increased, while lateral bending was reduced. Water treadmill training over 10 days appears to have an influence on back motion. Moreover, underwater treadmill mightbe useful for rehabilitation of horses because such exercise increased the overall range of motion of joints of the distal aspects of the limbs. Water depth also affects the amount of flexion and extension of various joints differently. Furthermore, the response of cases with physical or trauma induced inflammation indicates the potential value of spa bath hydrotherapy in any cases involving lower limb inflammation especially where alternate drug therapy is not an option.

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