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Why do we Apply Hippotherapy in Neurological Diseases? A Brief Overview and Future Perspectives

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Introduction

As a multidisciplinar approach, hippotherapy is a kind of rehabilitation that stimulates the patient both emotionally and physically. In fact, equine-assisted activities and therapies are effective means for improving many features of physical health in several neurological conditions such as mood disorders, attention deficit hyperactivity disorder, post-traumatic stress disorders and Down's syndrome [1-6] (Figure 1). Among the natural gaits of the horse (pace, trot and canter), the most used in equine-assisted therapy (EAT) is the pace, thanks to its intrinsic characteristics of cyclicity in cadenced and rhythmic beats, and to three-dimensional movements imposed to the patient in the saddle, perfectly simulating (for amplitude and frequency) the human gait. The rhythm of the horse at pace, about 60 oscillations per minute, allows the relaxation of muscle tone, whilst the sinusoidal shape reproduces the bascule of normal walking movement. In the three-dimensional sinusoidal horse's movement at pace, the back of the horse becomes an "afferent" pacing bridge particularly important for the person riding: back and forth, from side to side, top and bottom. This requires the compensation of muscular reactions of readjustment to promote balance and postural correction, necessary to effectively remain on the saddle. The horse's movement is transmitted to patient's central nervous system through many afferent nerve terminations; the brain, in turn, sends this information to the whole body so that the adjustments are made by an adaptive behavior aimed at rebalancing [7]. The three-dimensional horse's movement at pace is a sinusoid acting on the patient.

Horseback movements (Table 1) allow the patient to find a right posture, balance stabilization and straightening [8].

Types of horse back movement	Effects on patient
Back and forth	An anteroposterior movement of the sagittal plane due to the constant accelerations and decelerations during pace acts with a high concentration in patient's straightening
From side to side	Because of the centrifugal force, the patient loses balance on the left and right in rhythmic alternation. At pace, the pushing action of the horse's rear legs determines an associated lateral flexion of the animal's spine. A rotational component in the horizontal plane during pace stimulates the dissociation of the shoulder girdle from the pelvic bone.
Top and bottom	Stimulation on the vertical plane is particularly effective in the trot, due to the different characteristics and symmetrical skipped gait

Table 1: Type of horse back movement and their effect on patients.

The parallelism between the three-dimensionality of the human walking and the horse's gait gives the opportunity to the patient who have never walked or who walked with improper motor patterns to experiment the effects of EAT at the pelvis, trunk, girdle, upper limbs and head levels, resulting in stimulation of righting reactions and equilibrium [8].

In this perspective, it is fundamental how and who will choose the right horse, having the ideal morphological and disposition characteristics for the EAT: this choice requires a serious and progressive work plan and a proper training aimed to make the horse as safe and properly trained as possible.

The key variables that become so indispensable to ensure a high level of EAT are:

- The amplitude of pace movement, which varies in relation to the height of the animal (the more the horse is high, the more extensive will be the changes in balance), the amplitude of the chest (the more the chest is wide, the more extensive will be the wave movements) and the length of the trunk (the most the trunk is long, the more the movement will be large);
- The frequency of the movement, which depends on the length of the horse limbs in an inversely proportional manner;
- The age of the horse: an older horse feels more pain than a younger one and will tend to be more rigid and with reduced movements compared to a young animal; however, the older horse has usually more calm nature and less energy. Finding a right balance between those characteristics is one of the most important aspects to get the best benefits from EAT;
- The line that ideally links the hip points to the upper third of the scapula should be parallel to the ground.

The saddle is on its own able to select and filter reflex movements on the patient.

The horse movement is transmitted to the ischial bones of the patient, at the same time the hemipelvis are alternately forwarded and right and left rotated (Figure 1).

Figure 1: The horse movements.

The position on the horse allows a drastic broken of pathological postural patterns and riding plays a motion pattern that can be repeated over a longer period, at the similar rate of the human step.

The set of all the reported components allows:

1. The regulation of muscle tone
2. Pelvic mobilization/stabilization
3. The reinforcement or the appearance of righting mechanisms and trunk control
4. The improvement of the equilibrium reactions (especially in relation to changes of pace and direction).
5. Reduction of involuntary movements

Furthermore:

1. The visual and spatial stimulation provided by the special atmosphere of the stables with changes in color and brightness in relation to the movement of the horse stimulates a visual finalized attention, thus facilitating the acquisition of the size of the space;
2. The environments where the horses live have typical odors and noises, that are very evocative;
3. The intense tactile stimulation due to the contact with a large animal helps the awareness and knowledge of both oneself and horse's body;
4. The horse is a being expressing emotions like fear in which the patient can recognize and where he/she can hire a reassuring role; at the same time, riding a big and powerful animal offers protective feelings, self-esteem and self-confidence;
5. The horse has a lot of qualities such as warmth, softness, smell, smooth movements, big and intense eyes that may stimulate the important aspect of the attachment process for human development;
6. The relationship established with the horse is also an extraordinary element to recover the consciousness of patients' psychomotor skills, reactions and emotions.

All the reported features are favored by the involvement of specialized therapists who, thanks to their "therapeutic" experience, make possible that the patient obtains the best goals from this rehabilitative treatment.

On the other hand, to get the best results, it is important that the patient attends regularly the rehabilitation program and that there are no other contraindications to apply EAT (i.e. cardiac problems, epilepsy, hip dysplasia).

However, several controlled trials are still needed to strengthen the current knowledge, to establish dose-response characteristics of equine-assisted activities and therapies, and to better explore the physiologic basis of EAT.

Future Perspectives

In the near future, hippotherapy exercise program should be fostered to assess movement reaction time, muscle activation, functional mobility, muscle strength and balance and to provide objective clinical data on the role of sensory integration in maintaining postural stability and in the quantification of the subject's center of gravity. In this framework, gait analysis and stabilometric tools may play a major role in evaluating the effects of EAT in several neurological disorders.

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