

Horseback therapy and biofeedback self-control of physical rehabilitation processes for children with cerebral palsy

Nino Ionatamishvili, Dimitri Tsverava, Manon Loria, Lali Avaliani,
Manana Rukhadze¹

1- Head of the Department of Physical Rehabilitation, Sports Medicine and
Therapeutic Riding, Georgian State Medical Academy

Abstract

Child cerebral palsy (CCP) covers all aspects of disorders of motor, sensor systems and those structures that as a result of studding should become a base of highest activity forms that we call highest cortical functions. In order to study ridetherapy influence two groups of patients with cerebral palsy in the age from 3 to 14 years old, of both sexes were formed. The first basic group was composed of 50 children, 30 from them had hyperkinetic form and 20 – spastic syndromes. They underwent rehabilitation at the hippodrome 3-5 times a week for 90-120 minutes. II control group was composed from 50 children who did therapeutic gymnastics according to B. Bobath (I) methodology, 90-120 minutes daily. Course of treatment lasted 2-4 month in both groups. In order to assess effectiveness of rehabilitation we elaborated evaluation scales with point system. Examination before treatment gave opportunity to use individual and differential approach in each particular case while carrying out RT in the first group and TE in the second. Before beginning rehabilitation, in preparatory period children were theoretically acquainted with the stable, horse texture, different paces (step-trot-gallop), its feeding and care. Point system evaluation scales elaborated by us gave opportunity to define effectiveness of RT in children with cerebral palsy. Indicators of face, trunk and limbs involuntary movement intensity before rehabilitation were identical in both groups – $3,566 \pm 0,176$ and $3,567 \pm 0,164$ point. Final data after RT amounted to $1,002 \pm 0,009$ point in basic group and $2,001 \pm 0,135$ points in control group ($p < 0,001$). In order to study motor activity on horse children shown that

this method has higher therapeutic effect in case of hyperkineses compared . Biomechanical influence of RT on organism of child with cerebral palsy is interdependent process based on biological feedback – biofeedback. Thus, in conclusion, it may be said that horse bake therapy is original, effective, activity and adequate method that provides building of new motor skills, decreasing of spasticity, hyperkineses, broadening of outlook, improvement of memory, utmost mobilization of compensatory abilities of child's young developing brain to overcome all difficulties faces in the making of both perceptive and basic habitual skills in children with cerebral palsy .

Key word: Ridetherapy, Biofeedback, Child cerebral palsy , physical rehabilitation

Introduction

Child cerebral palsy (CCP) covers all aspects of disorders of motor, sensor systems and those structures that as a result of studding should become a base of highest activity forms that we call highest cortical functions. Consequently, involving various combinations of motor (pyramid, striopolid, cerebellar), sensor disorders and retardation different CCP forms require early revelation of compensatory abilities in childhood and its maximum usage.

However, level of child's social cognition does not give opportunity for not only maximum but also optimal development of brain reserve abilities. Having analyzed all available treatment methods (medical, physical) we concluded that the best affect might be achieved by means of such method involving the highest motivation, two contrary factors – desire and fear of falling from the horse. All this is presented in its best in ridetherapy (RT) or therapeutic riding. It is well known that physical rehabilitation of children with cerebral palsy requires peculiar approach in case of different forms and that is why we paid attention to ridetherapy as a new treatment method for given disease (2, 3, 4, 5). Depending on disorder different forms of CCP distorts not only child's appearance but also his/her activity coefficient that in its turn hampers formation of routine behavioral actions. In more conscious period i.e. later, all types of disorders are heavily reflected on sick child's social status. All this made us use individual approach,

defining which patient can and meets age norms of healthy child as passivity of the patient causes divergence between formation of vital skills and motor sphere effectiveness resulted by rehabilitation. As a rule, sick child does not realize that he/she has got negative motor defect and as fate willed it – is accommodating to it and not vice versa. That is why, it is necessary to teach him/her timely by means of therapeutic riding. During rehabilitation period two live creatures-man and horse. their characters, impulsiveness, emotionality come into contact and it is supplemented by fear and diffidence of a patient facing a huge animal.

In connection with this, usage of ridetherapy and finding out its effectiveness for motor defects correction in case of different CCP forms became our goal.

Given goal revealed following objectives: for patients with spastic syndromes achieve transition, improvement and enrichment of motor skills; for hyperkinetic patients by maximum mobilization of volitional activity, subject and existing forced involuntary movement to necessary behavioral skills to same level.

Methods of Study

In order to study ridetherapy influence two groups of patients with cerebral palsy in the age from 3 to 14 years old, of both sexes were formed. The first basic group was composed of 50 children, 30 from them had hyperkinetic form and 20 – spastic syndromes. They underwent rehabilitation at the hippodrome 3-5 times a week for 90-120 minutes. In order to achieve best therapeutic effect the horses were chosen specially – they should have been not young, quiet, trained and patients. Children were put on the horse for 3-5 minutes by turn with subsequent break. One horse was used for ridetherapy of 4-6 sick children. Special and working saddles were used, and horses were lunged. For child's support ridetherapy was carried out under physician-hippotherapists' control according to methodology elaborated by us (I basic group). II control group was composed from 50 children who did therapeutic gymnastics according to B. Bobath (1) methodology, 90-120 minutes daily. Course of treatment lasted 2-4 month in both groups.

In order to assess effectiveness of rehabilitation we elaborated evaluation scales with point system. Examination was carried out according to those initial conditions and abilities that children had in both groups. Muscular spasticity was assessed by point system; intensity of hyperkineses – 5 point system; motor activity of horse – 4 point system; static-locomotor activity – number of points obtained by child. Examination before treatment gave opportunity to use individual and differential approach in each particular case while carrying out RT in the first group and TE in the second. It is necessary to mention that in children with cerebral palsy passivity is caused by the pathological condition and thus does not depend on age. That is why the children lacked physical characteristics like endurance, adroitness, coordination, strength and movement speed. Therefore, assessment test on horse included not only necessary movements but also exercise for named characteristics. These patients also have deficiency of other function-manual manipulation with different toys and object. These difficulties are qualitatively different in children with spastic syndromes and hyperhineses.

Before beginning rehabilitation, in preparatory period children were theoretically acquainted with the stable, horse texture, different paces (step-trot-gallop), its feeding and care. Afterwards (during the training) the children were put on a horse, stood by and supported from both sides irrespective of disorders, if child's condition and abilities allowed – from one side. It is necessary not only because of motor function disorders, but also to prepare the child psychologically for mastering unknown live creature – horse. Exactly by this its possible to achieve both, liquidation of pathologically, organized motor sphere and synchronization of child's movements with horse, i.e. development of correct seat (balance). However, one more noteworthy factor that affects ridetherapy, success to significant degree is love for the horse. Although, it is not the only factor but is main by its essence, as psychological mood is the basis for the whole purposeful work of the child. In addition to correct balance development and its keeping during different paces (step-trot-step) formed control over head position in relation with body, mastered riding, achieved synchronization of movements with horse with stirrups, activated manipulatory function of hands. Besides, exercises were done at

pace for different hand and leg movements; sitting – with a face to the head (tail) with back support and different leg movements; on knees – moving limbs. More difficult exercises were done afterwards – with closed eyes, keeping a glass with water (glass, plastic, paper), standing on stirrups, leading bridle, and also manipulating with toys and household goods.

Resultsof Study

Point system evaluation scales elaborated by us gave opportunity to define effectiveness of RT in children with cerebral palsy. Indicators of face, trunk and limbs involuntary movement intensity before rehabilitation were identical in both groups – $3,566\pm 0,176$ and $3,567\pm 0,164$ point. Final data after RT amounted to $1,002\pm 0,009$ point in basic group and $2,001\pm 0,135$ points in control group ($p<0,001$). Intensity of hyperkineses decreased more significantly in children undergoing RT i.e. the child had to suppress involuntary movements by volitional effort (tab. 1). Investigation of spastic syndrome intensity in dynamics showed that before training data of both groups amounted to $2,150\pm 0,131$ and $2,150\pm 0,150$ points. However, in children who had RT spastic syndrome intensity decreased to $0,1500,100$ points ($p<0,001$). Diminution of muscular tone promotes for increase in voluntary motor function in children and that enhances movement sphere freedom (tab. 2).

In order to study motor activity on horse children were divided into two groups – 30 patients with hyperkineses and 20 – with spastic syndrome. Initial data amounted to $1,500\pm 0,121$ and $1,250\pm 0,100$ points. After training these data improved to $4,900\pm 0,140$ points in children with hyperkineses and $2,980\pm 0,136$ points in children with spastic syndrome ($p<0,001$). Thus, it can be concluded that ridetherapy has higher therapeutic effect in case of hyperkineses compared with spastic syndrome ($p<0,001$) (tab. 3). Research of static-locomotor activity in dynamics demonstrated that initial data in both groups were identical – $10,03\pm 0,30$ and $10,030\pm 0,29$ points in hyperkinetic children and $7,77\pm 0,210$ and $7,75\pm 0,434$ points in patients with spastic syndrome. Final results amounted to $28,11\pm 0,26$ points in the I group and $18,77\pm 0,24$ points in the II group ($p<0,001$) (tab. 4).

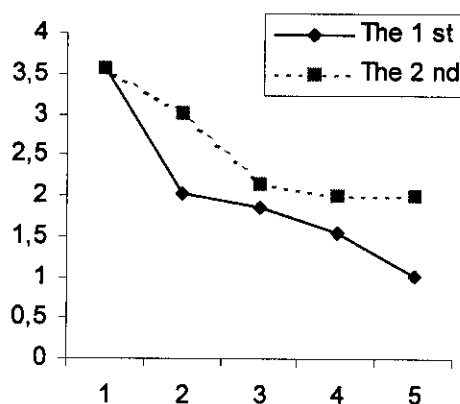
Proceeding from obtained data it is clear the better results were achieved in the basic group where children underwent ridetherapy.

Hence, RT in difference with conventional methods given opportunity for development of motor activity and child's volition alike, and what is most important – organization and striving for getting over difficulties. All these leads to diminution of hyperkineses, lowering of spasticity so that children's movements become more precise and purposeful while executing tasks, improves coordination while carrying out different manipulations and especially walking. At trainings we used toys and objects of different color, texture and size so in addition to motor function improvement, cognitive abilities of child including word stock enhanced. Ridetherapy stimulates child's motor functions and at the same time is fascinating process that makes him/her do exercises purposefully and precisely. What is most important, they are carried out activity by the child himself and that promotes for development of correct motor stereotype. Thus, negative movement defects diminish and a patient gets new, unknown before training, "thrust" by horse and at the same time, useful muscular sensations and involuntary movements in case of hyperkinetic form are subjected to necessary habitual skills at most. Besides, children become highly motivated and that permits suppression of fear, and most important – diffidence, hampering passivity disappears and all these influences training results that child feels himself. Felt freedom in movements raised trust to the horse and most valuable – feeling of victory over it and thus, the child consciously sets certain goal for himself i.e. appeared correlation of real actions and obtained results as they had self-control. However, despite all positive data in basic group, attention was paid to the fact that better results had children with hyperkinetic form. Children became more active and attentive during trainings, they carried out exercises with full possible energy, easily memorized tasks and executed them more precisely and concisely, gladly took care of "own" horse and helped in stable as far as possible.

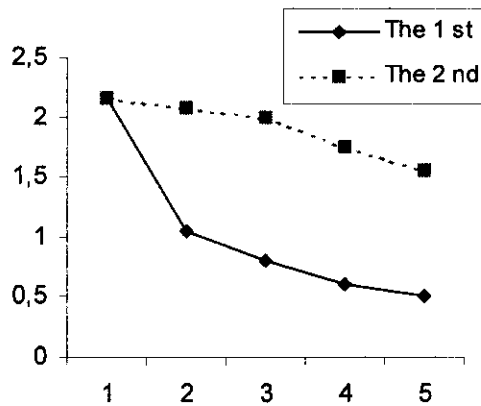
Thus, potential abilities of motor sphere in sick children though are qualitatively different after RT, never the less become freer and more versatile that is caused by

child's performance. Ultimately sick child raises over own conditionality, disregard external circumstances i.e. his psycho-physical condition overcomes it - 'transcending'`. Biomechanical influence of RT on organism of child with cerebral palsy is interdependent process based on biological feedback – biofeedback. The primary goal of biofeedback has been to promote the acquisition of self-control of physiological processes. Child with cerebral palsy must be motivated to learn to effect the physiological changes under study. The basic premise of biofeedback is that through the immediate feedback of the response under study children with hyperkinetic and spastic forms of cerebral palsy an individual can gain control over physical rehabilitation processes. As a result, horse reacts at patient's each movement. Three-dimensional vibrations formed from horseback and different paces (step-trot-step) in its turn force the child to suppress, correct and subject existing pathologically inadequately organized movement to new motor information.

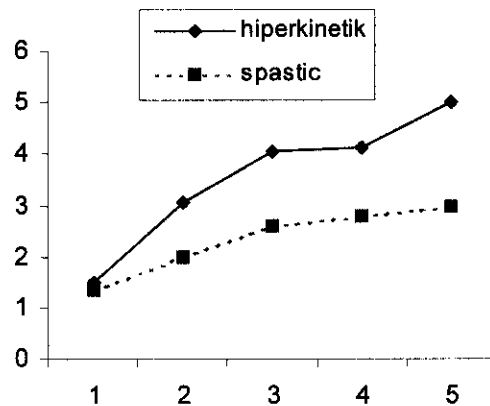
Thus, in conclusion, it may be said that horse bake therapy is original, effective, activity and adequate method that provides building of new motor skills, decreasing of spasticity, hyperkineses, broadening of outlook, improvement of memory, utmost mobilization of compensatory abilities of child's young developing brain to overcome all difficulties faces in the making of both perceptive and basic habitual skills in children with cerebral palsy.



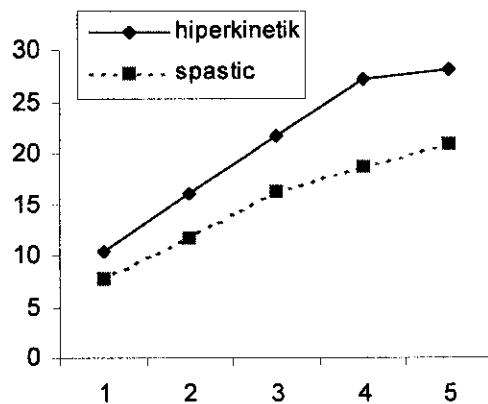
Tab.1. Dynamic of hyperkinesias changes in children with cerebral palsy



Tab.2. Dynamic of spastic changes in children with cerebral palsy



Tab.3. Dvynamic motor activity changes in children during riding therapy



Tab. 4 Dynamic of static-locomotor functions changes in children with cerebral palsy

Discussions and Conclusions

1. High effectiveness of ridetherapy is based on two high significant opposite competitive motivations – desire and fear, that depends on impulsiveness and emotionality of two characters – man and horse.
2. Ridetherapy forces ill child with hyperkineses to tense his will-power and learn to suppress them maximally and subject to those requirements that therapeutic riding sets before him at different stages of treatment.
3. In children with hyperkinetic and spastic forms of cerebral palsy functional activity, quality of movements and visual-motor coordination heightened based on correction of motor defects and social demands of behavioral (including perceptive) skills, which become more and more complicated.
4. Different paces and three-dimensional vibrations formed from horse back forced a child to tense muscular tone. In order to get this effect a child has to be under active independent control i.e. type of biofeedback.
5. Overcoming fear forces the child with cerebral palsy to mobilize latent resources of a young developing brain.
6. Riding therapy appeared to play the dominant role in the rehabilitation of the children with cerebral palsy.
7. Revealing the latent abilities of the child and the cooperating in the struggle against motor disturbances with the aid of the horse-animal appearing to be the emotional stimulus for the child.
8. In children with hyperkinetic form of cerebral palsy functional activity, quality of movements and visual-motor coordination heightened; in particular; muscular spasm, face grimaces, grotesque postures of body, mannered movements of fingers and toes were reduced that improved supporting ability of hands, body turning in different projections, seizure of objects.
9. Ridetherapy is especially original, effective progressive method for physical rehabilitation in children with hyperkinetic and spastic forms of cerebral palsy.

Reference

1. Bobath B. The very early treatment of cerebral palsy. *Develop. Med. Child. Neurol.*, 1967, vol. 9, nr. 24, p. 373-390.
2. Heiperitz W. *Therapeutic Riding*, Cosmos Verlag, Stuttgart., 1989, s. 55-56.
3. Inglis J., Sproule M., Leicht M., Doneld M.W. and Cambell D. Electromyographic biofeedback treatment of residual neuromuscular disabilities after cerebrovascular accident. *Physiotherapy Canada*, 1976, 28, p. 260-264.
4. Kellogg W.R, Cruk B. Aspects and answers. *A Manual for therapeutic Horsback Riding programs*. Chepp. Centre. 1988, p. 1-183.
5. Swift S. *Centered Riding* Heinemann Kingswood. London, SW. 3. CRR, 1988, p. 1-198.
6. Tsverava D., Tsagareli L., *Application of Ridetherapy in the Physical Rehabilitation System*. Proc. of the 2nd Congress of Physical Rehabilitation and Sport Medicine, Tbilisi, 1986, p. 3-8.