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Improving balance by experimenting through animal-assisted therapies

Îmbunătățirea echilibrului prin experimentarea unor terapii asistate de animale

Dana Bădău [1], Papp Enikö [1], Flaviu Stelian Duşa [1], Iulia Macovei [1], Patricia-Maria Mălăncrăvean [1], Mircea Ion-Ene [2], Adriana Neofit [2], Ramona Natalia Ungur [3], Adela Bădău [3]
[1] Department of Human Movement Sciences, University of Medicine and Pharmacy Tîrgu-Mureș, Romania
[2] Department of Individual Sports and Physiotherapy, "Dunărea de Jos" University Galați, Romania
[3] Department of Physical Education, University of Medicine and Pharmacy Tîrgu-Mureș, Romania

Abstract

Background. By combining two types of assisted therapies with horses and dogs, we believe that greater progress will be made in rehabilitating the balance compared to participating in a dog only- assisted therapy program.

Aims. The aim of the research is to assess the efficiency of implementation of animal-assisted therapy programs in order to improve the static and dynamic balance of children with neuromotor disabilities.

Methods. A prospective study for a period of three months included two groups of 7 children each with neuromotor impairments, age 5-7 years. The experimental group followed a dog and horse-assisted therapy program, and the control group a dog only-assisted program. Two sections of the Tinetti test were applied to assess the static and the standing balance. The main statistical indicators using SPSS 20. were: mean, standard deviation (SD), mean difference (MD), Z score. For the comparison of two groups we used: the t-test and the paired Wilcoxon test.

Results. The difference between the static balance tests in the Tinetti test: experimental group MD 1.23 ± 1.23, control group MD 0.61 ±1.12. Cohen's effect size was d = 0.98 for the experimental group, which means a large effect, and d = 0.54 for the control group, meaning a medium effect size. When testing the standing balance in the Tinetti test: the experiment group MD 1.40 ± 1.19, the control group MD 0.06 ± 0.88; Cohen's effect size was d = 1.17 for the experimental group, which means a very large effect and d = 0.07 for the control group, which means a very small effect size.

Conclusions. The animal-assisted therapy with dogs and horses increased the ability of children's balance with neuromotor deficiencies because they tried to change their behavior and participate more actively in the treatment process. In both Tinetti static and standing tests, the experimental group made statistically significant improvements between the two tests, for $p < 0.05$.

Keywords: balance, dog therapy, horse therapy, motor impairments, children.

Rezumat

Premize. Prin combinarea a două tipuri de terapii asistate cu cai şi câini, considerăm că se va realiza un progres sporit în ceea ce priveşte reabilitarea echilibrului comparativ cu participarea doar la programul de terapie asistată cu câini.

Obiective. Scopul cercetării constă în evaluarea eficienţei implementării unor programe terapeutice asistate de animale în vederea îmbunătăţirii echilibrului static şi dinamic al copiilor cu deficienţe neuromotorii.

Metode. Studiul prospectiv s-a desfăşurat pe o perioadă de 3 luni, incluzând două grupe cu câte 7 copii cu deficienţe neuromotorii, vârsta 5-7 ani. Grupa experiment a urmat un program de terapie asistată de câini şi cai, iar grupa de control un program asistat doar de câini. Au fost aplicate două variante ale testului Tinetti pentru evaluarea echilibrului din aşezat şi ortostatism. Principalii indicatori statistici cu ajutorul programului SPSS 20. au fost: media, deviaţia standard (SD), diferenţa dintre medii (MD), scorul Z. Pentru compararea a două grupe, am utilizat: testul t şi testul Wilcoxon pentru eşantioane pereche.

Rezultate. Diferenţa dintre testări privind echilibrul din aşezat la testul Tinetti: grupa experiment MD 1,23 ± 1,23, grupa de control MD 0,61 ± 1,12. Mărimea efectului Cohen a fost d = 0.98 pentru grupa experiment, o mărime mare a efectului, şi d = 0,54 pentru grupa de control, o mărime medie a efectului. La testarea echilibrului din ortostatism prin testul Tinetti: grupa experiment MD 1,40 ± 1,19, grupa de control MD 0,06 ± 0,88; mărimea efectului Cohen a fost d = 1,17 pentru grupa experiment, o mărime foarte mare a efectului şi d = 0,07 pentru grupa de control, o mărime foarte mică a efectului.

Concluzii. Terapia asistată de animale precum câinii şi caii a determinat creşterea capacităţii de echilibru la copiii cu deficienţe neuromotorii, dat fiind că aceştia încearcă să-şi modifice comportamentul şi să participe mai activ la procesul terapeutic. La ambele teste Tinetti din aşezat şi ortostatism, grupa experiment a înregistat progrese semnificative statistic între cele două testări, pentru $p<0,05$.

Cuvinte cheie: echilibru, terapie cu câini, terapie cu cai, deficienţe motorii, copii.

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Address for correspondence: University of Medicine and Pharmacy, Faculty of Medicine, Department of Physical Education, Tirgu-Mures, 38 Gheorghe Marinescu St., 540 139 Romania
E-mail: adela.badau@umftgm.ro
Corresponding author: Badau Adela, adela.badau@umftmg.ro
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Introduction

Animal-assisted therapies (AAT) are aimed at improving physical, cognitive, behavioral, psychosocial, emotional and linguistic aspects of various categories of subjects of different ages, with different physical, neuromotor mental disorders, etc., as a result of the interaction with animals. AAT can be performed individually or in a group, and physical benefits are directed to fine and gross motricity and to improved balance and postural control.

Animal-assisted therapies (AAT) allow to benefit from animal companionship during a targeted therapy, to achieve optimal results in patients, and to support therapy. They provide positive effects, such as adapting to stressful situations and hospital environments; decreasing anxiety, stress, pain and blood pressure; and increasing mobility and muscle activity (Elmacı & Cevizci, 2015).

In animal-assisted interventions (AAIs), animals are used as adjuncts to therapy to positively affect human health. Research into the effects of animal-assisted interventions (AAIs) has primarily addressed human health outcomes (Glenk, 2017).

An AAI refers to a goal-directed intervention in which an animal meeting specific criteria is an integral part of a treatment that assists in the healing process and rehabilitation of children with acute or chronic diseases (Rothe et al., 2005; Martin & Farnum, 2002). A variety of activities, such as caring for the animal, knowledge and games are included in a typical AAI session (O'Haire, 2013).

Animal interventions have been studied for various pathologies in children (Fabrizio et al., 2016; O'Haire, 2013; Bass et al., 2009; Dimitrijević, 2009; Schaefer, 2002) and in terms of satisfaction after the intervention and its effects on psychosocial behaviors (Stern & Konno, 2011; Souter & Miller, 2007). Constant adjustment to the horse movement stimulates muscle relaxation and thus encourages supportive, straightening and balance responses, facilitating movement. Hippotherapy provides sensory integration of kinesthetic, visual and vestibular influxes that are important for the development of postural and balance control (Zbornik, 2010).

Dogs, cats, horses, birds and toy animals are most often used in therapy. Animals are also used for the treatment of children with special needs. Interacting with a dog and other furry animals has a very positive effect on their quality of life (Dimitrijević, 2009). Although dogs are the most commonly used, all species can be employed (Fabrizio et al., 2016).

Equine-assisted therapy (EAT), hippotherapy, is a physical treatment strategy in which children with or without motor difficulties perform activities on and alongside a horse with the goal of using equine movements to improve balance, posture, gross and fine motor skills (Snider et al., 2007). Snider et al. (2007) state that the warmth, shape and rhythmical three-dimensional movements of the horse improve the flexibility, posture, balance and mobility of the rider. In addition, EAT provides a multisensory environment that will prove beneficial for children with profound social and communication deficits (Bass et al., 2009).

Equine-facilitated psychotherapy is a developing form of animal-assisted therapy, which primarily incorporates human interaction with horses as guides. Beneficial results of a child-horse relationship include care translation, socialization and conversation, self-esteem promotion, companionship and affection stimulation (Rothe et al., 2005).

The aim of the research is to evaluate the efficiency of the implementation of animal-assisted therapeutic programs in order to improve the static and dynamic balance of children with neuromotor deficiencies. By combining two types of assisted therapies with horses and dogs, we believe that increased progress will be made in improving the balance of participants in the study compared to the participation in a dog only-assisted therapy program.

Materials and methods

Research protocol

The specialized staff, as well as the companions, instructors and owners of the animals voluntarily participated in the study. Participation in the test was voluntary, and all the parents of the participants signed an informed consent form. The study was carried out according to the principles of the Declaration of Helsinki and was approved by the Ethics Committee of the university.

In the case of hippotherapy, sessions were individual, 30 minutes for each child, once a week, and in the case of dog-assisted therapy, sessions lasted for about one hour, once a week, time being organized in such a way that everyone could get in touch with the animal.

The dog-assisted therapy program consisted of different routes, obstacles, relays, team games, races, tailored according to each individual's ability, with gradually increasing difficulty from one session to another. The hippotherapy program focused on three types of patient activities: active - consisting of performing various horse exercises meant to improve the body›s posture, passive - in which the horse was moving and the patient had to adapt with the help of balance and coordination to the different categories of horse gaits such as gallop, trot and walk, and the most difficult one, in which both the rider and the horse were moving.

a) Period and place of the research

This was a longitudinal, prospective study over a period of three months February - May 2017, and the locations of the interventions were: the Alpha Transilvana Foundation in Targu Mures for dog-assisted therapy, the Maltese Special Kindergarten in Cluj-Napoca for dog-assisted therapy, and the Equine and Hippotherapy Center in Reghin. The initial evaluation (T1) was conducted between February 10-25, 2017, and the final evaluation (T2) took place on 12.05.2017.

b) Subjects and groups

The study was attended by 14 children, of which seven attended the dog-assisted therapy program and formed group II, and 7 attended both programs (hippotherapy and dog-assisted therapy), forming group I. Inclusion criteria: children with neuromotor deficiencies with a mean age ± SD 6.14 ± 1.19 years were selected, having their parents' consent to participate in the AAT. Exclusion criteria: the children›s refusal to have a contact with the animal due to

fear or lack of interest.

The characteristics of the experimental group subjects (according to medical records) who attended the combined dog and horse therapy program were (name initials, year of birth, sex, diagnosis): DK (2011, female), retardation of mental and language development, autistic spectrum disorders under observation, psychomotor instability with attention deficit, hyperkinetics; GHN (2011, male), moderate retardation of mental and language development and atypical features; KAK (2010, male), severe retardation of speech development, sequelae of infantile encephalopathy of mixed type, flaccid paraparesis/ paraplegia in cerebellar syndrome, autistic syndrome, moderate retardation of motor development; TM (2010, female), symptomatic epilepsy, complex focal seizures, severe mental and language retardation with autistic elements, hyperkinetic disorder with seizures, sequelae of infantile encephalopathy with flaccid paraparesis/ paraplegia, cerebellar syndrome; MDA (2010, female), global motor development disorder of central origin, mixed development retardation, febrile seizures/ convulsions, acute unstable angina; DSS (2010, male), mixed development retardation, cri du chat syndrome, flaccid tetraplegia; VD (2010, male), spastic quadriplegia, language and communication disorders.

The characteristics of the control group subjects (according to medical records) who attended the dog therapy program were (name initials, year of birth, sex, diagnosis): NB (2011, male), severe psychomotor retardation; RD (2009, female), cerebellar syndrome, flaccid tetraplegia, moderate psychomotor retardation; CF (2011, female), flaccid tetraplegia, overweight, epilepsy, moderate psychomotor retardation; MC (2011, male), right hemiparesis, strabismus; DI (2011, male), severe mental retardation, hyperopia; CC (2010, female), Down syndrome; IA (2010), moderate psychomotor retardation.

c) Tests applied

Two sections of the Tinetti test (Tinetti et al., 1986), including items described in Tables I and III, were applied to assess the static balance (on a seat without a backrest) and the standing balance (supervised by the examiner). Test evaluation scores: 0 pts - impossible to achieve, 1 pt for high-difficulty movement, 2 pts for low-difficulty movement, 3 pts for movement without difficulty.

d) Statistical processing

The data were processed using IBM-SPSS 18, 2010. The main statistical indicators were: mean, standard deviation (SD), mean difference (MD), Z score. Descriptive statistics (mean ± SD) was calculated for all coordinate variables. The value of statistical significance was set at $p < 0.05$. For the comparison of two groups we used the t-test and the paired Wilcoxon test.

Results

The differences using the Tinetti balance test are shown in Tables I and II: the experimental group MD 1.23 ± 1.23, and the control group MD 0.61 ± 1.12. Cohen›s effect size was d = 0.98 for the experimental group, which means a large effect size, and d = 0.54 for the control group, which means a medium effect size. The difference between pre-test and post-test values was statistically significant for the experimental group (z = 2.588, *p* 0.010), but for the control group the difference was not statistically significant (z = 1.807, *p* 0.071).

Table I

Mean and SD of items of the Tinetti test for the sitting balance in both groups.

Items	Group I (equine + dog therapies)		Group II (dog therapy)	
	Mean±SD	Mean±SD	Mean±SD	Mean±SD
	Pre-test	Post-test	Pre-test	Post-test
1. Sitting balance is steady and safe without any support	20.00±.37	22.00±.08	21.00±.11	21.00±.01
2. Sternum push	19.00±.48	19.00±.48	20.00±.37	20.00±.37
3. Trunk rotation/turn	20.00±.37	21.00±.24	17.00±.78	19.00±.48
4. Collecting (lifting) an object on the ground	18.00±.53	19.00±.48	17.00±.78	16.00±.75
5. Eyes closed - 15 sec.	17.00±.53	21.00±.29	18.00±.53	18.00±.53
6. Flexion of upper limbs at 90 degrees and staying upright for 15 sec.	19.00±.48	21.00±.08	16.00±.48	18.00±.53
7. Stretching forward (cm)	19.00±.48	19.00±.48	19.00±..48	19.00±.48
8. Placing and keeping the foot on a small chair	18.00±.53	18.00±.53	16.00±.75	16.00±.48
9. Throwing the ball/catching the ball	15.00±.69	17.00±.53	11.00±.53	11.00±.53
10. Rise from sitting	18.00±.78	18.00±.78	14.00±.81	15.00±.69
11. Trunk hyperextension (cm)	18.00±.78	20.00±.37	16.00±.75	19.00±.48
12. Lateral tilt of the torso (by pressing the elbow against a support)	18.00±.53	20.00±.37	17.00±.53	18.00±.53
13. Sitting on various unstable objects (bobath ball, water mattress, wheelchair, balance plate)	14.00±.57	14.00±.57	14.00±.57	14.00±.57

Table II

Descriptive analysis of differences between pre-test and post-test values in the experimental and control groups by the Tinetti test - sitting balance

Groups	Tests	Mean ±SD	Paired t-test		Paired Wilcoxon	
			t	p	Z score	p
Group I	Pre-test Post-test	17.92±1.75 19.15±2.11	3.593	.004	2.588[b]	.010
Group II	Pre-test Post-test	16.61±2.66 17.23±2.74	1.979	.071	1.807[b]	.071

b. - based on negative ranks; $p<0.05$

Tables III and IV highlight the differences between the results obtained for the standing balance - Tinetti test, as follows: for the experimental group MD 1.40 ± 1.19, and for the control group MD 0.06 ± 0.88. Cohen›s effect size was d = 1.17 for the experimental group, a very large effect size, and d = 0.07 for the control group, a very small effect size. The difference between pre- and post-test values was statistically significant for the experimental group, which was revealed using the Wilcoxon signed rank test for two paired samples (z = 3.104, *p* 0.002), but for the control group the difference was not statistically significant (z = 0.302, *p* 0.763).

Discussions

In both Tinetti tests - sitting and standing, the experimental group made statistically significant improvements between the two testings, but in the control group differences were statistically insignificant between tests, p <0.05.

Research over the past 30 years indicates that therapy dogs may offer physiological, emotional, social, and physical support to children (Friesen, 2010).

Various approaches exist for improving postural control and balance through AAT (Zadnikar & Kastrin, 2011; Shurtleff, 2009; Hamill et al., 2007; Benda et al., 2003).

Hippotherapy - performing exercises on the back of an unsaddled horse (trunk straightening, rotation) helps improve numerous motor functions (Zadnikar, 2010).

The results of the study conducted in children aged 7-9 years with autism suggested that an EAT intervention may be beneficial to improve the balance, upper limb coordination and possibly strength of children with ASD in a way that is acceptable but also enjoyable to these children (De Milander et al., 2016).

A round therapy field 20 meters in diameter is recommended in horse therapy, where the patient, the therapist and the horse are in uninterrupted interaction. Such therapeutic sessions are practiced 2 to 3 times per week (Yeh, 2005).

Vidrine et al. (2002) summarize three studies using therapy with horses. One study in children with special educational needs showed an increase in positive behavior among the study participants.

During the past century, horses have been used in programs helping people with physical disabilities. Riders benefit from the gentle rocking motion that can help to relax muscles and improve balance. Some theorists contend that the horse power and size provide opportunities for riders to explore issues related to vulnerability, power, and control (Lentini & Knox, 2009).

Some studies concluded that equine-facilitated psychotherapy provides well-being and an improvement in the quality of life of children with mental health problems; horses can put children therapeutically in touch with their own vitality by their large and gentle presence (Rothe et al., 2005).

Conclusions

1. Dog and horse-assisted therapy increased the abilities of children with neuromotor deficiencies, because they tried to change their behavior and participate more actively in the treatment process.
2. AAT contributed to the improvement of the static

Table III

Mean and SD of items of the Tinetti test for the standing balance in both groups.

Items	Group I (equine + dog therapies)		Group II (dog therapy)	
	Mean±SD	Mean±SD	Mean±SD	Mean±SD
	Pre-test	Post-test	Pre-test	Post-test
1. Sitting balance is steady and safe without any support	19.00±.48	20.00±.37	19.00±.48	20.00±.65
2. Sternum push	17.00±.78	17.00±.78	17.00±.53	16.00±.48
3. Trunk rotation/turn	19.00±.48	18.00±.53	18.00±.53	17.00±.53
4. Collecting (lifting) an object on the ground	17.00±.78	18.00±.53	19.00±.48	14.00±.89
5. Eyes closed - 15 sec.	15.00±.37	17.00±.69	13.00±.69	14.00±.53
6. Flexion of upper limbs at 90 degrees and staying upright for 15 sec.	16.00±.48	19.00±..34	15.00±.89	16.00±.53
7. Stretching forward (cm)	18.00±.78	20.00±.48	14.00±.48	14.00±.72
8. Placing and keeping the foot on a small chair	15.00±.69	16.00±.75	15.00±.89	12.00±.75
9. Throwing the ball/catching the ball	11.00±.97	14.00±.57	16.00±.48	16.00±.48
10. Standing on one foot	13.00±.37	15.00±.89	12.00±.49	12.00±.53
11. Stepping over obstacles	14.00±.57	16.00±.57	15.00±.38	15.00±.37
12. Walking on a drawn line	13.00±.37	14.00±.48	13.00±.37	12.00±.75
13. Moving hands and trunk while walking	14.00±1.00	15.00±.57	14.00±.57	13.00±.78
14. Climbing up and down stairs	17.00±.53	18.00±.53	16.00±.48	17.00±.53
15. Running	15.00±.89	17.00±.75	15.00±.89	16.00±.48

Table IV

Descriptive analysis of differences between pre-test and post-test values in the experimental and control groups by the Tinetti test - standing balance.

Groups	Tests	Mean ±SD	Paired t-test		Paired Wilcoxon	
			t	p	Z score	p
Group I	Pre-test Post-test	15.53±2.32 16.93±1.94	5.137	.000	3.104[b]	.002
Group II	Pre-test Post-test	15.40±2.13 15.46±2.19	.292	.774	.302[b]	.763

b. - based on negative ranks; p<0.05

and dynamic balance, the results being statistically significant.

3. Regarding the improvement of the static and dynamic balance, the combined dog and horse-assisted therapy had superior effects compared to the horse only-assisted therapy.

Conflicts of interest

The authors have no conflict of interest.

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