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The role of hippotherapy in children rehabilitation

Hipoterapia w rehabilitacji dzieci

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Abstract

Hippotherapy is one of the forms of animal therapy (zootherapy). It is defined as a therapeutic action to improve human health and its functioning, with the help of a horse and riding on its back. The aim of the study was to present current reports on hippotherapy, as well as its popularization as a method that supports traditional rehabilitation. The theoretical part of the thesis discusses the mechanism of the horse's therapeutic impact on humans, including its impact on the physical, emotional, motivation, cognitive and social spheres. The basic assumptions of hippotherapy are also presented - indications, contraindications, choice of a horse, the profession of a hippotherapist and the principles of conducting therapeutic activities with children. In the research part, in order to present up-to-date reports, a review of scientific articles from Poland and around the world, published in 2015-2019, on the effectiveness of hippotherapy activities and their impact on the psychomotor development of children with CPR, ASD and ADHD. These articles were found in the PubMed medical database. Twenty publications were selected that met all the search criteria. Most of the analyzed studies showed a positive effect of hippotherapy on the functioning of ill children. The most common effects are, the improvement of motor functions (including body posture, gait and balance), improvement of behavior, and better social functioning. It was confirmed that hippotherapy can complement comprehensive rehabilitation among children with CPR, ASD and ADHD, as well as motivate to therapy and exercise. On the basis of the discussed data, conclusions were also drawn that further research is needed, which would take into account larger groups of respondents and would show the long-term effects of therapy with the participation of a horse.

Key words:

Hippotherapy, horses, children therapy with CPR, ASD (autism spectrum disorder) i ADHD (attention-deficit hyperactivity disorder)

Streszczenie

Hipoterapia to jedna z form animaloterapii (zooterapii). Definiowana jest jako terapeutyczne działanie służące poprawie zdrowia człowieka oraz jego funkcjonowania, przy pomocy konia i jazdy na jego grzbiecie. Celem pracy było przedstawienie aktualnych doniesień dotyczących hipoterapii, a także jej popularyzacja jako metody, która wspomaga tradycyjną rehabilitację. W części teoretycznej pracy został omówiony mechanizm terapeutycznego oddziaływania konia na człowieka, z uwzględnieniem wpływu na sferę fizyczną, emocjonalno-motywacyjną, poznawczą i społeczną. Przedstawiono również podstawowe założenia hipoterapii – wskazania, przeciwwskazania, wybór konia, zawód hipoterapeuty oraz zasady prowadzenia zajęć terapeutycznych z dziećmi. W części badawczej, w celu przedstawienia aktualnych doniesień, dokonano przeglądu artykułów naukowych z Polski i ze świata, opublikowanych w latach 2015-2019, dotyczących skuteczności zajęć hipoterapeutycznych oraz ich wpływu na rozwój psychoruchowy dzieci z MPDz, ASD oraz ADHD. Artykuły te zostały odnalezione w bazie medycznej PubMed. Wytypowano 20 publikacji, które spełniały wszystkie kryteria wyszukiwania. Większość przeanalizowanych badań wykazała pozytywny wpływ hipoterapii na funkcjonowanie chorych dzieci. Najczęściej uzyskiwane efekty to przede wszystkim poprawa funkcji motorycznych (w tym postawy ciała, chodu i równowagi), poprawa zachowania, a także lepsze funkcjonowanie społeczne. Potwierdzono, że hipoterapia może stanowić uzupełnienie kompleksowej rehabilitacji wśród dzieci z MPDz, ASD i ADHD, jak również motywować do terapii i wykonywania ćwiczeń. Na podstawie omawianych danych wysunięto też wnioski o konieczności dalszych badań, które uwzględniałyby większe grupy badanych oraz wykazałyby długofalowe efekty terapii z udziałem konia.

Słowa kluczowe:

Hipoterapia, konie, terapia dzieci z MPDz, ASD (autism spectrum disorder) i ADHD (attention-deficit hyperactivity disorder)

The role of hippotherapy in children rehabilitation

One of the most popular forms of zootherapy is hippotherapy (from the Greek "*hippos*" – horse and "*therapeuein*" - therapy, heal) [1]. It's all the action which are aimed at restoring health and fitness with the use of the horse and riding on its back. It is a therapy that gives many possibilities - its impact is recognized to be varied and very broad.

According to the canons of Polish rehabilitation, we define hippotherapy as a therapeutic, targeted action aimed at improving human functioning.

in the physical, emotional, cognitive and social sphere, and a specially prepared horse is to be an integral part of the entire therapeutic process [2]. Although hippotherapy is a natural method of rehabilitation, it should be carried out by a qualified therapist and carried out in accordance with the recommendations of the doctor who directs the patient to this form of therapy. It should be also in collaboration with specialists who conduct a given patient on a daily basis [3, 4].

Horse therapy is a complementary method that supports the main treatments. It is an interdisciplinary activity in which, apart from therapeutic elements, also educational, recreational values are distinguished. Beside that sports element is also very valuable depending on the individual needs and capabilities of the patient [5].

Thanks to the Danish amazon Liz Hartel suffering from Heine-Medina disease hippotherapy was popularized. Thanks to systematic horse riding trainings, Liz achieved significant improvements in health. She even took part in the Olympic Games in Helsinki in 1952 and won a silver medal in horse riding. This can be considered as a symbolic date of the birth of hippotherapy. In later years, people became more interested in the therapeutic role of horses and the introduction of therapy into rehabilitation programs was initiated mainly in Western Europe, as well as in the United States of America and Canada [6, 7].

In Poland, as well as in the former USSR countries, the idea of rehabilitation with the participation of horses began to develop only in the 1980s. The first attempts to introduce it into medical practice were made in Konstancin near Warsaw by prof. Marian Weiss. Then, in 1985, doctors from Krakow, with the help of the equestrian club in Swoszowice, organized the first hippotherapy courses for children and adolescents [8].

A breakthrough in the development of hippotherapy in Poland was a nationwide conference held under the slogan "Hippotherapy – theory, practice, possibilities". During this conference, on June 4, 1992, a decision was made to establish the Polish Society of Hippotherapy (PTHip), which functions to this day [9].

Aims of the work

1. Showing and discussing the role of hippotherapy in children's rehabilitation with cerebral palsy (CPR), behaviors on the autism spectrum disorder (ASD) and Attention Deficit Disorder (ADHD).
2. Review of scientific research on the effectiveness of hippotherapy in children with various disorders of the nervous and motor systems carried out in 2015-2019 one.
3. Acquainting with the topic of hippotherapy among physiotherapists.

Types of hippotherapy

In Germany and Anglo-Saxon countries, the term hippotherapy is used only to refer to curative gymnastics on a horse and physiotherapy with a horse. Meanwhile, in Poland the word hippotherapy has a much broader meaning – it applies to all therapeutic activities performed with the help of a horse and riding on its back.

According to the Canons of Polish hippotherapy, there are currently 3 types of hippotherapy activities:

1. Physiotherapy on a horse - a form of therapy based on therapeutic gymnastics. Gymnastics is performed on a horse that is moving by a walk. It complements classic physiotherapy. The main goal is to improve the movement of the patient. Physiotherapy on horseback is carried out by a physiotherapist and is ordered and systematically controlled by a doctor.
2. Psycho-educational horse riding and vaulting – this are a groups of activities not only equestrian, but also psychological and educational, cognitive, emotional and physical improvement of a given patient. This form of hippotherapy is mainly carried out by psychologists, educators and occupational therapists.
3. Horse contact therapy - the essence of this therapy is human contact with the animal. By bonding with the horse, the patient has a chance to improve communication with the surrounding environment and other people. The most important thing is to create a therapeutic relationship, horse riding does not have to be part of the classes. The therapy is conducted mainly by psychiatrists, psychologists and educators [2].

Closely related to hippotherapy, but not part of it, it is recreational and sports horse riding for the disabled. It may have a therapeutic aspect. Its main goal is to actively spend free time outdoors by disabled people, as well as to enable them to be active in sports. Such classes are conducted by hippotherapy instructors and horse riding instructors after special preparation [10].

There are several therapeutically influencing mechanisms of hippotherapy. It is both a physical, emotional, motivating, cognitive and social interactions. These are very important elements that can significantly improve the functioning and quality of life of people with both physical, emotional and cognitive disorders. This influence is presented in Fig. 1.

The most numerous group of patients in hippotherapy are children with disorders of the nervous system and the musculoskeletal system [11].

The indications for horse therapy in children include the following diseases and developmental disorders:

1. Neurological syndromes:

- cerebral palsy – children who can independently control the head and active sitting position,
- people after craniocerebral injuries,
- microinjuries of the brain (minimal brain damage, exogenous early childhood psychoorganic syndrome), including ADHD (attention deficit hyperactivity disorder),
- muscle diseases (with muscle strength of 3 or more on the Lovett scale),
- visual impairment: blind and visually impaired children,
- hearing impairment: deaf and deaf children and hearing impaired,
- mental disorders, mental diseases.

Influence of hippotherapy			
PHYSICAL SPHERE	EMOTIONAL AND MOTIVATIONAL SPHERE	COGNITIVE SPHERE	SOCIAL SPHERE
- facilitation of the correct gait pattern; - normalization of muscle tone; - improvement of motor control (balance); - improvement of orientation; - stimulation and improvement in proprioception and exteroceptive sensation.	- increase of motivation and acceptance of therapy; - increasing of self-esteem; - reducing emotional disturbances; - development of independence and responsibility.	- stimulation of the reception of sensory impressions; - improvement of visual and auditory perception; - stimulation of memory, thinking and speech; - improvement of concentration; - acquiring and developing new skills; - communing with nature.	- psychosocial activation; - developing positive psychosocial relationships; - improving non-verbal communication; - establishing an emotional bond with the animal and other people; - counteracting social isolation of ill and disabled people.

Fig. 1. Impact of hippotherapy (own study)

2. Orthopedic teams:

- children with posture defects,
- scoliosis up to 20° according to Cobb (exception: progressive idiopathic scoliosis),
- people after limb amputations,
- developmental defects of limbs.

3. Other indications among children:

- genetic syndromes – incl. Down's syndrome (obligatory X-ray of the cervical spine – lateral and functional before the therapy)
- meningeal hernias
- various types of psychological syndromes, including: social maladjustment, emotional disorders, mental retardation
- psychomotor disorders of unknown etiology
- autism, including disorders with features of autism [2, 12].

Despite the fact that the majority of the recipients of hippotherapy are children, adults can also benefit from this form of therapy. It is addressed primarily to people who diagnosed with: multiple sclerosis, mental diseases / disorders, people after stroke or craniocerebral trauma, orthopedic or neurological diseases of the musculoskeletal system, as well as adults with addictions (drug addiction, alcoholism) and social pathologies [4].

It should also be remembered that despite the many advantages of hippotherapy on various diseases and ailments, there are a number of contraindications to this form of therapy. There are both absolute and relative contraindications here.

The absolute contraindications include:

- uncontrolled fear of animals (intolerance to this form of therapy),
- allergic to horse's hair, smell or sweat,

- increased intraocular pressure and detachment of the retina,
- unhealed wounds,
- lack of head control in motor development and active sitting position,
- instability of the cervical vertebrae of the spine (including Down's syndrome),
- scoliosis above 20° of Cobb scale, as well as progressive idiopathic scoliosis,
- subluxations, dislocations of the hip joints,
- muscle diseases with muscle strength on the Lovett scale below 3 points,
- hydrocephalus without an implanted valve,
- acute diseases, acute infectious diseases, deterioration of health in neurological syndromes,
- increased body temperature [5].

Relative contraindications in hippotherapy include: severe mental retardation, epilepsy, bone mineralization disorders, contractures, permanent deformations and deformities, significant limitations of the range of motion in the osteoarticular system, spinal hernias (in the lumbar spine), discopathies, blemishes haemorrhagic (including haemophilia) and ophthalmic diseases (consultation required) [2].

When starting therapy with a patient, a very important element is choosing the right horse, it should be individualized, at least partially. Patience and timidity should be extremely important features of a horse. The horse must tolerate close contact with several people at the same time. Touching, stroking, uncontrolled screams and movements of children or other unexpected stimuli should not cause any undesirable reactions in them. Therefore, it is extremely important that the animal is mentally tough [8].

The most commonly used breeds for hippotherapy are: hutsul, Polish horse, Fjord horse and horse breeds. Small horses and ponies work best, warmbloods are not recommended because of their temperament. It should also be emphasized that when selecting a horse, race affiliation is not important, but the features related to the horse's character and body build [5].

Types of exercises

Just sitting on a horse's back (usually without a saddle) provides the child with many stimuli – it gives the impression of human walking, reduces muscle spasticity, corrects body posture, etc. The transmission of motor impulses determines the possibilities of the movement of the entire pelvic girdle. Thanks to it, the impulses are delivered to the trunk and limbs through articular connections.

The essence of hippotherapy is the transfer of horse movements to patients pelvis, hip joints, spine, shoulder girdle and head – which release typical movement patterns of human gait. Hippotherapy can therefore be used in the reeducation of the human gait. Relief of the lower limbs while riding on the horse's back and the lack of support helps to exercise balance as well as the trunk muscles in the course of normal walking of a healthy person. Trunk training can be used in a therapy of gait, incl. in cerebral palsy. Therapeutic horse walking rate (regularity of movement) can not simulate any mechanical instruments. Horse naturally strives to be in harmony with the rider.

Therefore, the experienced animal doses its movements during tarsus, according to the mobility of the patient on his ridge [13, 14, 15].

Additionally, exercises performed during hippotherapy activities are aimed at inhibiting pathological reflexes and shaping specific attitudes, abilities, behaviors and skills in the patient [12]. The most important thing is to use exercises and their modifications individually to a specific child, its possibilities or limitations. The exercises used should be important from the point of view of the therapeutic purposefulness of their action. Among the many exercises used during hippotherapy classes for children, the following should be distinguished:

- exercises to strengthen individual muscle groups and shape muscle strength
- body awareness exercises
- balance and proprioception exercises
- fine motor skills exercises
- exercises to develop general coordination
- exercises to develop hand-eye coordination
- speech therapy and breathing exercises [5, 16].

The effectiveness of hippotherapy – a review of scientific research

The Pubmed medical database searched for the results of research on the effects of using hippotherapy in the treatment of children in 2015-2019, these were international publications, where the study group was at least 8 people. The following keywords were used: hippotherapy, Human, equine-assisted therapy. Publications inconsistent with the topic, case studies, systematic reviews, meta-analyzes and all works with an unspecified effectiveness evaluation criterion were excluded from the analysis.

The largest number of articles meeting the search criteria concerned hippotherapy in children with cerebral palsy (CP), autism spectrum disorder (ASD) and attention-deficit hyperactivity disorder (ADHD). 20 publications were selected that met all the search criteria in 100%.

A detailed analysis of the works was performed, taking into account: research, description of the study group and its size, size of the control group (if any), type of intervention, duration and frequency of therapy with the participation of a horse and its documented effects. Among the 20 analyzed publications, 9 concerned children with CP, 6 children with ASD and 5 children with ADHD.

Discussion

Rehabilitation of children with CP plays an important role in medical procedures. The disease is characterized by a variable course and different symptoms depending on the form of CPR. Due to the great interest in the problem of rehabilitation, there are many different forms of therapy, as well as the constant search for new methods that could support traditional physiotherapy [17]. Animal therapy is becoming more and more popular. Among them, hippotherapy arouses the greatest interest – for over a dozen years, numerous studies have been carried out on its effectiveness and usefulness in the treatment of children with CP [18].

The results of the latest research (2015-2019) analyzed in Table 2 show that hippotherapy positively affects the basic

Table 1. Review of research studies on the effectiveness of hippotherapy in children with CP (carried out in 2015-2019).

Authors	Subject of study	Grupa badana Study group	Rodzaj interwencji Type of intervention	Wyniki Results
Lucena-Antón et al. (2018)	Napięcie mięs / Muscle tension	n = 22, 3–14 lat/y.o., GMFCS IV–V; nc = 22	HT 45 min, 1 × tyg./ once a week., 12 tyg./weeks +TR 2×tyg / twice a week. (GK ty/ko TR/ GK only TR)	Significant reduction of spasticity of left (p = 0.04) and right (p = 0.047) adductors of hip joint measured by Ashworth scale versus control group (only short-term benefits examined)
Mutoh i et al. (2018)	Chód / Gait	n = 20, 4–19 lat/y.o., GMFCS I–III, obustronna spastyczność kłd / two sided spasticity	HT 30 min, 1 × tyg./ once a week, 48 tyg./weeks	Improvement of motor skills according to GMFCS (p = 0.001); improvement of gait parameters - lengthening of the stride (p = 0.014), increase in speed and average acceleration (p = 0.029)
Champagne et al. (2017)	Motoryka / Motor skills	n = 13, 4–12 lat/y.o., GMFCS I–II	HT 30 min (+30 min kontaktu z koniem/contact with horse), 1 × tyg./ once a week, 10 tyg./weeks	Improvement of manual skills/precision (p = 0.015), balance and bilateral coordination (p < 0.05) (results are the same immediately after the intervention and 10 weeks after it); strengthening the trunk muscles; improvement of motor functions (walking, running, jumping) and strength
Hsieh et al. (2017)	Motoryka, aktywność / Motor skills, activity	n = 14, 3–8 lat/y.o., GMFCS I, III, IV, V	HT 30 min, 1 × tyg./once a week, 12 tyg./weeks	Improvement of neuromuscular functions, improvement of gait, joint function, muscle tone, decrease in the number of involuntary movements, improvement of behavior control and non-verbal communication (all p < 5), the greatest improvement in children, GMFCS I–III

Autor Authors	Przedmiot badań Subject of study	Grupa badana Study group	Rodzaj interwencji Type of intervention	Wyniki Results
Alemdaroğlu et al. (2016)	Muscle tension	n = 9, mean 7.5 y.o., age from 5 y.o., nc = 7	HT 30 min, twice a week, 5 weeks +TR (GK only TR)	Significant decrease in hip adductors spasticity in short-term observation compared to the control group ($p < 0.025$)
Antunes et al. (2016)	Muscle tension	n = 10, 5–15 y.o., GMFCS I–III, both sided spasticity, nc = 10 (healthy children)	HT 30 min, sessions (1 × walk, 1 × trot)	Immediate reduction of hip adductors spasticity after each session (more after trot), improvement of the time-space parameters of gait after the session with trot (improvement of the phase of double support and rolling of the foot)
Matusiak-Wieczorek et al. (2016)	Balance in a sitting position	n = 19, 6–12 y.o., GMFCS I–II, nc = 20	HT 30 min, once a week, 12 weeks, +TR (GK only TR)	Pinproved balance and body posture - the greatest in T-setting and arm function control ($p < 0.018$), improved head positioning and slight improvement in foot function control ($p > 0.05$) improvement more often in the study group ($p = 0.01$) and in children aged 6–7 ($p = 0.01$)
Moraes et al. (2016)	Motor skills, balance	n = 15, 5–10 y.o., GMFCS I, II, IV	HT 30 min, twice a week, 12 weeks	Poprawa równowagi statycznej i dynamicznej ($p < 0.001$), wzrost samodzielności i samoobsługi ($p < 0.05$) poprawa mobilności, poprawa funkcji społecznych / Improvement of a static and dynamic balance ($p < 0.001$), increased independence and self-service ($p < 0.05$), improved mobility, improved social functions
Kwon et al. (2015)	Motor skills	n = 45, 4–10 y.o., GMFCS I–IV, nc = 46	HT 30 min, twice a week, 8 weeks, +TR (GK only TR)	Poprawa chodu ($p < 0.05$), funkcji motorycznych i równowagi u dzieci z MPD na różnych poziomach czynnościowych ($p < 0.05$) / Improvement in gait ($p < 0.05$), motor functions and balance in children with CP at different levels of function ($p < 0.05$)

n - number of patients in test group; nc - number of patients in the control group; B - boys; CG - control group; HT - hippootherapy; ST - speech therapy classes; wk. - week; mth - month; p - test probability.

Table 2. Review of research studies on the effectiveness of hippotherapy among children with ASD (carried out in 2015-2019)

Authors	Subject of study	Study group	Type of intervention	Results
Harris et al. (2017)	Behavior	n = 12, 6-9 y.o., mainly B, cheavy ASD; nc = 14	HT appr. 45 min, once a week, 5-6 weeks + ZL once a week (CG only ST)	Significant reduction in ASD symptoms and hyperactivity, improving social functioning; no significant changes in stereotyping and speech
Petty et al. (2017)	Behavior on home pets	n = 31, 6-16 y.o., mainly B, pet owners, nc = 36	HT 60 min (15 min of horse care), once a week; 10 weeks (CG education without horse)	Increased interactions with pets in the study group, children became more protective and caring; increase in social interaction
Anderson et al. (2016)	Social functioning	n = 15, mainly B, 5-16 y.o.	HT 180 min, once a week, 5 weeks	Improvement of social functioning (increase in empathy) and reduction of maladjusted behavior; no significant influence on communication
Borgi et al. (2016)	Behavior; social functioning	n = 15, 6-12 y.o., only B, nc = 13	HT 60-70 min, once a week, 25 tyg (6 months) (CG without HT)	Improvement of social functioning (without CG), reduced planning time in problem-solving tasks and less improvement of motor functions
Gabriëls et al. (2015)	Behavior; social functioning	n = 58, 6-16 y.o., nc = 58	HT 45 min, once a week, 10 weeks (CG - artistic project)	Decrease in irritability, impulsiveness and hyperactivity ($p < 0.001$) after the 5th intervention, improvement in social cognition ($p = 0.05$) and communication ($p = 0.003$), including increased vocabulary (new words, number of words)
Steiner et al. (2015)	Gait, behavior	n = 13, 10-13 y.o., nc = 13	HT 30 min, once a week, 1 month, + seducational sessions 1h/day (CG only educational sessions)	lengthening of the step, more stable gait in the sagittal plane, improvement of balance ($p < 0.05$), coordination and orientation, improvement of mental skills compared to the main group (confirmed six months after the end of the intervention)

n - number of patients in test group; *nc* - number of patients in the control group; *B* - boys; *CG* - control group; *HT* - hippotherapy; *ST* - speech therapy classes; *wk.* - week; *mtl* - month; *p* - test probability.

Table 3. Review of research studies on the effectiveness of hippotherapy in children with ADHD (conducted in 2015-2019).

Authors	Subject of study	Study group	Type of intervention	Results
Oh et al. (2018)	Basic ADHD symptoms, comparison of the effects of hippotherapy and pharmacotherapy	n = 17, 6–12 y.o., mainly B, nc = 17	HT (PHR), 60 min, twice a week, 12 /weeks, (CG with pharmacotherapy 12 wks.)	Significant improvement in basic ADHD symptoms in both groups ($p < 0.001$): improved attention, impulsivity / hyperactivity, quality of life; no significant differences in the treatment outcomes of both groups
García-Gómez et al. (2016)	Basic ADHD symptoms, social functioning	n = 9, 7–14 y.o., nc = 5	HT 45 min, twice a week, 12 weeks (CG daily home activities)	Hyperactivity – no significant differences between the groups; in the study group, improvement in the interpersonal relations index in the quality of life questionnaire compared to the control group ($p < 0.033$)
Hyun et al. (2016)	Gait balance, brain connections	n = 12, ś average 10.8 y.o., mainly B, nc = 12 (healthy children)	HT 70 min, 3 times a week, 4 weeks	Improvement of ADHD clinical symptoms ($p < 0.01$), improvement of mood ($p < 0.01$; no differences between groups), improvement of brain connectivity in the areas responsible for balance control during walking (greater in healthy children), and thus improving the balance
Jang et al. (2015)	Basic ADHD symptoms	n = 20, 6–13 y.o., mainly B	HT (PHR) 70 min, twice a week, 12 weeks	Improvement in basic ADHD symptoms (inattention, hyperactivity, impulsiveness), improvement in the social aspect ($p = 0.03$), manual dexterity and coordination ($p = 0.001$)
Lee et al. (2015)	Brain functions, physical fitness	n = 20, ś average 11.5 y.o., mainly B, nc = 19	HT 60 min, once a week, 32 weeks (CG: movement exercises)	The level of adipose tissue in the study group decreased significantly, and in the control group it increased ($p = 0.049$), no differences in the physical fitness of both groups ($p > 0.05$), increased cerebellar activity, but without significant differences compared to the control group ($p > 0.05$), an increase in BDNF (brain-derived neurotrophic factor) but no significant changes in BDNF between the two groups

n - number of patients in test group; *nc* - number of patients in the control group; *B* - boys; *CG* - control group; *HT* - hippotherapy; *ST* - speech therapy classes; *wk* - week; *mtl* - month; *p* - test probability.

problem of children with cerebral palsy – abnormal motor development, which causes problems in everyday functioning. Proven in them the improvement of motor functions after hippotherapy is also confirmed in earlier studies by Debuse et al. and Zadnikar and Kastrin [19, 20]. Research by Drnach et al. and Park et al. also confirmed the beneficial effect of horse therapy on the motor skills of children with CP and showed that it may be useful in maximizing the functional efficiency of children with CP [21, 22]. Despite numerous studies on this subject, Whalen and Case-Smith note that there is still no literature that would unequivocally confirm the therapeutic effect of hippotherapy on people affected by CPR, with randomization and the use of specific protocols [23].

The improvement in gross motor activity after hippotherapy contributes to the improvement of the gait parameters in these patients. Statistically significant increased walking speed and the extension of the step after horse therapy, noted by Mutoh et al [24], were also described in earlier studies by Kwon et al. [15]. Manikowska et al. Also pointed to the normalization of walking speed, but did not notice any improvement in stride length [25].

In the publications analyzed in this study, no reports were found on the influence of hippotherapy on fine motor skills. Meanwhile, already in 2010, there were studies by Sawaryn indicating a significant improvement in such functions as: precise grip, using a spoon or throwing a bag [17]. Improving fine motor skills and eye-hand coordination of the assessed the timed shoelace tying test, also noted M. Szymczak. Time after horse intervention in all children with CP it was shortened. The children also achieved a better result in solving 54-piece puzzles on time [26].

One of the most important aspects of rehabilitation of children with CP is improving the quality of life. In recent years, however, there has been no reliable research which would indicate its improvement after the use of hippotherapy. Białoszewski et al., However, documented that after one year of therapy with a horse, the overall satisfaction with life increased significantly among parents of children with CP who attended the classes.

In these parents, an increase in the level of acceptance of the child's disease was also found [27].

The impact of hippotherapy on the quality of life of patients was the subject of research among children suffering from autism spectrum disorders. Studies by Lanning et al. have shown that as little as 6 weeks of hippotherapy classes contribute to the improvement of the quality of life in people with ASD [28]. The improvement in the quality of life index of children assessed by their parents was also described by Kern et al. [29].

The improvement in the behavior and social functioning of autistic children shown in recent publications after a series of activities with the participation of a horse (Table 3) is also confirmed by the previously presented studies by Kern et al., Lanning et al. and Ajzenman et al. [28-30]. The latter also pointed to the positive effect of hippotherapy on communication in people with ASD [29]. Confirmation of the effectiveness of hippotherapy classes in reducing the severity of the basic symptoms of ASD can be found in the article by Ward et al. [31].

Among children with attention deficit hyperactivity disorder,

the improvement in basic ADHD symptoms is controversial, especially when it comes to reduction of hyperactivity and inattention after hippotherapy. García-Gómez et al. did not show any effect of therapeutic activities involving horses on hyperactivity in this group of patients [32].

No effect on the underlying symptoms of the disorder (including inattention) is also confirmed by the research of Lee et al., in which no significant differences were found in the brain images of regions related to the attention processes of the group of people practicing hippotherapy [33]. These reports are contradicted by the publication by Cuypers et al. In his study, parents participated in hippotherapy sessions and it was them, based on their observations, they reported a significant reduction in the severity of ADHD symptoms, including hyperactivity in their children. In the case of these reports, however, concerns are raised by the size of the study group - it was only five people [34].

The above-mentioned Cuypers et al. Also proved the improvement of social relations in children with ADHD after hippotherapy [33]. Confirmation of the improvement in social interactions can also be found in the latest publications (Table 4). Trotter et al., in a study of children and adolescents at risk of social exclusion, found that working with horses was effective in reducing negative social behavior and reinforcing those that are positive [35].

Conclusions

1. Hippotherapy can complement comprehensive rehabilitation among people with CP, ASD and ADHD. It is an effective method of supporting children's development with various disorders.
2. Contact with an animal arouses interest among children and motivates them for therapy.
3. Hippotherapy classes can positively affect motor functions and social interactions of sick children.
4. It is necessary to conduct further, reliable research confirming the effectiveness of hippotherapy.

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