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Dolna 17, Warsaw,
Poland 00-773
+48 226 0 227 03
editorial_office@rsglobal.pl

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THE ROLE OF HIPPOTHERAPY IN THE REHABILITATION OF PATIENTS WITH SELECTED CENTRAL NERVOUS SYSTEM DISORDERS: A NARRATIVE REVIEW

Julia Kwiecińska *(Corresponding Author, Email: julia.kwieci@gmail.com)*
University Clinical Hospital in Opole, aleja Wincentego Witosa 26, 46-020 Opole, Poland
ORCID ID: 0009-0004-0924-6063

Władysław Hryniuk
University Clinical Hospital in Opole, aleja Wincentego Witosa 26, 46-020 Opole, Poland
ORCID ID: 0009-0009-8653-468X

Jacek Sitkiewicz
Silesian Centre for Heart Diseases in Zabrze, Marii Skłodowskiej-Curie 9, 41-800 Zabrze, Poland
ORCID ID: 0009-0006-0889-0652

Alicja Toczyłowska
University Clinical Hospital in Opole, aleja Wincentego Witosa 26, 46-020 Opole, Poland
ORCID ID: 0009-0007-3155-0573

Mateusz Muras
University Clinical Hospital in Opole, aleja Wincentego Witosa 26, 46-020 Opole, Poland
ORCID ID: 0009-0003-4536-6006

Łukasz Bialic
Medical University of Warsaw, Żwirki i Wigury 61, 02-091 Warszawa, Poland
ORCID ID: 0000-0003-4837-5920

Lidia Mądrzak
Medical University of Warsaw, Żwirki i Wigury 61, 02-091 Warszawa, Poland
ORCID ID: 0009-0005-9516-911X

Marta Korchowiec
Medical University of Warsaw, Żwirki i Wigury 61, 02-091 Warszawa, Poland
ORCID ID: 0009-0008-3365-4728

Wiktor Chrzanowski
Medical University of Warsaw, Żwirki i Wigury 61, 02-091 Warszawa, Poland
ORCID ID: 0009-0008-0820-1452

Katarzyna Krzyżanowska
Medical University of Warsaw, Żwirki i Wigury 61, 02-091 Warszawa, Poland
ORCID ID: 0009-0009-3306-0804

ABSTRACT

Introduction: Hippotherapy is an equine-assisted intervention gaining popularity to support the rehabilitation of patients with neurological disorders. By applying the horse's rhythmic movement, it aims to improve motor function, postural control, and overall quality of life. In addition to traditional therapy with live animals, mechanical simulators are now also employed. Neurological conditions such as cerebral palsy, stroke, and multiple sclerosis often lead to functional impairments that may benefit from complementary therapies.
Aim: The aim of this review is to evaluate the effectiveness of hippotherapy in improving physical and psychosocial outcomes in patients with selected central nervous system disorders.
Review methods: All data were collected from publicly available sources. This article's databases were accessed via PubMed, Google Scholar, and other scientific databases in May 2025.
Conclusions: Hippotherapy appears to be an effective complementary method in the rehabilitation of patients with neurological disorders, offering improvements in motor function, balance, posture, and psychosocial well-being. Both traditional and simulator-based forms show therapeutic potential. However, variability in study quality, small sample sizes, lack of standardization, and high costs limit the strength of current evidence. Further high-quality research is needed to confirm its effectiveness and cost-efficiency in clinical practice.

KEYWORDS

Hippotherapy, Neurological Rehabilitation, Cerebral Palsy, Stroke, Multiple Sclerosis

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1. Introduction

The horses discussed in this article have accompanied humans for centuries, supporting transportation, agriculture, and military endeavors. The earliest reference to their role in medicine dates back to 460 BCE, when horseback riding was employed by Hippocrates as a therapy for insomnia and a means of improving muscle tone in patient (1).

Today, the impact of animals on human mental and physical health is widely appreciated and used. Interaction with animals plays a significant role in human life, with particular importance for individuals facing illnesses and disabilities. Several forms of human–animal interaction have been identified, including:

- Animal-Assisted Therapy (AAT),
- Animal-Assisted Activities (AAA),
- Animal-Assisted Education (AAE) (2).

Hippotherapy uses horseback riding as a therapeutic method aimed at improving health outcomes. As with all forms of Animal-Assisted Therapy (AAT), its implementation requires a qualified team consisting of a trained animal and a physical rehabilitation specialist with expertise in hippotherapy (2). In recent years, there has been significant growth in research on hippotherapy as a complementary approach to standard treatment methods (3).

In addition to conventional hippotherapy, therapies incorporating horseback riding simulators have also been developing. These simulators help overcome limitations associated with traditional hippotherapy, such as limited accessibility, the small number of centers offering such therapy, and the high costs related to the use of horses in the rehabilitation process. Hippotherapy simulation devices make it possible to experience horseback riding indoors and within rehabilitation facilities. The simulator imitates the passive movement pattern of a horse's gait through a robotic device equipped with a dynamic saddle, offering the advantage of conducting therapy without spatial, temporal, or weather-related constraints (4,5).

A horse selected for therapeutic sessions must have a gentle temperament, and its experience in working with individuals with disabilities enables it to adjust its movement to the patient's physical capabilities (6). The slowest of the horse's gaits—the walk—is used in therapy. A typical therapeutic session usually consists of mounting the horse, performing various activities during the ride, and then safely dismounting the animal (6). In hippotherapy, the horse functions as a motor stimulator. The patient's task is to perceive the rhythm of the animal's movement. The horse transmits motion impulses to its rider, striving to synchronize the rider's movements with its own. An experienced horse shifts its center of gravity beneath that of the patient, continuously seeking to regain balance, thereby minimizing movement disturbances resulting from the rider's disability (7).

Through the horse's physical movement, patients can develop coordination, balance, strength, and proper muscle tone (8). One of the most significant effects of hippotherapy on patients is the improvement of postural control—enhancing stability and strengthening righting reactions. Stimulation of the patient's center of gravity occurs in multiple planes, which triggers automatic postural responses and enables the maintenance of an appropriate upright position, supporting trunk stability during changes in body position .(9) A second therapeutic benefit is the improvement of gait—movements performed during horseback riding imitate the natural human locomotor patterns, facilitating their automatization and functional restoration. Additionally, hippotherapy contributes to the regulation of muscle tone by promoting coordination between agonist and antagonist muscle groups and improving their neuromuscular integration through dynamic, repetitive stimuli generated during riding (1). During horseback riding, a reduction in involuntary movements is observed, which supports the development of muscular coordination. An improvement in aerobic capacity and joint flexibility is also noticeable (10).

In addition to its effects on motor function, hippotherapy also influences other domains of human functioning by enhancing social and emotional skills (11). Interaction with the horse contributes to increased self-confidence and increases the willingness to engage in the activities undertaken. Contact with the animal induces a sense of well-being in patients (10). Moreover, studies measuring the levels of hormones secreted by riders during horseback riding confirm that they reduce stress, which may have a positive effect on patients undergoing equine-assisted therapy (12)

According to Mittly et al., a significant proportion, approximately 40% of people requiring rehabilitation are neurological patients (2). Hippotherapy represents one of the supportive methods for reducing functional disability rates in this group of patients (2). The target populations discussed include persons with cerebral palsy, multiple sclerosis, and those recovering from stroke.

2. Objective

The aim of this review is to analyze the literature demonstrating the potential use of hippotherapy as a supportive intervention in the rehabilitation and quality of life improvement of patients with selected central nervous system disorders.

3. Methodology

For this narrative review all data were collected from publicly available sources. The databases used in this article were accessed through PubMed and screened in May 2025. Only studies published from 2018 to 2025 were included in the analysis. Studies in both English and Polish were retrieved. The reference lists of identified studies were searched for additional articles. The studies were screened based on the title and abstract and then selected for full -text review by the first author.

4. Results:

The Use of Hippotherapy in Patients With Cerebral Palsy

Definition of Cerebral Palsy (CP) and the Role of Rehabilitation in Treatment

Cerebral palsy (CP) is the leading cause of physical disability in children (13). The condition affects approximately 2–3 children per 1,000 live births, and this incidence has remained relatively stable over the past decades (14). Cerebral palsy is the result of a series of events that lead to damage to the developing brain either before, during, or shortly after birth (14). It is a condition characterized by movement disorders, muscle tone, and posture, resulting from abnormal transmission of impulses between the central nervous system and the muscles. These disorders lead to excessive muscle activity, which affects the child's posture and gait, ultimately limiting daily functioning and independence. Therefore, the treatment of cerebral palsy relies on

various therapeutic approaches aimed at improving motor skills (15). Rehabilitation involves the use of neurodevelopmental therapies, with the primary goals of reducing spasticity, normalizing postural and motor perception, and stimulating physiological movement patterns (13). In addition to standard physiotherapy, alternative forms of rehabilitation are being explored to support treatment—one of which is hippotherapy (15).

The Impact of Hippotherapy on Postural and Balance Improvement in Patients

Several authors of scientific studies consistently suggest the positive impact of horseback riding therapy on body weight distribution and the proper positioning of the center of gravity, therefore the general body balance among patients (13,16–18). A randomized controlled trial from 2020 (15) confirmed the positive effect of equine-assisted therapy on postural control in children with cerebral palsy. The Sitting Assessment Scale (SAS) was used for the assessment. Statistically significant differences were observed in the intervention groups regarding head positioning, upper limb function, and trunk control (15). A pilot study was also conducted to assess the bioelectrical activity of two key postural muscles within the pelvic girdle—the rectus abdominis and the adductor magnus—in individuals undergoing hippotherapy. Surface electromyography (EMG) analysis indicated that both muscles achieved functional harmonization, with more symmetrical activation in response to the horse's movement. Overall, this translated into increased efficiency in performing postural tasks by patients, and therefore improved body posture (19). In addition to conventional hippotherapy, therapies involving horseback riding simulators have also been evaluated. A systematic review summarizing the results of 12 studies comparing standard physiotherapy with the use of mechanical horseback riding simulators in the treatment of patients with cerebral palsy confirmed improvements in functional balance and sitting ability among study participants (5).

Nevertheless, a systematic review on motor rehabilitation in children and adolescents with cerebral palsy by Silvia Faccioli et al. reported only low-quality evidence suggesting that hippotherapy may be considered as an adjunctive method to support improvements in posture and balance among patients aged 2 to 18 years (20).

The Impact of Hippotherapy on Joint Range of Motion in Patients

A single-blinded study by Kiana Ramenzani et al. demonstrated a significant increase in hip joint range of motion among children with bilateral spastic cerebral palsy who underwent simulated hippotherapy (4). These findings are consistent with studies reviewed by Obrero-Gaitán et al., who also reported improvements in hip abduction range after horse riding simulator therapy (5).

The Impact of Hippotherapy on Muscle Spasticity in Patients

Working on the correct muscle activity of people suffering from cerebral palsy is important to make it easier for them to move and function on a daily basis (17). The review by Menor-Rodríguez et al. included six different studies analyzing the effects of hippotherapy on muscle spasticity and tone in patients. The studies demonstrated a positive impact of horseback riding therapy on improving range of motion and muscle symmetry (17). Another meta-analysis agrees on the improvement of muscle spasticity in people undergoing hippotherapy, but emphasizes that this improvement is short-term (21). The issue of muscle spasticity has also been raised in the context of horseback riding simulator therapy. A single-blinded study by Ramezani et al. demonstrated a significant reduction in spasticity of the adductor muscles of the thigh in subjects undergoing robotic-assisted therapy (4), on the other hand, Oberero-Gaitán et al. did not find significant differences between horseback riding simulator therapy and conventional physiotherapy in this regard, which suggests the need for further research (5).

The Impact of Hippotherapy on Gross Motor Development in Patients

In their systematic review and meta-analysis, Guindos-Sánchez et al. demonstrated that hippotherapy interventions significantly improve balance, muscle spasticity, and consequently motor function in people with cerebral palsy (13). Several other literature reviews have confirmed this finding (3,17,18), taking into account not only conventional hippotherapy but also robotic-assisted systems (5,22). However, full consensus among authors cannot be assumed. In a study comparing physiotherapy alone to physiotherapy combined with hippotherapy, similar effects were observed in terms of improving gross motor function in children and adolescents with cerebral palsy, with the clinical change not reaching statistical significance (23). The meta-analysis included five studies; however, a high risk of bias was identified.

The Role of Hippotherapy in Enhancing Patients' Self-Esteem

It has been demonstrated that contact with a horse enhances patients' sense of self-worth and level of self-esteem (17).

The Use of Hippotherapy in Patients After Stroke

Definition of Stroke and the Role of Rehabilitation in Patient Recovery

Stroke belongs to the group of neurological disorders caused by disturbances in cerebral blood flow. The formation of clots within blood vessels can lead to arterial occlusion, vascular damage, and, consequently, the interruption of oxygen transport—resulting in neuronal cell death due to hypoxia (24).

According to the latest data from the Global Burden of Disease (GBD) 2021, stroke is the second leading cause of death (about 7 million in one year) among non-communicable diseases (25). It has also been demonstrated that stroke is the third leading cause of total losses due to death and disability, as measured by disability-adjusted life years (DALYs) (25). Due to the latter fact, the development and optimization of rehabilitation techniques for post-stroke patients is of critical importance.

Neurological deficits resulting from stroke can significantly impair the ability to maintain proper posture and ambulation, which subsequently leads to a decrease in the level of social activity and ultimately the general well-being and quality of life of people after stroke (26). There is evidence suggesting that hippotherapy may serve as a complementary rehabilitation method for this group of neurological patients (26–28).

The Impact of Hippotherapy on Gait Improvement in Patients

Lina Bunketorp-Käll et al. conducted a study demonstrating both immediate and sustained improvements in walking ability among post-stroke patients who underwent horseback riding therapy (26). The study used knowledge of how the horse's three-dimensional movements stimulate various muscle groups. By inducing rhythmic pelvic motions that resembling natural gait, horseback riding served as both a motor and sensory stimulus for the participants. The results confirmed an improvement in short-distance walking speed, both at self-selected and fast-paced walking speeds (26). Furthermore, the improvement in walking speed observed after the intervention was significantly correlated with an increased self-perception of recovery among the patients (29).

Additionally, a study employing a horseback riding simulator also reported enhanced functional performance in post-stroke patients, as measured by gait tests (27). In contrast, Marquez et al., in their systematic review, did not establish a clear association between improvements in gait parameters and hippotherapy in patients with motor impairments. In their work, they compared the results of 9 case-control studies on the use of hippotherapy in adults with acquired brain injuries. (30).

The Impact of Hippotherapy on the Improvement of Patients' Postural Balance

The meta-analysis by Marquez et al. not only failed to demonstrate improvements in gait parameters among patients, but also indicated a lack of statistically significant enhancement in balance among study participants undergoing equine-assisted therapy (30). However, this conclusion is not supported by two other studies that used simulators and mechanical devices for hippotherapy (27,28). Both studies consistently confirmed the positive impact of this type of rehabilitation on balance in post-stroke patients (27,28).

The Impact of Hippotherapy on Postural Control and Functional Mobility in Patients

Although Coban & Mutluay, using the Fugl-Meyer Assessment Scale (FM), the Trunk Impairment Scale (TIS), and the Timed Up and Go (TUG) test, demonstrated a statistically significant improvement in postural control and functional mobility among post-stroke patients (28), OZTURK et al did not find any improvement in these domains in their study (27).

The Impact of Hippotherapy on Improving Patients' Quality of Life

In one of the studies, the use of the SF-36 questionnaire demonstrated that hippotherapy may contribute to improving the quality of life of patients (28).

The Use of Hippotherapy in Patients With Multiple Sclerosis

Definition and Treatment of Multiple Sclerosis

Multiple sclerosis (MS) is classified as an autoimmune disease of the central nervous system. Globally, the number of patients exceeds 2.5 million, with the majority being young adults between the ages of 18 and 50, more often women (31). There are four different forms of the disease: relapsing-remitting multiple sclerosis, clinically isolated syndrome, secondary progressive multiple sclerosis, and primary progressive multiple sclerosis (10) The most common type is relapsing-remitting multiple sclerosis, which may transition into the secondary progressive form. Less frequently, disability progresses from the very beginning of the disease, a condition classified as primary progressive multiple sclerosis. The pathophysiology of MS is complex, as a result of inflammatory reactions occurring throughout the central nervous system, there is demyelination of neurons - the production of myelin is disturbed (32). The main symptoms of multiple sclerosis include visual disturbances, cognitive impairment, gradual sensory loss, mood disorders, chronic fatigue, and bladder dysfunction, but most notably motor deficits and balance problems (32). Pharmacological treatment of multiple sclerosis includes disease-modifying therapies, strategies for managing disease relapses, and symptomatic treatment. Unfortunately, although physicians can slow the progression of neurodegenerative changes, there is currently no effective pharmacological therapy capable of curing patients by completely stopping the progression of the disease (31).

Given the clinical presentation of the disease, which includes progressive motor disability, rehabilitation plays a significant role in improving patients' quality of life by enhancing their independence in everyday life (31). One of the rehabilitation techniques used is hippotherapy.

The Impact of Hippotherapy on Improving Patients' Balance

Authors of several studies conducted in recent years agree on the positive impact of hippotherapy on improving patients' postural balance (10,33–35). One piece of evidence supporting this thesis is a randomized study comparing horseback riding therapy with Cawthorne-Cooksey exercises (34), a type of vestibular rehabilitation based on performing specific movements of the eyes, head, and body (36). In this study, by comparing the results of the Tinetti Balance and Gait Evaluation Scale, it was demonstrated that hippotherapy was more effective in improving balance among patients (34). Moreover, the study by Moraes et al not only confirmed improvements in postural control among patients but also, through the use of posturography, provided a better understanding of the mechanisms underlying this effect (33).

The Impact of Hippotherapy on Patients' Gait 36 39

Although the meta-analysis by David Suarez Iglesias et al (37) did not demonstrate a direct beneficial effect of horse-assisted therapy on patients' gait, other studies using the 6-Minute Walk Test, the Timed 25-Foot Walk Test, and spatiotemporal gait parameters, have provided evidence of improved endurance and gait characteristics in individuals with multiple sclerosis undergoing hippotherapy (34,38). Given the high prevalence of mobility impairments in multiple sclerosis patients, these findings confirm the important role of horse-assisted therapy in helping patients maintain their ability to move independently.

The Impact of Hippotherapy on Improving Patients' Quality of Life

As a form of interaction between the patient and the animal, hippotherapy is more pleasant than the standard form of rehabilitation (10). It may be beneficial for patients with multiple sclerosis by reducing fatigue, alleviating pain, and improving their overall perception of quality of life. (10,33–35,37).

5. Discussion and Conclusion

Many studies from recent years have shown that hippotherapy—both traditional, involving live animals, and robotic-assisted—has a number of positive effects in the rehabilitation of patients with cerebral palsy. The benefits include improvements in postural control, body balance, joint range of motion, and reduction in muscle spasticity, as well as a favorable impact on gross motor development and patients' self-esteem. However, despite numerous studies confirming the effectiveness of this method, some results—particularly when compared to conventional physiotherapy—remain inconclusive. The quality of some of the evidence is low, which can be attributed to limitations such as heterogeneity in the intensity and content of horse-based training sessions, studies with too few participants, studies with a high risk of bias, and variations in intervention duration—along with a lack of long-term follow-up data. Therefore, hippotherapy may be considered an effective and valuable complementary intervention for people suffering from cerebral palsy;

however, further well-designed studies are needed to clearly establish its superiority over standard rehabilitation methods.

Similar challenges are present when evaluating the use of hippotherapy in post-stroke rehabilitation. Although patients generally tolerate this form of therapy well, current studies do not provide consistent evidence of its effectiveness for this population. The ability to draw definitive conclusions is hindered by the heterogeneity of outcomes, therapy dosages, and the specific types of hippotherapy applied.

In the context of multiple sclerosis, hippotherapy has a comprehensive, positive effect on the functioning of patients and should be considered as an alternative method to standard rehabilitation techniques. While researchers consistently agree on its beneficial effects on health aspects such as balance and postural control, reduction of fatigue, pain relief, and overall quality of life, there is a lack of consistency in scientific evidence regarding its impact on gait improvement in study participants. One of the limitations that make it difficult to standardize the effects obtained after using hippotherapy in patients include the lack of consistency in the definition of hippotherapy itself, a different, sometimes too small number of study participants, a lack of information on the effectiveness of this rehabilitation method in specific forms of multiple sclerosis, insufficient monitoring after the completion of the studies, which makes it impossible to assess the long-term effect of hippotherapy on patients

Based on the above findings, it can be concluded that hippotherapy can have a beneficial effect on patients struggling with neurological diseases and should be considered as a complement to conventional rehabilitation techniques. Horse movement acts as a complex sensory-motor stimulus, which makes it a valuable tool in the process of neurorehabilitation. Moreover, as an activity associated with contact with an animal, it is a form of pleasant for patients, it is an interesting alternative to standard treatment. There is a growing interest in not only classical hippotherapy with the participation of a live animal, but also in its modern equivalent using horse movement simulators. However, despite the numerous evidence of the beneficial effect of hippotherapy on the functioning of patients with central nervous system disorders, there is a lack of full consistency of results. The main limitations include the low quality of some of the available scientific evidence, which is often due to the small number of participants in the studies, the absence of control groups, the short duration of the intervention, and the high risk of bias. Furthermore, there is significant heterogeneity in the analyzed publications - both in the definition of hippotherapy itself and in the therapeutic protocols applied, the frequency of sessions, the duration of therapy, or the methods of assessing the effects. Some studies report only short-term effects, without evaluating the long-term impact of the therapy. Differences in the measurement tools used and the lack of standardization make it difficult to compare results and draw general conclusions. Another important factor limiting the widespread use of hippotherapy is its high cost. The therapy requires the involvement of a trained team, a properly prepared therapeutic environment, and horses with specific temperament and movement characteristics. Additional founding is needed for the maintenance, training, and veterinary care of the animals. This raises the question of the cost-effectiveness of this intervention compared to classical forms of physiotherapy. Consequently, although hippotherapy shows promising potential as a supportive therapy, further well-designed and methodologically sound studies are needed to clearly determine its effectiveness and cost-efficiency in clinical practice.

Disclosures

Author's contribution: Conceptualisation: Julia Kwiecińska

Methodology: Julia Kwiecińska, Władysław Hryniuk

Software: Julia Kwiecińska, Władysław Hryniuk

Check: Marta Korchowiec, Katarzyna Krzyżanowska, Wiktor Chrzanowski

Formal analysis: Julia Kwiecińska, Marta Korchowiec, Katarzyna Krzyżanowska

Investigation: Julia Kwiecińska, Marta Korchowiec

Resources: Julia Kwiecińska, Alicja Toczyłowska, Mateusz Muras, Łukasz Bialic, Jacek Sitkiewicz

Data curation: Julia Kwiecińska, Alicja Toczyłowska, Łukasz Bialic, Mateusz Muras, Jacek Sitkiewicz, Lidia Mądrzak

Writing – rough preparation: Julia Kwiecińska, Lidia Mądrzak, Władysław Hryniuk

Writing – review and editing: Julia Kwiecińska, Wiktor Chrzanowski

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