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Hippotherapy Used in Medical Recovery

Iustina Condurache [1], Irina Duduca [1], Andrei Gheorghita [1], Anisia Nechita[1], Cezar Mucileanu [1], Mariana Rotariu [1]

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1 Faculty of Medical Bioengineering, University of Medicine and Pharmacy "Grigore T. Popa" Iasi

* Correspondence: Cezar Mucileanu, email: mucileanu.vasilecezar@yahoo.com

Abstract: Hippotherapy, also known as equine-assisted therapy, falls into the category of alternative therapies that involve human-horse interaction for therapeutic purposes. Horse therapies are especially used for children with various physical, cognitive, and emotional disorders. They can also be successfully used with adults and the elderly. The horse's movement is what stimulates the development of motor skills, balance, and coordination. Direct interaction with the horse, including caring for it, riding, and other related activities, is effective in developing social, emotional, and cognitive skills in both children and adults, as well as in the elderly. Hippotherapy encourages self-confidence, concentration, and motor coordination, making it suitable for people who are anxious, antisocial, depressed, have language difficulties, or low self-esteem. Studies highlight that the presence of horses changes the frequency of the human brain, with subjects becoming more aware and focused when around horses. Horses help therapy beneficiaries stay connected to the present, becoming more aware of their experiences. Additionally, patients learn to pay more attention to the feelings and nonverbal language transmitted by the being they come into contact with. Numerous studies show that horseback riding improves balance, coordination, and reflexes, induces muscle relaxation, reduces spasticity, increases joint mobility, and improves respiratory function and blood circulation. The main objective of the paper is to identify therapies that use horses for patients diagnosed with various conditions, the benefits of these therapies on patients' motor skills, and their effects on patients' mental state. Additionally, we aim to identify horse-related activities that enhance concentration, help address behavioral issues, and facilitate patients' integration into social groups.

Keywords: hippotherapy, horse therapy, equine-assisted therapy, rehabilitation

1. Introduction

Hippotherapy is a therapeutic method integrated into physical, occupational, and speech therapies, which leverages the natural movement and gait of the horse to provide motor and sensory stimulation. This intervention focuses on optimizing neurological functions and sensory processes, and is applied in the treatment of patients with physical and mental conditions [1].

The mechanism underlying the physical benefits of horseback riding is associated with the movements generated by the horse during its gait, which influence the rider's movement. This movement pattern resembles human walking, producing a bilateral and consistent stimulus that activates both voluntary and involuntary muscle activity. It has been demonstrated that this process contributes to the improvement or maintenance of postural control [2]. Additionally, psychological benefits have been observed following equine-assisted therapy (EAT), including improvements in self-esteem, enhanced quality of life (HRQoL), emotional well-being, and social integration [3] [4].

During the horse's gait, it generates a rhythmic motion that stimulates anterior and posterior oscillations of the rider's body. These movements encourage the rider to

adopt proper posture, maintaining balance during the therapy. Both the horse and the surrounding environment provide a diverse range of sensory and motor stimuli for the rider.

Horseback riding delivers effective sensory stimulation through the horse's variable, rhythmic, and repetitive movements. These movements naturally mimic the human pelvis's motion during walking. Changes in the horse's gait allow the therapist to assess sensory stimulation and integrate these observations into clinical therapies to achieve the desired outcomes.

Hippotherapy contributes to reduced recovery times and enhances the patient's balance and muscular control. The slow and rhythmic movements of the horse have significant therapeutic effects and assist in the development of paraspinal muscles. The variable rhythm of the horse's gait exerts a stronger influence on the pelvic girdle bones compared to the patient's normal walking pattern. This treatment method, which is also enjoyable, promotes patient cooperation. Consequently, hippotherapy contributes to the improvement of balance, mobility, and posture [1] [5].

2. Matherials and Methods

For the purpose of drafting this paper, a range of virtual libraries was utilized, including Google Scholar, ScienceDirect, the National Library of Medicine, Academic Physiotherapy Conference Proceedings, and PubMed Central. Searches were conducted using specific keywords such as hippotherapy, equine therapy, equine-assisted therapy, and rehabilitation.

For analysis, studies published after 2010 were selected. Additionally, selection was based on specific criteria; only studies relevant to the chosen topic were included after reviewing their abstracts.

The primary objective of this paper is to identify therapies involving horses for patients diagnosed with various conditions, to assess the benefits of these therapies on patients' motor skills, and to evaluate their effects on patients' psychological states. Furthermore, the aim is to identify activities that enhance concentration, address behavioral issues, and facilitate the integration of patients into social groups.

3. Results and discussion

Cerebral palsy (CP) is the most common and severe motor disability in childhood [6]. It refers to a group of permanent neurological conditions characterized by postural and motor disabilities [7], which result in limitations in functional abilities and physical activity. This leads to impaired physical, psychological, and social development, abnormal muscle tone accompanied by balance and coordination disorders, spasticity, and tremors. Depending on the timing of onset, these conditions can occur prenatally, during birth, or postnatally [8].

Studies highlight various medical approaches within the fields of physiotherapy and animal-assisted therapy aimed at alleviating motor, behavioral, balance, and gait disorders in children with cerebral palsy. Complementing these therapies, hippotherapy stands out as an innovative and adjunctive approach that aids in the treatment of children with cerebral palsy. Hippotherapy, or equine-assisted therapy, is a therapeutic modality that utilizes the movements of horses during their gait to rehabilitate neurological conditions, due to the motor and sensory stimuli conveyed [9]. This therapy must be conducted under the guidance of a qualified hippotherapy physiotherapist. The exercises utilized during hippotherapy sessions focus on challenging balance, emphasizing the maintenance of balance and seated posture through the horse's gait.

In 2022, Esteban Obrero-Gaitán and collaborators performed a systematic review and meta-analysis [10], examining studies from six databases: Web of Science, PubMed Medline, CINAHL, PEDro, SCOPUS, and SciELO. The selected clinical studies assessed the effectiveness of Hippotherapy and Related Strategies (HRS) relative to other interventions for patients with cerebral palsyThe principal variables examined

included gross motor function (encompassing both the overall score and the ability to maintain a seated position), functional balance, spasticity, hip range of motion, posturographic balance, and patient well-being. The risk of bias was assessed using the Cochrane Risk of Bias tool, and the aggregate effect was determined through Cohen's Standardized Mean Difference (SMD), with a 95% confidence interval (95% CI).

The systematic review encompassed twelve studies, of which ten were included in the meta-analysis, providing data from 343 patients with spastic diplegic cerebral palsy. The findings demonstrated that Hippotherapy and Related Strategies (HRS) in conjunction with physiotherapy is more effective than physiotherapy alone in enhancing overall gross motor function (SMD 0.98; 95% CI 0.35–1.62), the ability to sit (SMD 0.84; 95% CI 0.32–1.36), and functional balance (SMD 0.60; 95% CI 0.10–1.08). Furthermore, HRS therapy proved to be more effective than simulation in improving hip abduction range of motion (SMD 0.79; 95% CI 0.21–1.37) [10]. Simulator-based equestrian therapy proves to be an effective approach for enhancing gross motor function, functional balance, and hip abduction range of motion in children with cerebral palsy, in comparison to traditional physiotherapy or placebo interventions.

In 2019, Laura De Guindos-Sanchez conducted a systematic review and rigorous meta-analysis of randomized controlled trials to evaluate the impact of Hippotherapy (HPT) interventions on gross motor function in patients with cerebral palsy (CP). This analysis was based on data extracted from major databases, including PubMed, Scopus, Embase, and Web of Science. The methodological quality of the randomized controlled trials was assessed using the Physiotherapy Evidence Database (PEDro) scale. Data were collected from 542 participants across the 10 studies analyzed. It was found that favorable effects were achieved on gross motor function, with improvements measured using the Gross Motor Function Measure-66 (Standardized Mean Difference [SMD] = 0.81, 95% Confidence Interval [CI] = 0.47–1.15), and the Gross Motor Function Measure-88, including Dimension A (SMD = 0.64, 95% CI = 0.30–0.97), Dimension B (SMD = 0.42, 95% CI = 0.09–0.75), and Dimension E (SMD = 0.40, 95% CI = 0.06–0.73). These results underscore the potential benefits of Hippotherapy (HPT) interventions in enhancing gross motor function in patients with cerebral palsy (CP) [5].

Given that there is no curative treatment for this condition, but only a series of therapies that alleviate symptoms, Menor-Rodriguez M.J. et al. aimed to highlight in this literature review the importance and positive effects of hippotherapy on the health of children with cerebral palsy. Throughout the study, the authors present three principles of hippotherapy. These include the transfer of heat from the horse to the therapist, which is beneficial for muscle and ligament extension and relaxation, thereby enhancing sensory perception [11] [12]. The transmission of rhythmic impulses involves the horse delivering approximately 90-110 rhythmic impulses or vibrations from its lumbar muscles to the patient's pelvic girdle. These movements compel the patient to recalibrate their balance, thereby enhancing postural control [12], balance, and coordination [13]. The third principle involves the transmission of a three-dimensional locomotion pattern that resembles human movement. This pattern contributes to increased elasticity and flexibility of the pelvic ligaments, stabilizing and coordinating the trunk and head through the rhythmic automation of the horse's movements. The literature review highlights that hippotherapy has positive effects on the health of children with cerebral palsy (CP). Three of the analyzed studies assessed improvements in gross motor function, noting a reduction in involuntary movements one year after the completion of treatment. Balance and postural control were evaluated by five studies, which reported positive changes in weight distribution and the localization of the center of gravity, thereby enhancing postural stability and balance. Six studies investigated the effects of equine therapy on spasticity and muscle tone, indicating improvements in muscle size and tone, which are crucial factors in reducing spasticity [14] [15]. The psychological, cognitive, and social effects were addressed in three studies, which highlighted improvements in self-esteem and

socialization, thereby enhancing concentration and attention during therapy. Additionally, two studies observed improvements in the independent performance of daily activities. Hippotherapy provides significant benefits across multiple functions, including gross motor skills, balance and postural control, spasticity, and muscle tone. It also contributes to reduced dependency in performing daily activities and enhances psychological, cognitive, and social aspects.

Multiple sclerosis (MS) is a chronic disorder distinguished by progressive demyelination and axonal loss within the central nervous system. The symptoms of MS can manifest individually or in various combinations, and include a broad spectrum of issues such as fatigue, paresthesias, rigidity, muscle spasms, tremors, weakness, dizziness, gait disturbances, and pain [16]. The symptoms presented significantly diminish the health-related quality of life (HRQoL) for individuals with multiple sclerosis (PwMS) [17] [18]. Previous studies have demonstrated that individuals with multiple sclerosis (PwMS) often exhibit reduced postural control, which increases their risk of falls. This aspect is particularly significant, as falls are associated with injuries, decreased participation in activities, and an increased fear of falling among patients [19].

While pharmacological and non-pharmacological treatments provide benefits, rehabilitation programs are recommended to enhance both the physical and mental health of individuals with multiple sclerosis (PwMS). Complementary and alternative therapies have been introduced to alleviate symptom severity and improve health-related quality of life (HRQoL) in PwMS. However, the efficacy of these therapies has occasionally been questioned [20]. In this context, fewer than half of the clinical practice guidelines for individuals with multiple sclerosis (PwMS) include complementary and alternative therapies. Therefore, a review of studies is necessary to provide clearer evidence and identify therapies that should be proposed to maximize beneficial outcomes and reduce symptom severity. Previous research on animal-assisted interventions has reported positive effects on physical and mental health. Equine-assisted therapies (EAT), as part of these interventions, have demonstrated benefits for the elderly, individuals with autism, children with attention deficit disorder, cerebral palsy, and populations suffering from chronic pain [21].

Ana Myriam Lavín-Perez et al. conducted a systematic review with the aim of providing a current analysis of the effects of equine-assisted therapies (EAT) on individuals with multiple sclerosis (PwMS) [22]. Two databases, PubMed and Web of Science, were utilized in the search, which concluded at the beginning of 2022. A total of 195 patients with multiple sclerosis (PwMS), aged between 40.3 and 51.3 years, were included in the study. Equine-assisted therapy (EAT) interventions were administered over an average period of 13.6 weeks, with session frequencies ranging from once every ten days to weekly. Sessions lasted an average of 34 minutes and were conducted on real horses. Randomized controlled trials (RCTs) demonstrated positive effects on quality of life, spasticity, balance, and gait speed. Additionally, non-RCT research highlighted improvements in balance, spasticity, and postural control—areas not assessed in the RCT studies. It is essential to note that significant effects were observed exclusively when the control group was inactive or receiving standard treatment. In this context, equine-assisted therapies (EAT) emerge as a promising and effective option for improving quality of life, fatigue, balance, spasticity, and gait speed in patients with multiple sclerosis (PwMS). However, due to the heterogeneity of comparison groups, results may vary depending on the study design. Additionally, including uncontrolled studies to gain a broader perspective may increase the risk of bias, which must be considered with caution.

Autism spectrum disorder (ASD) is a neurodevelopmental disorder that affects approximately 78 million individuals [23]. It is a persistent, congenital, and complex condition impacting social interactions, cognitive functioning, and perceptual abilities, often accompanied by intellectual disabilities [24] [25]. Due to the alarming number of individuals with autism spectrum disorders, Ningkun Xiao and colleagues conducted

an analysis of specialized studies to highlight the importance and effects of hippotherapy in treating this condition [26]. The included studies emphasized the significance of rhythmic movements during walking, which activate the vestibular system and yield positive results in speech and learning [27] [28] [29]. Patients are required to actively manage their body movements, which reflects in their voluntary postural control abilities and improvement in nonverbal communication. Equine-assisted activities are highly beneficial for children with autism, including activities in the stable, cleaning the stable, feeding, and grooming horses. Occupational therapy exercises assisted by horses improve physical, behavioral, and social health in patients.

In 2020, Daniel Collado-Mateo and his team carried out a systematic review and meta-analysis utilizing two electronic databases, Web of Science and PubMed. Their review incorporated eleven studies, including seven randomized controlled trials. The analysis focused on evaluating the impact of equine-assisted therapy and horseback riding simulators on chronic pain [30]. The study aimed to analyze the literature to determine the effectiveness of treatment in both cases and the advantages and disadvantages of each approach. The high cost of a hippotherapy session due to space maintenance, horse care and training, center supplies, and staff salaries can be a barrier for patients. The lack of specialized centers with qualified personnel, as well as external factors such as weather, distance to centers, potential allergic reactions, fear, and anxiety [31], can be problematic for maintaining long-term treatment. In response, horseback riding simulators have been developed to replicate the three-dimensional movements experienced during actual riding in a safe and controlled environment. However, the literature suggests that simulators are ineffective in reducing psychological and behavioral issues due to the lack of patient-horse interaction [32]. This interaction is crucial for psychological and physical relaxation, facilitated by pre- and post-therapy activities such as grooming, caring for, and feeding the horses [33], which help in reducing chronic pain. The reduction of spasticity and muscle hypertonia through the natural warmth of horses, which is 1-5 degrees higher than the human body temperature [33], also contributes to alleviating chronic pain. The study results indicated significant improvements in posture, increased muscle strength in the abdominal, lumbar, trunk, and hip regions, based on the analyzed articles, for both real and simulated horse therapies. The authors emphasize the lack of available data to make a precise comparison between the two approaches, offering an accurate conclusion.

Post-traumatic stress disorder (PTSD) is prevalent worldwide, particularly following major traumas such as wars, natural disasters, pandemics, and interpersonal violence [34]. Studies show that the percentage of military personnel and veterans with PTSD approaches 30% [35]. In addition to the characteristic symptoms of PTSD, there are often deficiencies in social, occupational, and physical spheres, impacting family life, suicidal thoughts, and attempts [36]. William R. Marchand reviewed the specialized literature to identify potential mechanisms of action and outcomes of equine-assisted therapy [37]. He analyzed both psychological and pharmacological treatments for PTSD, presenting data from a study [38] showing that 72% of patients undergoing pharmacological treatment discontinued it within approximately 180 days. However, another study [39] provided information on the involvement of war veterans with PTSD in equine therapy. Of six planned sessions, 58% completed four or more, while 24.2% completed the treatment. After analyzing twenty-three studies, the authors found that conventional treatments are sometimes insufficient for complete recovery, and equine-assisted therapy could complement them. The bond between the horse and the patient, the horse's attention, rhythmic impulses transmitted during riding, recreational activities such as preparing and feeding the horse, and indirect effects on the body form the basis of this theory. However, due to the lack of well-validated and well-described studies with well-structured samples, it is challenging to draw precise conclusions from the existing literature, placing this field in an early stage of scientific development [37].

To highlight the benefits and diversity of equine therapy, Lea Badin et al. conducted a systematic review [40] aiming to present the effects of this therapy among elderly individuals. For this work, 244 studies were analyzed, of which only thirteen were eligible for inclusion in the review. The synthesis provided information on the effects of horse-assisted therapy in the physical, physiological, and psychological domains. Regarding the physical effects of therapy, improvements were noted in balance, gait, increased muscle strength, postural coordination, and positive changes in hand prehension. Balance was evaluated in the studies using the Berg Balance Scale [41] [42] [43], the Fullerton Advanced Balance Scale [41] [44], the Functional Reach Test [43], the length of the balancing path [45], or balance platforms [46]. Gait was most often analyzed using the Timed Up & Go test [42] [43] [46] maximum walking speed [47] over a marked 16-meter path, and measuring stride length and timing [45]. To assess muscle strength, the Chair Stand Test [42] [46] and the Sit and Reach Test [43] were used, while a dynamometer for hand prehension and the Knee Extension Test [47] were employed for upper and lower limbs. Due to the dynamic and complex movements involved in riding, which engage the whole body, significant improvements in walking [47] as well as posture and balance [45] were observed compared to a control group performing traditional physical exercises. The primary physiological effects of equine therapy are similar to those of sports, including increased serotonin levels and decreased cortisol secretion, which help reduce everyday stress and improve patients' quality of life. Psychologically, the review highlights an improvement in the quality of life for patients, including those with Alzheimer's disease [43] [48].

Specialized literature defines stress as the perception or threat of disrupting the homeostasis of a living organism. Repeated stress on the body's systems can induce physiological adaptations that contribute to restoring homeostasis, thus improving functional capacity and overall functioning. In the context of equine-assisted therapy (EAS), the rhythmic movement of the horse generates repetitive body movements in the rider. Consequently, physical adaptations observed, including improvements in gross motor function, balance, posture, muscle asymmetry, and spasticity, are likely a result of exposure to acute stress periods generated by external factors.

Brandon R. Rigby examined the concentrations of immunoglobulin A (IgA), serotonin, cortisol, progesterone, and oxytocin within the context of rider physiology during equine-assisted services (EAS). Although the literature varies in its characterization of hormonal concentrations, existing studies show promising results regarding stress reduction in riders during EAS. Positive outcomes in stress modulation may support the observed physical and psychosocial benefits across diverse populations, regardless of age, diagnosis, or level of equestrian experience. However, chronic stress periods, indicated physiologically by elevated levels of glucocorticoids and catecholamines, may impact horse performance during EAS and negatively affect the human-animal interaction [49]. Given the interdisciplinary nature of this topic and the complexity of collecting and analyzing blood and saliva samples, future research teams should include biologists, biochemists, and health practitioners such as nurses, phlebotomists, and physiotherapists. It is essential to conduct better-controlled studies with adequate fidelity in treatment and experimental design to enable precise quantification of stress-associated hormonal concentrations. Additionally, factors such as the method of sample collection (saliva versus plasma and/or serum), timing of collection, and the timing of data collection before, during, and after EAS sessions must be considered, as peak hormone concentrations and sex-specific characteristics can influence neuroendocrine responses to stress. Addressing these aspects will help advance the accessibility and feasibility of EAS.

A 2020 study revealed that 40.3 million Americans reported a substance use disorder (SUD), and only about one-tenth of them received specialized treatment. Among individuals undergoing treatment for substance-related disorders (SUD), the average dropout rate for psychosocial treatments is 30.4% [50]. Considering the

documented positive association between treatment and improved outcomes for people with SUD, it is crucial to identify interventions that enhance treatment motivation, encourage abstinence, and combat relapse.

A relevant therapeutic approach is represented by equine-assisted services (EAS). This is a general term used to include all interventions involving horses, provided by professionals to benefit patients [51]. Psychotherapies that include horses, such as equine-assisted psychotherapy (EAP) and equine-facilitated psychotherapy (EFP), are innovative methods where the animal plays both a supportive role in therapeutic interventions and a mediator between the psychotherapist and the patient [52]. The integration of horses into treatments for psychological disorders has been extensively documented, with specialty studies suggesting that participation in EAS leads to significant reductions in psychological stress, hyperactivity-related behaviors, violent behaviors, as well as post-traumatic stress disorder (PTSD) and anxiety [53].

According to recent research, the literature indicates a positive impact of equine-assisted therapy on substance abuse. A recent study demonstrated that EAS interventions for individuals suffering from anxiety and PTSD led to a considerable reduction in alcohol consumption among patients [54]. Despite previous research suggesting a positive effect of EAS on behavioral health, there are concerns about the methodological limitations of existing studies. Additionally, there are risks related to the potential promotion of these treatments as costly and with uncertain efficacy, facing difficulties in widespread implementation among affected populations.

Diaz and colleagues conducted a scoping study to assess the current state of the literature, identify existing gaps, and suggest further research directions useful for evaluating the effectiveness of EAS in the context of substance use disorder (SUD) reduction. The choice of a scoping review was based on the insufficiency of relevant literature and the need to evaluate all available studies. In this review, 192 articles were selected, of which only 71 were chosen for detailed evaluation [55]. The quantitative information presented in the analyzed article is not sufficient to clearly demonstrate the beneficial effect of EAS. Using a more robust experimental design, randomized controlled trial (RCT), Gatti et al. [56] did not confirm the statistical data obtained by Kern Godal et al. [57], but observed insignificant differences in treatment completion (44% compared to 32%) and duration (98.7 days versus 107.4 days) between the horse-assisted treatment (HAT) group and the usual treatment (TAU) group. Qualitative studies highlight a series of beneficial effects of EAS for patients undergoing SUD treatment or those diagnosed with SUD. These findings are consistent with results obtained in other research studying EAS as adjunctive therapies for populations suffering from mental health disorders or trauma, where individuals showed reductions in negative psychosocial symptoms and established meaningful connections with horses [58].

However, there are certain limitations to consider when evaluating the applicability of these results. The studies included have paid more attention to the positive aspects of EAS. Some studies have reported a disparity between positive and negative aspects, suggesting that some favorable experiences of the authors with horses may have influenced the interpretation of patient responses. Additionally, it is essential to note that available data in the literature are limited for adolescent and young adult populations.

5. Conclusions

Equine therapy, or horse-assisted therapy, has proven effective across a range of conditions, with existing literature describing its positive effects for patients diagnosed with cerebral palsy, multiple sclerosis, and autism. Additionally, favorable outcomes of equine therapy have been observed in managing pain, whether chronic or post-traumatic stress. Isolated studies also describe potential positive effects of horse therapy for individuals suffering from various dependencies. Despite these promising trends, methodological limitations, the limited diversity of studied populations, and

the small number of available studies delay definitive conclusions about the efficacy of equine-assisted services (EAS) as an adjunct treatment for various conditions. To advance in this field, there is a need for a greater number of studies with rigorous research designs that continue to explore the outcomes of EAS. Additionally, future research should ensure clear reporting of participant demographic data and strive to standardize and optimize the terminology used in describing equine-related services. Another research direction should focus on the efficacy of EAS as an adjunct to treatment for various conditions in adults and the elderly, as existing studies largely focus on children, youth, and adolescents.

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