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The role of Equotherapy as auxiliar treatment tool in physical and psychiatric disorders: a narrative review

O papel da Equoterapia como ferramenta auxiliar de tratamento em distúrbios físicos e psiquiátricos: uma revisão narrativa

El papel de la Equinoterapia como herramienta auxiliar en el tratamiento de trastornos físicos y psiquiátricos: una revisión narrativa

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Abstract
Equotherapy, also known as Hippotherapy (HPT), is a modality of therapy that uses horses as the main tool. Equotherapy provides several earnings to patients with cerebral palsy and autism spectrum disorder, such as increasing postural tonus and intellectual capability. However, the results achieved can be reproduced in patients with several physical and psychiatric disorders. The purpose of this article is to review studies with reference to the practice of equine therapy by patients with different physical and psychiatric disorders and to verify the applicability of this therapy in the treatment of these conditions, as well as their main results. Pubmed and Embase databases were searched for articles on Hippotherapy since 2011, with 27 articles (including 19 systematic reviews) included. Their content includes cerebral palsy, autism spectrum disorder, down´s syndrome, mental and rheumatological disorders, and presents HPT as a promising tool in complementary therapy for these conditions. There are some HPT effects already known, such as improvements in emotional control, posture, and balance, besides self-esteem and quality of life improvements, effects of the feeling of empowerment and all the combined results.
Keywords: Equine-Assisted Therapy; Cerebral Palsy; Psychomotor Performance; Rehabilitation; Horses.

Resumo
A equoterapia consiste em uma modalidade de terapia a qual utiliza cavalos como principal ferramenta. A equoterapia promove inúmeros benefícios a pacientes com paralisia cerebral e com transtorno do espectro autista, como aumento do tônus postural e aumento da capacidade intelectual. Entretanto, estes resultados alcançados podem ser reproduzidos em pacientes com diversos outros distúrbios, tanto físicos quanto neuropsiquiátricos. O objetivo desta revisão narrativa é revisar estudos sobre a prática da equoterapia por pacientes com diferentes distúrbios, físicos e psiquiátricos, e verificar a aplicabilidade desta terapia no tratamento dessas condições, bem como seus principais resultados. Foram realizadas pesquisas em bases de dados como Pubmed e Embase, nas quais artigos sobre equoterapia, desde 2011 foram encontrados, tendo sido 27 artigos (incluindo 19 revisões sistemáticas) incluídos nesta revisão. O conteúdo destes engloba paralisia cerebral, transtorno do espectro autista, síndrome de Down, desordens mentais e reumatológicas e apresenta a equoterapia como uma ferramenta promissora para complementar o tratamento destas condições. Alguns dos efeitos da equoterapia já são conhecidos, como melhorias no controle emocional, postura e no equilíbrio, além de aumento da autoestima e da qualidade de vida, consequências da sensação de empoderamento ao se montar um cavalo e de todos os resultados combinados.
Palavras-chave: Terapia Assistida por Cavalos; Paralisia Cerebral; Desempenho Psicomotor; Reabilitação; Cavalos.

Resumen
La equinoterapia, también conocida como hipoterapia, es un tipo de terapia que utiliza caballos como herramienta principal. La equinoterapia proporciona varias ganancias a los pacientes con parálisis cerebral y trastorno del espectro

autista, como el aumento del tono postural y la capacidad intelectual. Sin embargo, los resultados obtenidos pueden reproducirse en pacientes con diversos trastornos físicos y psiquiátricos. El objetivo de este artículo es revisar estudios con referencia a la práctica de la equinoterapia por pacientes con diferentes trastornos físicos y psiquiátricos y verificar la aplicabilidad de esta terapia en el tratamiento de estas condiciones, así como sus principales resultados. Se buscaron en las bases de datos Pubmed y Embase artículos sobre Hipoterapia desde 2011, incluyéndose 27 artículos (incluyendo 19 revisiones sistemáticas). Su contenido incluye parálisis cerebral, trastorno del espectro autista, síndrome de Down, trastornos mentales y reumatológicos, y presenta HPT como una herramienta en la terapia complementaria para estas afecciones. Ya se conocen algunos efectos de HPT, como mejoras en el control emocional, la postura y el equilibrio, además de mejoras en la autoestima y la calidad de vida, efectos del sentimiento de empoderamiento y todos los resultados combinados.
Palabras clave: Terapía Asistida por Caballos; Parálisis Cerebral; Desempeño Psicomotor; Rehabilitación; Caballos.

1. Introduction

Hippotherapy, according to the American Hippotherapy Association, Inc. (AHA Inc.), is a treatment tool that uses the horse as a mediator of therapeutic interventions (American Hippotherapy Association, 2020). It is not a strategy nor a therapeutic procedure nor meets the definition of modality (Hilliere et al., 2021). It is offered as physical and occupational therapy for several patients. Anecdotes in history suggest that horses have been men´s essential partners throughout time, playing an important role in the human psyche (Hilliere et al., 2021). Hippocrates first mentioned equine-assisted treatment in his works, however, it was only turned into a therapy tool with established protocols in 1960, in Europe (Koca & Hilmi, 2015). In 1970, hippotherapy became standardized in the United States (PATH INTL, 2020). Presently, there are 4,800 certified instructors and 881 Therapeutic Riding Centers worldwide (PATH INTL, 2020). The therapeutic use of horses is categorized as alternative, complementary and/or integrative by several authors, although there are a couple terms concerning hippotherapy that should be specified (White-Lewis, 2020). Equine Assisted Therapy (EAT), Equine Assisted Activities and Therapies (EAAT) and Equine Assisted Activities (EAA) are terminologies that are not recommended by AHA Inc. for use in healthcare, considering their potential for confusion (American Hippotherapy Association, 2020). However, they were incorporated in some articles included in this review, as a synonym of Hippotherapy.

Heat transmission between animal and human and human´s continuous response to equine gait are the main justifications for the therapeutic outcomes. Animal´s movements into sagittal, transversal and frontal planes generate constant stimulus in patient´s deep agonist musculature (White-Lewis, 2020). It results in the strengthening of muscles and joints, through the dissociation of the pelvic and scapular girdles and in tonic postural control (White-Lewis, 2020). Another potential benefit of equine therapy concerns neural connections and in the enhancement of psychological, social, and educational skills (White-Lewis, 2020). Therefore, there is an increase in coordination, in self-esteem, self-control, irritability, anxiety, concentration and hyperactivity. Based on all the positive effects mentioned above, the aim of this study is to review articles regarding equotherapy, to verify its role in the treatment of several pathologies and to disseminate the current knowledge about this therapeutic method and its clinical application. The respective evidence was sought in previous publications, mainly in systematic review studies.

2. Methodology

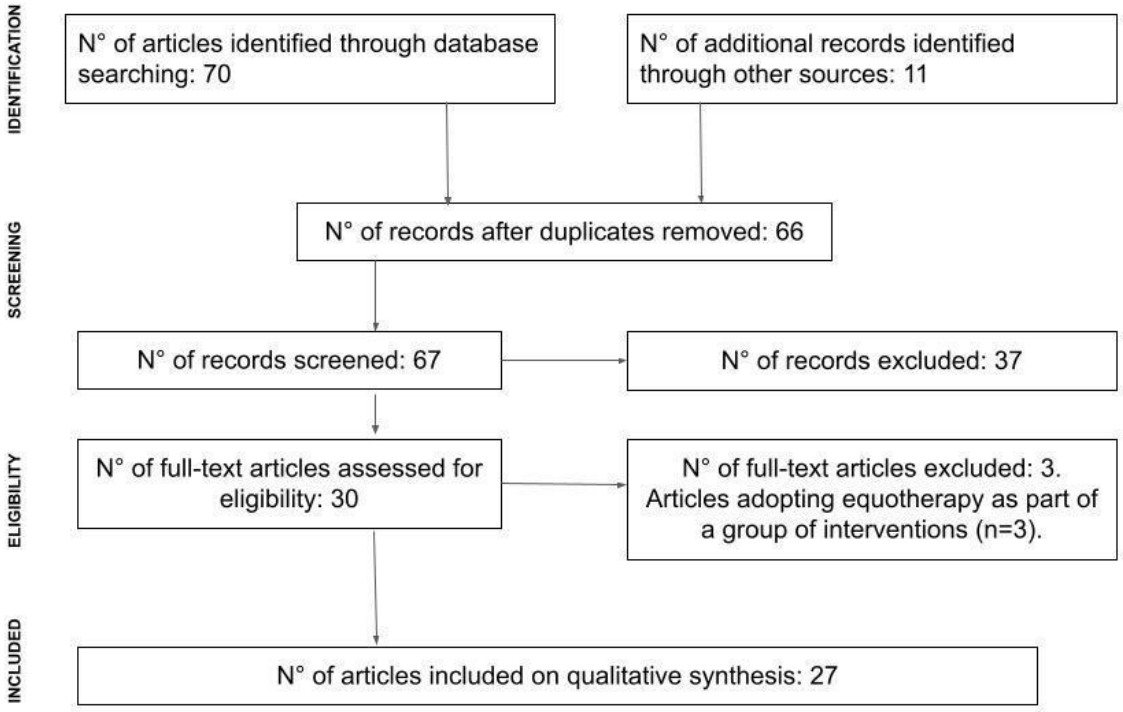
The present research is a narrative review of previous bibliographies. It is qualitative research elaborated according to the following steps: 1. Topic preparation and problem definition; 1.1. Choice of the subject; 1.2. Establishing the inclusion and exclusion criteria, and searching the literature; 1.3. Literature review; 1.4. Documentation; 1.5. Categorization of selected studies; 1.6. Problem delineation); 2. Construction and presentation of the report; 2.1. Construction of the framework and critique of the theoretical documentation; 2.2. Assessment and interpretation of results; 2.3. Knowledge overview, organization and article wording (Köche, 2011). From the use of the PICO strategy, an acronym for (P) problem or population, (I) intervention, (C)

comparison and (O) outcome, the research question was constructed: “What is the scientific production regarding the applicability of Equine Therapy in the treatment of several physical and psychiatric disorders?” (Galvão & Pereira, 2014).

Pubmed and Embase databases were searched for articles descriptors provided by Decs ("Hippotherapy" AND "Equine Assisted Therapy"). The research was carried out independently by the authors. We chose to use broad terms for a far-reaching data contemplation. The inclusion criteria were the following: publications in English, Portuguese or Spanish, and systematic review studies conducted within 10 years. Exclusion criteria were the following: cohort studies, narrative articles, description of a protocol or guideline, equine therapy citation only, and full text not available. A total of 70 articles were identified, and 10 more articles were added during article writing. From this amount, 65 were selected for screening, from which, based on the exclusion criteria, 37 articles were excluded. Regarding eligibility, of the 28 remaining articles, 3 were excluded during full text revision. Two of them have equine therapy in conjunction with other physical activities and/or therapies, and one was conducted with a large group and high risk of bias, which does not meet the objective of this review. In the end, 27 full-text articles were included. For the preparation of the research article, five additional theoretical references were applied. For data extraction, these 27 articles included were carefully read and reread.

The author’s purpose was to summarize hippotherapy´s effects regarding different conditions and diseases, in order to master the available knowledge and use it as a basis or foundation for developing a theoretical explanatory model (Köche, 2011). Therefore, the conditions founded by our research are presented in the results section, as well as a table with the categorization of the articles included. This categorization includes the following information: authors/study, aim, participants, results, conclusions and limitations. For the analysis of the selected studies, the content analysis was applied, with the thematic modality (Souza, 2019 / Campos, 2004). The methodology can be found described in the flow chart in figure 1, prepared according to the PRISMA flow diagram model.

Figure 1 - Flowchart Preferred Reporting Items for Systematic reviews and Meta-Analysis (PRISMA) referent to identification, screening, eligibility and studies included. (Page et al., 2021).



Source: Authors.

3. Results

The characterization of the scientific articles selected in the present review can be found underneath, in Table 1.

Table 1 - Characteristics of the included studies retrieved by the review.

STUDY	AIM	PARTICIPANTS	RESULTS	CONCLUSIONS	LIMITATIONS
Moraes et Al, 2015	To systematic review the effects of HPT in postural control and balance of children with CP	Age: 27 months – 18 years Condition: CP	The benefits of HPT depend on parameters/scales used, especially for walking, running, jumping, and sitting. Satisfactory results were found in postural control and balance	HPT intervention has positive effects on postural control and balance in individuals with CP	Methodological quality of the studies
Menor-Rodriguez et. Al, 2021	To determine the main benefits provided by hippotherapy as a rehabilitation technique in children with CP	Age: 2-16 years Condition: CP	There is an increase in movement-related functions, body weight distribution, self-esteem, self-perception and independent activities performances; better location of center of gravity, stability and body control; reduction in the spasticity	Hippotherapy provides benefits at physical, psychological, cognitive, and social levels. It should be considered as a complementary rehabilitation therapy to conventional treatments.	Conflicts in the degree of improvements
Zadnikar, 2011	To presents an overview of the effects of HTP and THR on postural control or balance in children with CP	Age: 2-16 years Condition: 39 with CP	Effectiveness of 21/39 ($p<0,001$). No chances in postural control or balance in non-disabled children	There are positive effects on postural control and balance after HPT, THR and even in artificial saddles.	Small sample size Differences in the type and severity of CP
Guindos-Sanchez, 2020	To analyze the effectiveness of HPT interventions on GMF in subjects with CP	Age: 5,9 – 9,6 Condition: CP	Favorable effects were obtained on GMF with 30-45 min sessions, twice weekly for 8-12 weeks.	HTP interventions were effective to improve GMF, balance recovery and muscle spasticity in subjects with CP.	Medium sample size
Mc Daniel et Al, 2017	To develop a comprehensive 'map' pertaining to EAT interventions for people with ASD	Age: 0-12 years Condition: ASD	Improvements in interpersonal interactions, social skills, control of voluntary movement, autism severity and QoL	EAT has improved behavior conditions in at least one aspect, although heterogeneities within EAT´s types	Few studies included Distinct EAT types
Srinivasan et. Al, 2018	To assess the quality and quantity of evidence in support of equine therapies as an adjunct therapy tool for individuals with ASD	Age: 3-16 years Condition: 294 with ASD	The effects of equine therapies on multiple skills in ASD were assessed, mostly at a frequency of 1 session/week ranging from 30-60 minutes in duration, for at least 1 month	Promising immediate effects of short-term equine therapy interventions on behavioral skills in ASD, while cognitive functional skills of individuals with ASD are at present poorly researched	Few numbers of studies with methodological rigor to compare THR and HTP to conventional therapies
Trzimiel et. Al, 2018	To assess the effectiveness of Equine-Assisted Activities and Therapies EAAT in ASD patients	Age: 3-16 years Condition: ASD	Improvement reported in the following domains: socialization, engagement, maladaptive behaviors, and shorter reaction time in problem-solving situations after EAAT. The meta-analysis revealed no statistically significant differences for the investigated effects	EAAT may be a useful form of therapy in children with ASD	Small sample size Different methodological research
De Miguel et Al, 2018	To review published literature on the effect exerted by HTP on the gross motor function of people with DS	Age: 24 months – 13 years Condition: DS	Improvements in walking ability, motor skills, oscillation phase and balance	There is no strong evidence on the improvement of gross motor function in people with Down´s syndrome	Limited cases

				after treatment with hippotherapy	
Helmer et. Al, 2021	To evaluate equine-assisted activities and therapies in patients with ADHD	Age: 6-18 years Condition: ADHD	Improvements in mental, neuromusculoskeletal functions and in the cardiovascular system with EAPT. QoL was improved in both TR and EAPT	EAS may be beneficial in promoting the physiological functions of body systems for children with ADHD. QoL still requires further evidence	Limited ample sizes
Kinney et Al, 2019	To describe the features of the literature concerning equine-assisted interventions among veterans	Age: 22-73 Condition: war veterans	Improvement on static but not dynamic balance. HPT showed effectiveness for reducing SPF, while TR showed mixed effects on balance	EAAT Interventions among veterans disproportionately targeted psychosocial outcomes and yielded promising results	Poor emphasized of the theoretical development of EAAT interventions
Kovacs et Al, 2020	To examine the existing clinical studies in adult populations on PP combined with EAP	Age: - Condition: PTSD, SA, TP, pain patients	Significant: decline in symptoms of the psych diseases, mainly in PTSD symptoms; improvements on resilience, vitality, and social functioning	The EAP field is still in its infancy, so it is understandable that there are no relevant efficacy studies published combining PP and EAP	Small sample size
Hilliere et Al, 2018	To analyze EAT and HRS´s effects in older adults. To suggest future directions in clinical practice and research	Age: 60 +. Average 71. Condition: elderly	HPT improves balance, core and lower limb muscle strength, mobility and gait speed, reduces cortisol and increases serotonin levels and alpha EEG activity	HPT might improve physical function and might induce hormonal and cerebral activity changes. HRS´s benefices limited to physical fitness and muscular activity	Confusing definition and protocols terminology. Studies do not provide intent-to-treat analyses nor long-term follow-ups. Lack of research / affective results
Suárez-Iglesias et Al, 2021	To evaluate the available data on the potential health benefits of EAT in MS	Age: 29-72 Condition: MS	Improvement in static but not dynamic balance, while significant benefits were observed on the patients' QoL. HPT reduced self-perceived fatigue, while TR showed mixed effects on balance and QoL	HPT seems to have beneficial effects on static balance, QoL and fatigue, but not directly on gait and dynamic balance. It could be incorporated as a complementary therapy for MS	Limited actual evidence
Prieto et. Al, 2020	To evaluate the effects of EAT on the functioning of individuals with different health conditions	Age: 4-75 years Condition: no specific condition	Positive effects of EAT on exercise tolerance, quality of life (high confidence), mobility, interpersonal interactions (moderate confidence)	There are significant results of EAT´s positive effects on exercise tolerance and on QoL of people with disabilities	Not all studies used instruments with the WHO´s biopsychic-social model
Collado-Mateo et. Al, 2020	To evaluate the effects of horse riding on chronic pain.	Age: 50-65 Condition: chronic pain	HR significantly reduced the pain levels of patients with low back pain (p = 0.03).	HR could be a useful exercise to reduce pain, but more studies are needed.	Low number of studies Difficulties to compare the effects of HR with real horses to riding simulators
Bronson et Al, 2010	To systematically review the evidence for HTP as an intervention to improve balance in persons with MS	Age: 24-72 years (43.3) Condition: MS	Significative differences in balance, in the Berg Balance Scale	HPT has a positive effect on balance in persons with MS and has an added benefit of enhancing quality of life.	Limited data.

Abbreviations: EAT = equine assisted herapy; ASD: autism spectrum disorder; HTP: hippotherapy; THR: therapeutic horseback riding; DS: Down´s syndrome; GMF: Gross motor function; HR = horse riding; PTSD: post traumatic spectrum disorder; SA = social anxiety; TP = traumatization problems; PP = psychodynamic psychotherapy; EAP = equine assisted psychotherapy; MS = multiple sclerosis; SPF = self-perceived fatigue; ADHD = attention deficit hyperactivity disorder; EAPT = Equine Assisted Psycho-Therapy; QoL = quality of life; WHO = World Health Organization. Source: Authors.

Cerebral palsy

Cerebral palsy (CP), also known as chronic non-progressive encephalopathy, represents the main source of physical disability in children (Murgia et al., 2018). Patients usually have limitations in their postural control, balance, gait, gross motor function, besides perceptive and sensorial disturbances, visual acuity reduction and epilepsy predisposition (Moraes et al., 2015

/ Menor-Rodríguez et al., 2021). Spasticity is defined as an increase in muscle tone, aggravated by passive stretching. It is the most common cerebral palsy subtype (Guindos-Sanches et al., 2020). Once there is no curative treatment for PC, management is based on symptomatic relief, not always achieved with conventional therapies. We found four systematic reviews regarding the use of Hippotherapy in children with CP. While practicing, the patient needs to adjust their body and posture to stay on top of the horse. This rhythmic movement combined with external rotation of the hip joint has a positive effect on spasticity (Guindos-Sanchez et al., 2020). Repetition causes strengthening of the pelvic, abdominal, and lumbar muscles, which reduces postural compensations and improves balance and postural control, stride length and cadence (Moraes et al., 2015).

HTP seems to promote hypertrophy and increase muscle tone, essential factors for spasticity reduction. In their review, *Menor Rodriguez et al.* have found that these effects are particularly valuable for some specific muscle groups: elbow flexors, plantar flexors, hip extensors, and hip abductors (Menor-Rodríguez et al., 2021). The perception of postural and balance improvement was unanimous in the systematics reviews regarding cerebral palsy included in this study. Variations in horse gait speed and direction during practice may be the answer. It increases muscle fiber control, improving posture and balance through neuromuscular coordination and vestibular stimuli. *Zadnikar et al.* concluded that it is applicable not only for HPT but also for horse-back riding simulators (Zadnikar & Kastrin, 2011). HPT is also capable of increasing functional skills in daily activities, autonomy, and child´s functional performance, with positive effects in quality of life (Moraes et al., 2015 / Guindos-Sanchez, L. et. al., 2020). Evidence shows that a 30–45-minute session, twice a week, for 8-12 weeks, can produce significant effects in gross motor function and postural tone in children with CP (Zadnikar & Kastrin, 2011). Unfortunately, these effects are not permanent, and depend on the continuity of the practice (Moraes et al., 2015 / Menor-Rodríguez et al., 2021 / Guindos-Sanchez et al., 2020 / Zadnikar & Kastrin, 2011).

Acute Cerebral Injury

Gait deviations depend, directly, from walking speed. This is the most common measurement of walking ability during locomotor rehabilitation. It is simple, economic, sensible, and specific and has also shown itself as a good predictor of independence, functional level, hospital stay, health condition, quality of life and mortality (Wonsetler & Bowden, 2017). *Wonsetler et al.* systematic review has analyzed HPT effects in post stroke patients' recovery. The authors found out that hippotherapy practice increases spatiotemporal parameters, such as balance, gait, and asymmetry rates.

Autism Spectrum Disorder

Autism Spectrum Disorder (ASD), according to the Diagnostic and Statistical Manual Disorders (DSM-5), is a neurologic condition, where deficits in social interaction are noticeable (American Psychiatric Association, 2014). Three systematic reviews included in this article support that hippotherapy improves not only expressive verbal communication but also problematic behaviors. Some behavioral outcomes were the following: less occurrences of physical and verbal aggressions, less irritability and hyperactivity, increased motivation to get involved in daily activities and decreased latency of the first movement while solving a problem. In addition, stimuli to adaptive attitude and positive emotion expression are endpoints that deserve attention (McDaniel Peters & Wood, 2017 / Srinivasan et al., 2018). Up to now, the evidence of EAT for ASD patients are based on different therapeutic programs. *Trzmiel et. al* has found that therapeutic riding is the most common EAT incorporated program in different studies. This therapy typically focuses on enhancing motor, communication, emotional and cognitive skills (Trzmiel et al., 2019). Grooming, feeding, and taking care of the horses are tasks that allow the development of a special relationship between the child and the animal, which, in the long term, could be replicated in other social contexts.

According to McDaniel et. Al systematic review, the primary outcome of the interventions was to improve voluntary motor control (McDaniel & Wood, 2017). Most of the studies used scales with strong acceptance to measure its outcomes.

Down´s Syndrome

Down´s Syndrome, the most common human genetic disease, is an important cause of cognitive impairment, intellectual deficit and physical disturbance, especially hypotony of lower extremity muscles. Children who practice hippotherapy enhance motor coordination and the stability of head and body, probably because of some increases in ankle and knee angular parameters. These results, however, are still under conventional physiotherapy ones. *De Miguel et al* found that HPT is effective for both static and dynamic balance. Patients with DS oscillate more during ambulation, probably due to difficulties in capturing sensory information and determining the position of the body in space. Therefore, equotherapy may become an additional management tool for these patients (De Miguel et al., 2018).

Attention Deficit Hyperactivity Disorder

Attention Deficit Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder, according to DSM-5, and it´s clinical aspects include persistent patterns of inattention, impulsivity, and hyperactivity (American Psychiatric Association, 2014). There is a rising popularity of complementary therapies beyond the traditional pharmacological interventions in children with ADHD, and, due to its trends in increasing quality of life, hippotherapy became a promising intervention. Two studies regarding this condition defended that the practice could express a positive general tendency in depression, anxiety, and somatization symptoms, self-esteem, attention, muscle strength and motor coordination (Pérez-Gómez et Al., 2020 / Helmer et al., 2021). One study from *Perez-Gomez et. al* review concluded that HPT could improve cardiorespiratory fitness and body composition, once associated with Fit strategies (Pérez-Gómez, J. et. al., 2020).

When evaluating the benefits of hippotherapy in ADHD by scales, such as the Strengths and Difficulties Questionnaire (SDQ), the K-ARS, the Corea Child Behavior Checklist (K-CBCL), the ADHD Evaluation Scale and the Global Gravity Scale, significant improvements were perceived (Pérez-Gómez et al., 2020 / Helmer et al., 2021). *Helmer et al. found* that EAAS effects are related to a significant increase in memory functions of bilateral middle frontal gyrus and left precentral gyrus, responsible for literacy, number identification and volunteer movements, respectively (Helmer et al., 2021).

Psychiatric disorders

Correlations between HPT and other psychiatric disorders were identified among some retrieved articles. We found two studies regarding post-traumatic stress disorders, one regarding schizophrenia, one about depression and anxiety, and one about dementia.

Equotherapy has been studied in post-traumatic stress disorders and depression related to health conditions, especially in war veterans. Although it's an effective intervention against anxiety symptoms, its bigger advantage consists of social reintegration. Veterans point out how difficult it is to accept themselves and their abilities. Therefore, equotherapy brings forward improvements in confidence, patience, gratitude, and in establishing limits during social interactions. It also stimulates involvement in the civil community, eighter in recreational and volunteer activities (Helmer et al., 2021).

Perez-Gomez et al. figured out that students at risk of social exclusion, addiction in virtual games, or with psychiatric conditions are good responders to HPT strategies. (Pérez-Gómez et al., 2020). These children showed persistent, responsible, impulsiveness, assertiveness, with better emotional regulation and a decreased school dropout rate (Pérez-Gómez, et al., 2020).

According to *Jormfeldt et al.* systematic review, equotherapy provides improvements in schizophrenia´s negative symptoms. HPT seems to promote a constant remission of the disease in individuals during the early start stage. It also promotes

a higher pharmacological adherence, and decreases emergency interventions, such as hospitalization, compulsory treatment or staying in nursing homes. Progress in self-esteem, confidence and in sense of self-efficacy are reported. Positive attachment, reflective functioning and emotion regulation also add points for hippotherapy, besides some effects on obesity, a significant component of pharmacological management (Jormfeldt & Carlsson, 2018). In addition, there are some reports supporting that hippotherapy decreases depression, anxiety, social phobia, and post-traumatic stress disorder symptoms ratios. It is also effective in substance abuse therapies, increasing the permanence of the patients (Jormfeldt & Carlsson, 2018 / Kovács et al., 2020).

Equitation seems to increase conversation and affection levels in patients with mild to moderate dementia stages. Dementia is almost an exclusive condition of elderly. In time, when comparing the effects of HPT in healthy older adults, *Hillarie et. al* found a significant increase in step lengths, gait speed, lower limbs, and core muscle strength. In the same review, one study has analyzed hormonal effects of HPT, indicating a significant increase in serotonin concentrations whereas cortisol concentrations decreased. Other studies have found that HPT can increase relative faster alpha power in some brain domains, in seniors (Hilliere et al., 2021).

Chronic pain and multiple sclerosis

Equotherapy can be an effective adjuvant treatment for patients with multiple sclerosis, when combined to aerobic and strength training, especially, patients with an Extended Disability Status Scale (EDSS) < 5. These patients present limitations to walk distances higher than 300 meters, to perform daily activities or the necessity of minimum assistance (Casa da Saúde, 2021 / Suárez-Iglesias et al., 2021). Hippotherapy has presented significant outcomes in static balance, stride cadence, self-perceived fatigue reduction and quality of life (Suárez-Iglesias et al. 2021). The effect on balance seems to be the most significant in these patients and was validated by the Berg Balance Scale in *Bronson et. Al* review´s (Prieto et al. 2020). It is also responsible for increasing effort tolerance, which is beneficial to cardiovascular and respiratory systems function (Bronson et al. 2010).

Multiple sclerosis, as well as arthritis and back/neck pain are common sources of chronic pain, which can be another positive effect of HPT in patients with multiple sclerosis. Lower back pain is the most common among all types of musculoskeletal pain conditions (Collado-Mateo et al., 2020). According to Collado-Mateo et al. it could be related to poor posture, reduced activation of the trunk muscles, reduced trunk movement, poor proprioceptive perception, and postural instabilities (Collado-Mateo et al., 2020). The stimulus generated during equotherapy sessions are favorable, especially to lower back pain, owing to a strength isometric exercise that hypertrophies transverse abdominal and lumbar multifidus muscles, as well as hip and spine erector muscles, which results in a significant decrease in pain and motor impairments (Barbora et al., 2021). Riding simulators can show similar effects, however, the emotional response of riding a real horse and the natural temperature of an animal's body (up to 5°C higher than human body temperature) presents additional benefits (Collado-Mateo et al., 2020).

4. Discussion

There are several theories regarding human-animal interactions that could explain Animal Assisted Therapy´s results. One of them sees the experimental approach as a facilitator of the psychotherapeutic process. Nature connection, multisensorial activities and positive emotional context are some of the advantages of HPT´s practice. The senses of autonomy and self-efficacy, freedom and leadership fomented by equitation cannot be compared to any other therapeutic activities. The studies included in the present review support, unanimously, the benefits of equotherapy for motor function, balance, cadence, and walking. It is related to horse´s rhythmic gait, which offers a precise, gentle, and repetitive pattern to the rider, which resembles the human

gait. These results are even better than the ones from activities such as simulators, treadmill training, aerobic activities or adapted physical activities, eighter in children and adults with deficiencies.

The most studied equotherapy´s usage is for cerebral palsy´s treatment. Today, it is known that equotherapy promotes symptomatic improvements, especially in balance and postural tone, but also in gross motor function and in spasticity. In children with Down's Syndrome, equotherapy can be considered as an additional tool to clinical management, although, it's beneficials on static and dynamic balance are less favorable than physiotherapy, for instance. For children with Attention and Hyperactivity Deficit Disorder, equotherapy has the potential to improve disease´s main symptoms, including learning disorders, aside from balance, gait and motor coordinator. It seems to be also a good choice for patients with autism spectrum disorder. The cavalcade can stimulate specific areas of the brain, inducing benefits in memory, emotional perception and learning process. Indeed, there is strong evidence that HPT increases communication and positive emotions expression, while decreases irritability, hyperactivity, and stress.

Equotherapy was also studied in war veterans, facilitating their reintegration to the civil community. It provides positive results in confidence, patience, gratefulness, and respect for others, as well as in the capability of establishing limits during social interactions.

In patients with schizophrenia, this therapy modality guarantees decreases in negative symptoms and in disease progression, especially during early start, and it also enlarges pharmacological adherence and reduces emergency interventions. Positive attachment, reflexive operation and emotional regulation also undergo positive changes. In terms of general mental health, symptoms of depression and general anxiety, post-traumatic stress, social anxiety, and phobias can be positively managed.

Equotherapy is also a potential tool in the recovery of post-stroke patients, especially the ones with march disturbances sequelae. The therapy increases march´s speed and stride length, besides increases in balance, both on standing, though support base expansion, and sitting.

Limitations of the study: once the present study is a narrative revision, its limitations are represented by those regarding the included articles. These limitations consist in small samples, which harms data effectiveness. Some studies, for issues of time or population, couldn´t respond to all their questions, or have responded with low evidence. Still, a significant part of the revised studies could not determine if the beneficials of equotherapy were persistent or not. Another limitation consisted in the search of equotherapy in an isolated form because it was normally evaluated together with other similar activities.

EAAS is a promising treatment tool for different conditions, especially its main programs, equine assisted activities and hippotherapy. However, there are several questions that still need to be explained and supported by high-quality trials to increase the confidence in the treatment effect, to guarantee the effects of the practice. Up to now, it is known that this is a complementary treatment that has its own intrinsic effects, which can be transmitted and replicated into several conditions, such as cerebral palsy and autism spectrum disorder, the most studied ones. There are several beneficials that can be achieved with Hippotherapy. Nevertheless, it should not be applied to replace traditional physiotherapies or pharmacological treatments.

5. Conclusion

Hippotherapy is a multidisciplinary approach that presents multisystemic benefits. Its sessions increase, in general, march patterns, balance, posture, motor coordinator and are still responsible for specific aspects from several pathologies. The limitations of this review were the number of articles with full text available, the level of evidence of the studies and the sample size of the included studies on the reviews, which makes it difficult to prove EAAT effects. However, this review has

shown the beneficials of hippotherapy reported so far, in various clinical spheres. In conclusion, equotherapy is a positive and dynamic therapy, which has been increasingly studied and implemented in health centers.

Further studies, especially randomized clinical trials, are required to obtain stronger evidence for the theoretical basis of equotherapy as an intervention tool and to be indicated in guidelines. We also suggest that further research with an observational focus be carried out in order to follow patients over time and determine the main effects of equine therapy on their treatment, as well as qualitative research directed towards the analysis of patients' and relatives' reports regarding quality of life and behavioral profile.

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