Horse-assisted therapy for balance in the elderly: a systematic review of the literature

Terapia assistida por cavalos para equilíbrio em idosos: uma revisão sistemática da literatura

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ABSTRACT
Background: Horse therapy is a technique that has long been used mainly for balance training in children. However, the effect on the balance of the elderly is not well known, which is why it is considered an innovative topic for the field of rehabilitation nursing. Objective: To identify current scientific evidence on the effectiveness of horse-assisted therapy programmes in maintaining body balance in the elderly. Methodology: Systematic Literature Review, according to the methodology proposed by the JBI. A search was made for studies dated between 2011 and 2022, in Portuguese, English and Spanish, using the following databases: Medline/Pubmed, Web of Science, Cochrane Library, CINAHL complete and PEDro. Two independent reviewers carried out the critical appraisal, extraction, and synthesis of the data. Results: Three randomised, controlled studies were included, showing a reduction in the risk of falls in elderly people undergoing horse therapy programmes, improving their quality of life. The results were assessed using the Time up and go (TUG) test, the Berg balance scale, the Functional Reach Test (FRT), the BPM system (SMS Healthcare software) - static balance, and the AP1105 platform - dynamic balance. All the studies concluded that the three-dimensional movement of the horse is fundamental to these results. Conclusion: Horse-assisted therapy (HAT) has been shown to be effective in preventing falls in the elderly. Considering the rehabilitation nurses’ competences, it is possible that they could play a fundamental role in the horse-assisted therapy team.

Keywords: hippotherapy, horse-assisted therapy, balance, elderly.

RESUMO
Introdução: A equoterapia é uma técnica que há muito tempo é utilizada principalmente para treinamento de equilíbrio em crianças. No entanto, o efeito no equilíbrio dos idosos não é bem conhecido, razão pela qual é considerado um tema inovador para a área da enfermagem de reabilitação. Objetivo: Identificar evidências científicas atuais sobre a eficácia de programas de terapia assistida por cavalos na manutenção do equilíbrio corporal em idosos. Metodologia: Revisão Sistemática da Literatura, conforme metodologia proposta pelo JBI. Foi realizada busca por estudos datados entre 2011 e 2022, nos idiomas português, inglês e espanhol, nas seguintes bases de dados: Medline/Pubmed, Web of Science, Cochrane Library, CINAHL complete e PEDro. Dois revisores independentes realizaram a avaliação crítica, extração e síntese dos dados. Resultados: Foram incluídos três estudos randomizados e controlados que demonstraram redução do risco de quedas em idosos submetidos a programas de equoterapia, melhorando a sua qualidade de vida. Os resultados foram avaliados por meio do teste Time up and go (TUG), escala de equilíbrio de Berg, teste de alcance funcional (FRT), sistema BPM (software SMS Healthcare) - equilíbrio estático e plataforma AP1105 - equilíbrio dinâmico. Todos os estudos concluíram que o movimento tridimensional do cavalo é fundamental para estes resultados. Conclusão: A terapia assistida por cavalos (TAH) demonstrou ser eficaz na prevenção de quedas em idosos. Considerando as competências dos enfermeiros de reabilitação, é possível que estes desempenhem um papel fundamental na equipa de terapia assistida por cavalos.

Palavras-chave: equoterapia, terapia assistida por cavalos, equilíbrio, idosos.
1 INTRODUCTION

The insertion of the horse in therapeutic processes dates from 458-370 BC, when Hippocrates, father of medicine, referred to horseback riding as a regenerating factor of health (Freire, 1999). According to Mandrá et al. (2019), the horse is the second most used animal as a zootherapist. This demonstrates psychomotor, cognitive, and psychosocial benefits of populations aged 3 to 99 years of both genders, sick and healthy. It promotes communication skills, social interaction, improves executive function and sensory processing, revealing positive effects on the person with autism spectrum disorder (ASD), Cerebral Palsy (CP), Hyperactivity and Attention Deficit Syndrome (ADHD), Down Syndrome, Alzheimer's, Stroke, among others (Mandrá et al., 2019).

This therapy is very poorly regulated worldwide. Some countries, such as Brazil, have a structured organization managed by the Brazilian National Association of Equine Therapy (ANDE-Brazil). The United States is being structured through the HETI - Federation of Horses in Education and International Therapy AISBL. In Portugal it is not yet regulated, which implies several different ways of naming this type of therapy, as well as different ways of working, unlike Brazil and the United States of America.

In 2007, The Portuguese Association of Therapy and Equestrian Training - CAVALO AMIGO (APTFE, 2007) was founded as a private and non-profit association, with the aim of promoting sports, therapeutic and adapted riding to the entire population of its area of influence (district of Coimbra). In 2022, it was created, the Portuguese Society of Equine Assisted Services (SPSAE, 2022), with the mission of promoting, developing, and bringing together professionals and entities to promote the development of Equine Assisted Therapies and Activities in Portugal.

Despite its multidisciplinary character, this therapy is still restricted to private initiatives of some professionals with aptitude and access to animals and to some entities. Being a Rehabilitation Nurse (RN) a professional with the specific competencies of: a) caring for people with special needs, throughout the life cycle, in all contexts of care practice; b) empower the person with disabilities, limitation of activity and/or restriction of participation for the reintegration and exercise of citizenship; c) maximise functionality through the development of the person’s
capacities (Ordem dos Enfermeiros, 2010), it makes sense that you are part of the multidisciplinary HAT team.

The intervention of the RN is increasingly notorious in innovative projects in the community, namely in community care units (UCC), family health units (USF), home hospitalization (HD), technological innovation projects, among others. The high level of knowledge and increased experience allow you to make decisions regarding health promotion, prevention of secondary complications, treatment and rehabilitation maximizing the person's potential.

As health professionals aware of the alarming economic and social consequences that Portugal and Europe face with population ageing, we consider urgent a paradigm shift towards active ageing and the promotion of healthy lifestyles.

Human aging by itself is not a problem, but a natural part of life, and it is desirable that it constitutes an opportunity to live longer, healthier, and as autonomously as possible. This is the ideal reality in an increasingly ageing Europe. There are currently several authors who correlate physical inactivity with the vulnerability and loss of function of the elderly person (Cabral et al., 2021; Martins et al., 2022. The risk of falls and fragility fractures continue to be a scourge of the elderly person with physical inactivity and dependence on basic and instrumental activities of daily living (Ribeiro et al, 2022).

On the other hand, higher levels of valorisation and attribution of life goals of the institutionalized elderly person (Investment in Personal Life -IVP), correlates with the male sex (p = 0.047), higher academic qualifications (p = 0.041) and with a higher level of functional independence (p = 0.037). The family, in turn, also has a positive and significant effect (p = 0.020) on the PVI of the elderly, like the existence of more hope (p = 0.002) and greater satisfaction with life (p = 0.013), (Martins et al, 2018)

The European Innovation Partnership in Active and Healthy Ageing (EIP on AHA) is an initiative launched by the European Commission to promote innovation and digital transformation in the field of active and healthy ageing. The concept of the European Innovation Partnership is a partnership that can help strengthen EU research and innovation by bringing together all relevant actors at European, national, and regional level in different policy areas to address a specific societal
challenge and involve all levels of the innovation chain, (RePEnSA, 2021).

The European Innovation Partnership on Active and Healthy Ageing (EIP on AHA) aims to promote healthy and active ageing, to improve the health and quality of life of Europeans, especially the elderly, by supporting the long-term sustainability and efficiency of health and social care systems, increasing the competitiveness of EU industry through business and expansion into new markets (EIP on AHA, 2023).

It is intended with these programs / initiatives, that the elderly person has a more active role in this phase of their life, which implies an integrated action at the level of changing behaviours and attitudes of the population in general and the training of health professionals and other fields of social intervention, an adaptation of health services and social support to the new social and family realities that accompany individual and demographic aging and an adjustment of the environment to the frailties that most often accompany old age.

1.1 HORSE-ASSISTED THERAPY

To understand what horse-assisted therapy the American Association: Professional Association Therapeutic Horsemanship International (PATH Intl) defines Horse-Assisted Therapy (HAT) as Equine-assisted activities and therapies (EAAT), which means, therapy and horse-assisted activities, where several terms arise, such as some described in Table 1:

| Hypotheraphy | Defined as physical, occupational or treatment strategy of the health professional, which uses the movement of the horse. The word Hippotherapy derives from the Greek word hippos, meaning horse. The term Hippotherapy refers to the use of horse movement as a treatment strategy by physical therapists, occupational therapists, and speech therapists to deal with disabilities, functional limitations, and neuromotor and sensory dysfunctions. This treatment strategy is used as part of an integrated treatment program to achieve functional goals. |
| Therapeutic riding | An equine-assisted modality activity with the aim of contributing positively to the cognitive, physical, emotional, and social well-being of people with special needs. |
| Equine-assisted therapy | Treatment that incorporates equine activities and/or the environment. Rehabilitation goals are related to the needs of the patient and health professionals. |

Source: Own Authorship
According to ANDE-Brasil, the Horse-Assisted Therapy designated (in Brazil) as "Equine Therapy", is a therapeutic method that uses the horse within an interdisciplinary approach in the areas of health, education and riding, seeking the biopsychosocial development of people with disabilities and / or with special needs (ANDE-Brasil, 2023). The word **Equine Therapy**® was created by ANDE-Brasil, to characterize all practices that use the horse with riding techniques and equestrian activities, aiming at the rehabilitation and education of people with disabilities or special needs. This therapy employs the horse as a co-therapist of gains on the physical and psychic level. (ANDE-Brasil, 2023)

Lima (2018) describes that this method, through a therapeutic approach, acts as a stimulus to overcome the damages: motor/neuromotor, psychomotor/intellectual, behavioural/relational, and sensory.

### 1.2 HORSE THERAPY BENEFITS

In horse-assisted therapy, the horse forms an indispensable part of the work team. When riding the horse, the rider benefits from its movement, body heat and texture, while the horse's image, character and language favour the establishment of affective bonds between both (White, E., Zippel, J., & Kumar, S., 2020). The selection of the horse for therapy is based on two fundamental characteristics which are: the physique/anatomy of the horse and its character. Physically it is very important that the horse is in optimal condition to perform the therapies. At the same time, it is important to ensure that the horse's body is proportionally muscular and prepared to perform therapy. (Menor-Rodríguez et al, 2021)

Depending on the needs of the rider it is important to look for a horse, which should not pass 1.60 metres high at the withers, to allow the multidisciplinary team to work comfortably with the rider: hold their extremities, support the trunk, and exchange objects to do various exercises, (White, E., Zippel, J., & Kumar, S., 2020).

### 1.3 HORSE BIOMECHANICS

Horses have three natural movements, they are the step, the trot, and the gallop. When the horse moves at a pace, it transmits an average of 90-120 stimuli per minute to the rider's pelvic region. This movement that stimulates your physical
part can also relax all your muscles, since it is in contact with the animal and the rest of the body in the back and forth of the movement. The horse's step is defined as a rhythmic, three-dimensional, and rotating movement that produces a stimulation in the rider's musculature very similar to a person when walking. It provides benefits at the neuromuscular and sensory level, improves, and reinforces the tone of the trunk and pelvic girdle, (White, E., Zippel, J., & Kumar, S., 2020).

According to Lima, although the step is the lowest speed tempo, given the speed and synchrony of the movements, in approximately one second the horse can lift and support its four limbs again on the ground, in a natural, harmonious, and fluent way (Lima S, 2018). As Lima says: the horse's step tempo is itself an extremely complex tempo, since the whole body is involved for the equine to move. Although certain muscle groups work harder than others, there is no way to require the equine to move without its entire body being involved in maintaining balance. It has a quaternary rhythm, that is, the four-stroke, where there is no suspension time and the beats on the ground are repeated in a constant way.

Since the horse is an animal with an extraordinary and docile character, and has a three-dimensional movement, it has all the characteristics to be used as a co-therapist, in a multidisciplinary team of professionals. In all situations, the horse, has a large part of the responsibility of the success of this therapy, because it is the horse, which stimulates the hip joint, As if it were gait, the balance of the trunk, through the activation of all the muscles of the trunk, allows to work the motor coordination among many other aspects.

1.4 WORK EQUIPMENT

According to Lima (2018), the choice of equipment to be used in the therapy horse (blanket, Ceylon with one or two handles, stirrups, etc.) has great weight to achieve good results in this therapy. To meet this, three aspects should be analysed, in this order:

1. Adapting the equipment to the horse, ensuring its well-being, keeping it safe during the session and restricting its range of movement as little as possible.
2. The suitability of the equipment for the rider.
3. Allow safe assembly/disassembly.

Therefore, it is necessary and fundamental, to know the various possibilities of equipment configurations and to know what they are intended for, as well as their advantages and disadvantages, it is essential for each horse and rider to be treated in a unique way, with evaluation and prior planning and constant evaluations.

The various materials that exist, and which can be used in the various therapy sessions, will depend entirely on the health situation of the rider with whom we are working. In other words, for example, in a situation where there are two people with cerebral palsy, with one of them we can use the two-ring cylinder (Figure 1) and with the other we may have to use a single-ring cylinder (Figure 2), depending on the abduction capacity of the lower limbs.

The turning circles are chosen according to the needs of the rider and the degree of abduction of the user's lower limbs. For example, to use the 2-handle cylinder, the person must have a higher degree of abduction than the person using the single-ring cylinder. There are different types of saddles for different disciplines and situations. When choosing a saddle, we also need to make a prior assessment of the physical situation of the person in question, such as the position of the pelvic region, if we are dealing with a person with anteversion or retroversion of the pelvic girdle, to choose the most suitable saddle (Figure 3).

Figure 1: Cylon loop with 2 rings.

Source: Maria Melo’s personal collection
Saddles come in different sizes, measured in inches, ranging from 15 to 18 inches. The position in the saddle decides the position of the upper body (Podhajky cited by Lima, 2018), so it is closely linked not only to riding, but also to the positioning of the pelvic girdle and its stability. In HAT, the constant displacement of the pelvic region in relation to the centre of gravity, through the movement of the horse, forces the rider to maintain their balance, strengthening the muscles involved (Rhodin et al, 2017). The stirrups shown in the image below (Figure 4) are designed to prevent the rider from putting their feet too far into the stirrups.
Figure 4: Ladder for easy mounting and dismounting/trimming of the horse.

Source: Maria Melo’s personal collection

Figure 5: Structure/working track, 20x40m arena.

Source: Portuguese Equestrian Federation, 2012

As Lima (2018) mentions, so that on horseback, in the classic position, the individual remains perfectly aligned, maintaining the lumbar curvature, his pelvis cannot be totally forward (anteversion) or rear (retroversion). When deepening its seat in the saddle, the ischial tuberosities are the lowest part of the rider, its spine remains aligned and does not unbalance forward or backward, occurring the rectification of the trunk.

When the horse starts the march, other results emerge and the rider, adjusting intensely, will maintain balance by "fighting" against gravity and inertia. Something similar happens in a situation of slope, when the horse moves uphill, the action of gravity brings the body of the rider back, this in turn, tilts the trunk forward to maintain its balance point, otherwise it may fall (Lima S, 2018).

In the following image (Figure 6), we can see the difference that is observed
in the position, with the same rider, but using different materials. The first, with a blanket and cutter. The second with saddle.

Figure 6: Position comparison using different materials.

Source: Syllas Lima, 2018

Considering that HAT involves the movement of all body segments, contributing to the development of muscle strength, relaxation, awareness of one's own body, improvement of motor coordination and balance, is HAT an added value for the elderly? Are HAT programs effective in maintaining the body balance of the elderly?

In the initial phase of a systematic review, it is necessary to develop a review protocol. The protocol is a document that is separate from the systematic review report and pre-defines the objectives and methods of the systematic review, which makes the process transparent and allows the reader to see how the conclusions and recommendations were reached (Aromataris & Munn, 2020). The review protocol was carried out and followed by the authors, although it has not been published. However, it can be provided on request.

2 METHODOLOGY

Given the research issue and its objective, this Systematic Literature Review (RSL) is a "Systematic Review of Efficacy", (Aromataris & Munn, 2020). This aims to contribute to the clarification of good practices of Specialized Care in Rehabilitation Nursing. The following research protocol is based on the guidelines of the JBI Manual for Evidence Synthesis. A systematic review of the literature may have a set of objectives to be achieved, but the formulation of the problem, from which the research question evolves, is the main objective (Snyder, H., 2019), which is formulated based on the PI[CO] method (Table 2).
2.1 RESEARCH STRATEGY

Conducting a systematic review of the literature requires a meticulous, objective, and reproducible research in an aggregate of resources, to identify, as much as possible, studies in the area according to the inclusion and exclusion criteria. There are several sources that can be consulted for a systematic review. To identify relevant studies in accordance with the defined criteria, we conducted research that includes studies between 2011 and 2022, in the languages Portuguese, Spanish and English, using the following databases: Web of Science (all databases); CINAHL Complete via EBSCO; MEDLINE complete via EBSCO; PubMed; Cochrane Central Register for Controlled Trials via EBSCO; Nursing & Allied Health Collection: Comprehensive via EBSCO; Peter.

The following MeSH terms were used, consulted on MeSH Descriptor Data 2020 https://meshb.nlm.nih.gov/search: "Hippotherapy" - MeSH Heading; "equine-assisted therapy" - MeSH Heading; "therapeutic horseback riding" - MeSH Heading; "aged" MeSH Heading; "balance" - MeSH Heading. All these descriptors were combined with the Boolean operators AND and OR. The descriptors were used, in Portuguese and English, in the referred scientific search engines, to carry out more in-depth research and to obtain the complete articles.

In the searches carried out on the Medline, Pubmed, Web of Science, Cochrane Library, Nursing & Allied Health Collection: Comprehensive and PEDro platforms, the temporal frieze was used as limiters: January 2011 to August 2022, and the searches were carried out in Portuguese and English. Being the expression of Boolean research" (Table 3).
Table 3: Location and selection of studies

<table>
<thead>
<tr>
<th>Database</th>
<th>Search phrase</th>
<th>Limiters</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Web of science (all databases)</td>
<td>(hippotherap* OR &quot;equine-assisted therap** OR &quot;therapeutic horseback rid**&quot;) aged and balance</td>
<td>2022,2021,2020, 2019, 2018, 2017 Non-pediatrics, zoology, or physiology</td>
<td>12</td>
</tr>
<tr>
<td>2 CINAHL Complete (via EBSCO)</td>
<td>(hippotherap* OR &quot;equine-assisted therap** OR &quot;therapeutic horseback riding&quot;) aged and balance</td>
<td>2017.01.01-2022.12.31 Middle aged: 45-64 years Aged:65+ years</td>
<td>13</td>
</tr>
<tr>
<td>3 MEDLINE complete (via EBSCO)</td>
<td>(hippotherap* OR &quot;equine-assisted therap** OR &quot;therapeutic horseback riding&quot;) aged and balance</td>
<td>2017.01.01-2022.12.31 Middle aged: 45-64 years Aged:65+ years</td>
<td>20</td>
</tr>
<tr>
<td>4 PubMed</td>
<td>((hippotherap* OR &quot;equine-assisted therap** OR &quot;therapeutic horseback riding&quot;) AND (aged)) AND (balance)</td>
<td>2017.01.01-2022.12.31 Middle aged: 45-64 years Aged:65+ years</td>
<td>12</td>
</tr>
<tr>
<td>5 Cochrane Central Register for Controlled Trials (via EBSCO)</td>
<td>(hippotherap* OR &quot;equine-assisted therap** OR &quot;therapeutic horseback riding&quot;) aged and balance</td>
<td>2017.01.01-2022.12.31 Middle aged: 45-64 years Aged:65+ years</td>
<td>11</td>
</tr>
<tr>
<td>6 Nursing &amp; Allied Health Collection: Comprehensive (via EBSCO)</td>
<td>(hippotherap* OR &quot;equine-assisted therap** OR &quot;therapeutic horseback riding&quot;) aged and balance</td>
<td>2017.01.01-2022.12.31 Middle aged: 45-64 years Aged:65+ years</td>
<td>1</td>
</tr>
<tr>
<td>7 PEDro</td>
<td>equine-assisted therapy</td>
<td>2017.01.01-2022.12.31</td>
<td>6</td>
</tr>
</tbody>
</table>

Source: Own Authorship

To identify the most relevant studies for this review, concepts related to the participants and the intervention under study were isolated to define the MeSH (Medical Subject Headings) descriptors most suitable for the research, as well as current terms. The following databases were then selected: Web of Science (all databases); CINAHL®, Nursing & Allied Health Collection, MEDLINE® with Full Text - via EBSCO; PubMed, Cochrane Central Register for Controlled Trials. The Physiotherapy Evidence Database PEDro was also included.

The search in the databases took place between May and December 2022, with the limiting factors being the chronological filter (2015.01.01 to 2022.12.31) and access to the full text (Table 4).

Table 4: Eligibility Criteria

<table>
<thead>
<tr>
<th>Eligibility Criteria</th>
<th>Inclusion Criteria</th>
<th>Exclusion Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>PARTICIPANTS</td>
<td>Adult ≥65 years old</td>
<td>Children, young adults</td>
</tr>
<tr>
<td>INTERVENTION</td>
<td>Hippotherapy/Hippotherapy/Assisted Therapy Program with Horses</td>
<td>Programs that do not include horse therapy or simulators</td>
</tr>
<tr>
<td>&quot;OUTCOMES&quot;</td>
<td>Body balance, functional capacity</td>
<td>All studies that do not analyse the inclusion variables</td>
</tr>
<tr>
<td>STUDY DESIGN</td>
<td>Cross-sectional analytical Randomized</td>
<td>Qualitative studies;</td>
</tr>
</tbody>
</table>
The research results listed above resulted in 75 articles, which were initially analysed by two reviewers. This first analysis was based on selecting the articles for their relevance to this RSL (study design, participants, interventions, and results) by reading the titles and abstracts.

After each reviewer had selected the studies, 58 articles were excluded by consensus because they were not related to the research question and 13 because they were repeated. Thus, 4 articles (Table 5) with potential interest for this study were identified and selected for full text analysis.

Table 5: Selected studies for full-text analysis

<table>
<thead>
<tr>
<th>N</th>
<th>Studies</th>
<th>Database</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>Impact of hippotherapy for balance improvement and flexibility in elderly people</td>
<td>PubMed</td>
<td>Meets criteria</td>
</tr>
<tr>
<td>S2</td>
<td>The Effects of Hippotherapy on Elderly Persons’ Static Balance and Gait</td>
<td>webofScience</td>
<td>Meets criteria</td>
</tr>
<tr>
<td>S3</td>
<td>Effect of equine-assisted therapy on the postural balance of the elderly</td>
<td>webofScience</td>
<td>Meets criteria</td>
</tr>
<tr>
<td>S4</td>
<td>The Effects of Therapeutic Horseback Riding on Balance</td>
<td>EBSCO</td>
<td>Does not meet sample criteria</td>
</tr>
</tbody>
</table>

Secondly, the reviewers read and analysed the 4 complete articles in the light of the defined eligibility criteria, resulting in the exclusion of 1 qualitative study, as it had only one elderly participant, the rest being adults and children with various pathologies.

This resulted in 3 studies with criteria for methodological assessment. Methodological assessment of the studies to be included in an SRL is fundamental to guaranteeing their quality and minimising the risk of bias (Joanna Briggs Institute, 2020). These biases can have implications for decision-making in evidence-based practice.

The two independent researchers (MM and SB) used the instruments provided by the JBI according to the type of study: a checklist for randomised clinical trials and the checklist for quasi-experimental clinical trials. Based on these assumptions, the methodological quality of each study was assessed, and the three studies analysed were included.
The study selection process is outlined in the diagram in Figure 8, adapted from the PRISMA flowchart (McKenzie et al., 2020).

![Figure 7: Research process and studies selection](image)

Source: Own Authorship, adapted from the PRISMA flowchart

**3 RESULTS**

In this section, it is presented a brief presentation of the selected articles’ main results. The results are presented in a table (Table 6) for better understanding and analysis.
### Study 1 (S1)


**https://doi.org/10.1016/j.jbmt.2019.10.002**

**Objectives/ Study design/ Study duration**  
To examine the effects of horse-assisted therapy on balance and flexibility in the elderly, to determine whether this is an effective intervention for this population/ Randomised double-blind study/ 10 weeks, 10 sessions of 30 minutes each, 1x per week

**Number and type of participants**  
30 healthy seniors  
2 groups were randomly created, control group (CG) of 15 people (2 men and 13 women) and experimental group (EG) of 15 people (4 men and 11 women)  
Note: the EG did not attend conventional physiotherapy only therapy with horses. And the CG did neither physiotherapy nor therapy with horses

**Interventions**  
Standard "hippotherapy" protocol in Brazil. Before the EG started the HAT sessions, tests were applied to both groups, CG and EG, such as the Time up and go Test (TUG), Berg scale and the Functional Range Test (TAF). As well as 10 sessions later, the range test with wells box was done before and after each session. During the HAT session, the person sat in the saddle with their feet on the stirrups for the first 15 minutes and with their feet off the stirrups for the remaining 15 minutes. No other type of activity was allowed during the session (the participants had never had contact with this type of therapy before)

**Findings**  
The TUG test showed a significant time difference before and after the HAT sessions in the EG (p=0.036) but not for the CG (p=0.135). As well as the TAF, it showed statistically significant differences, before and after the CT sessions, in the EG p=0.030, and in the CG the p=0.955. Regarding the Berg scale, there was no significant difference in the EG before and after each individual session.

**Conclusions**  
The sensory and motor stimuli transmitted to people during the three-dimensional movement of the horse, even without any other activity during these sessions, seems to have led to improvements in the parameters evaluated, such as reduction of the time spent for the TUG test, increases in mobility, reach distance with TAF and distance reached during the test of sitting and reaching with the wells box. Additionally, improvements in the flexibility of the muscles of the back, the chains of the lower limbs and the trunk were observed. The major limitation of this study was the fact that the sample was small. Following these results, we can infer that HAT has a beneficial impact on the quality of life of the elderly, based on the improvement of balance and flexibility after the intervention.

**Effectiveness Evaluation Scales**  
Evaluation before the 1st session of HAT and 10 weeks after the last session- Berg, TUG and TAF scale.  
Evaluation before each session, during the 10 sessions - reach test with wells box

### Study 2 (S2)


**https://doi.org/10.1589/jpts.26.25**

**Objective/ Design/ Duration of the study**  
To examine the effects of HAT scan on static balance and gait in the elderly/ Randomized, double-blind study/ 12 weeks, 3x per week, with sessions of 20 minutes each

**Number and type of participants**  
30 elderlies, with no record of falls in the last year and absence of disease that could affect the HAT sessions.  
Created 2 groups, treadmill group (GP) of 11 people (7 men and 4 women) and experimental group (EG) of 11 people (5 men and 6 women)
| Interventions                                                                 | During the HAT sessions the horse rode a circle of 30m in diameter, 20x to the right and 20x to the left in the 20 minutes of the session. During the sessions, 8 people dropped out of the study. In each treadmill session of the GP, the training started at a minimum speed of 0.1km/hour, progressing to the individual maximum speeds each person, which they maintained for 20 minutes. Before and after each session, the static balance capacity of the subjects was measured, each one was instructed to stand on a BPM system (SMS Health care software) while looking forward with their eyes open 30s, where the length of the oscillation trajectory was measured. To measure the subjects’ dynamic balance capacity, their step lengths and step times were measured using an AP1105. |
| FIndings                                                                      | After 12 weeks, step length significantly increased p≤0.05, and step time and oscillation trajectory length decreased (p≤0.05) significantly in both groups. A comparison of the lengths of the oscillation trajectories after the intervention between the two groups revealed that the EG presented greater decreases than the RG (p≤0.05) |
| Conclusions                                                                  | A large range of oscillation indicates ineffective postural control and a high risk of falling. In this study, the lengths of the oscillation trajectories decreased significantly after 8 weeks of intervention in both groups. Therefore, we can conclude that both groups obtained improvements in static balance, with the experimental group presenting greater effects. These researchers believe that this difference occurs because in CT is composed of more dynamic movements, the three-dimensional movement of the horse, than the exercises on the treadmill, which results in greater promotion of dynamic postural responses. |
| Effectiveness Evaluation                                                     | Evaluation was performed before and after each intervention in both groups through the BPM software and AP1105. |
| Objective/ Design/ Study Duration                                            | To verify if the HAT scan is capable of producing alterations in the balance of the elderly/ Controlled experimental study. Convenience sample/ 8 weeks, fortnightly sessions of 30 minutes, totalling 16 sessions. |
| Number and type of participants                                             | The sample was composed of 17 elderlies, divided into experimental group (EG), seven subjects and control group (CG), ten subjects. |
| Interventions                                                                 | Stabilometry data acquisition was performed using the AMTI (Force Measurement Systems) force platform. For clinical analysis of sitting balance, transfers from sitting to standing, stability in walking and changes in gait course, the Timed Up and Go (TUG) test was used. The HAT sessions were performed using two horse movements, step and trot, different surfaces, sand, asphalt, and grass, and with several different slopes plus combinations of movements and changes of direction. An English saddle was used, using low stirrups so that the joints of the head, spine, shoulders, hips, knees, and ankles were aligned, thus facilitating the treatment focused on improving the postural balance of the upright position. Soon after the 16th session of the HAT, evaluation of repeated stabilimeter using the same methodology as the pre-intervention measures. |
| Findings                                                                      | According to the Mann-Whitney test, the treatment had a significant effect (p=0.04) on the mean results of the TUG test between the groups, and the EG (5.12+-/-0.70) was significantly better than the CG (5.98/-1.01). According to the Wilcoxon test, there was a significant effect of treatment between the groups (p=0.04) on the mean TUG score. The post-test mean of the EG (5.12 +/-0.70) was |
significantly better than the pre-test mean (6.37 +/-2.17). There was no significant difference between the pre- and post-test results of the CG.

<table>
<thead>
<tr>
<th>Conclusions</th>
<th>The TUG test of less than 10s means a low risk of falling and that this assessment of postural balance. The force platform failed to detect significant changes in postural balance. However, the TUG test showed a significant decrease in execution time and 16 sessions of HAT scan were sufficient as a predictor of lower risk of falls in the elderly.</th>
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<tbody>
<tr>
<td>Effectiveness Evaluation</td>
<td>Evaluation was done through the TUG test as well as a force platform (COP).</td>
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</table>

Source: Own Authorship

4 DISCUSSION

There are several studies that address the benefits of HAT, in several different samples, such as children, people with Down syndrome, the elderly, people with cerebral palsy.

The article "Electromyographic analysis of stomatognathic muscles in elderly after hippotherapy" refers to HAT as a treatment strategy that uses horse movement as part of a comprehensive intervention program to achieve functional results. It is not intended to replace conventional treatment(s), but complementary therapy. This therapeutic activity facilitates and requires the participation of the whole individual, thus contributing to the improvement of trunk strength, balance control and motor coordination. Recreational use of therapeutic riding has been shown to improve coordination, motor skills, posture, and head control. (Mello et al. 2020)

It is an integrated intervention program to obtain functional results, contributing to the rehabilitation of cardiopulmonary, musculoskeletal, and neuromuscular dysfunctions. (Mello et al. 2020)

Equine therapy can improve the motor function of these children with cerebral palsy, as has been demonstrated in most of the studies presented (Silva et al. 2011).

Another study states that, since "hippotherapy" promotes the stimulation of the vestibular, proprioceptive, and motor systems, through the movement produced by the horse's step, which requires constant postural adjustments, which combined with the dissociation of the pelvic and scapular girdles, provoke reactions of rectification of the trunk and tonic adjustments. Thus, they act dynamically in the search for stability and postural control, positively interfering in the quality of life of these individuals and revealing that in addition to physical
gains, there is a diversity of psychosocial benefits that need to be considered (Freire et al. 2020)

Through an analysis by photogrammetry before and after sessions of Equine Therapy, it is concluded that the use of the blanket with the feet outside the stapes provided individuals with Down syndrome with satisfactory changes in postural alignment, especially in the alignment of the lower limbs. Pre- and post-"equine therapy " postural evaluation in individuals with Down syndrome that reflected in an improvement of static posture in an individualized way. (Ribeiro et al. 2016)

Throughout the interventions, evident changes in motor control were observed, so it seems that equestrian therapy will be an appropriate therapy for the intervention of motor changes. (Rosario-Montejo et al. 2014)

It demonstrated that horseback riding provided motor and sensory impulses, indicating that walking a horse at a pace provides stimulation highly like that generated by human gait and therefore provides optimal treatment benefits for people with mobility difficulties (Ribeiro et al. 2018)

The results of the sessions, of assisted therapy with horses, is influenced by the material used in the sessions, as the following study says "The riding material influenced the muscular stimulation of the quadriceps and tibialis anterior, and these muscles were more active in the riding with blanket and feet in the stirrup, followed by the riding in the saddle with the feet in the stirrups, suggesting that the feet positioned in the stirrups is a relevant factor for greater muscle recruitment of the lower limbs to maintain postural balance during riding moments. This study may contribute to improve the treatment strategy in hippotherapy, regarding the choice of riding material and approaches aimed at improving the positioning of the lower limbs, especially those related to muscle activation. (Ribeiro et al. 2018)

Educating nurses about equine-assisted activities and therapies has the potential to expand nurses’ roles and the profession to meet clients’ needs (Fahs P., 2020).

In relation to the studies we analysed, comparing studies 1 and 2 were composed of 30 elderly each, and reported as a limitation to the study the small number of the sample, as well as the time during which the balance and flexibility
skills of the elderly can be maintained after the benefits of the HAT needed to be evaluated in follow-up tests.

Comparing the studies, 1 and 3, we can say that both applied the TUG scale where they concluded that the time to perform the TUG before the HAT sessions and the time after these sessions decreases it, translating into a decrease in the risk of falling.

Study 2 divided the group of 30 elderly people into two groups, a control group that did treadmill and another experimental group that did the assisted therapy sessions with horses. In this study the evaluation was made through a BPM system where the length of the oscillation trajectory was evaluated, where the conclusion of this work, in my perspective was very interesting, since both groups had an activity with the objective of working the static balance, both had benefits for these activities, but the experimental group that did HAT was more benefited. That is, it was contracted that the length of the oscillation trajectories decreased more in the elderly of this group, resulting in a decrease in the risk of falling.

Regarding the duration of the projects, the study that lasted the longest, was study 2, which lasted 12 weeks, with the sessions three times a week, lasting 20 minutes each, study 1 lasted 10 weeks and the sessions once a week 30 minutes each, and study 3, lasted 8 weeks and each session of 30 minutes.

Regarding the sample, of the 3 articles that were analysed, in all studies, groups of healthy elderly people were.

5 CONCLUSIONS

In conclusion, the studies reveal the efficacy of horse-assisted therapy in body balance, demonstrated by the reduction in the time taken to perform the TUG test, which means that there is a decrease in the risk of falling, allowing risk prevention and improvement of quality of life for these people.

Considering the objective of this review, we can conclude that there is evidence on the benefits of HAT in the balance of the elderly, reflecting in the reduction of the risk of fall of the elderly person we consider the objective achieved, however without forgetting its limitations.

This work for us was an incredible journey, of increasing knowledge,
consolidating others, we tested all our limits. But it was worth it.

**Limitations of the study:** The great limitation we felt for the accomplishment of this study was the scarcity of time, which justifies the use of limiters such as access to the full text, which limited us a little to the investigation.

**Recommendations for the future:** We consider that in future studies it is important to increase the duration of the study, increase the sample and an evaluation before and after the sessions more in-depth, for a collection of more accurate data on the benefits of Horse Therapy in the population over 65 years. It also makes sense that RN can be part of the multidisciplinary team that make up Horse-Assisted Therapy (CAT), for its differentiating skills.

**Suggested Intervention Program:** The overall objective of the intervention program is to maximize functions and improve the quality of life of the elderly person. It is the responsibility of the nurse specialist in rehabilitation nursing to prescribe, implement, evaluate, and reformulate the intervention protocol.

According to the evidence found each session should have a duration of 20 to 30 min, 1 to 3x week, for at least 12 weeks. The specifications of each phase are presented in Table 2. The ideal place for the realization of the program is a closed arena, since it constitutes a controlled environment where the individual is accompanied in person, throughout the program, by the RN and the riding guide.

**Table 7: Suggested Horse Therapy Program for the Elderly**

<table>
<thead>
<tr>
<th>Responsible Professional:</th>
<th>Guide-Rider and Nurse Specialist in Rehabilitation Nursing</th>
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<tbody>
<tr>
<td><strong>Target group:</strong> People over 65</td>
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<tr>
<td><strong>Objective:</strong> To maximize functional capacity and maintain/improve the quality of life of the individual</td>
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<td><strong>Location:</strong> Indoor riding arena (20x 40m) <strong>Type of training:</strong> Continuous low to moderate intensity</td>
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<tr>
<td><strong>Program duration:</strong> 24 weeks <strong>Frequency:</strong> 1-2 times/week <strong>Session duration:</strong> 20 - 30 minutes</td>
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**Initial Assessment**
Clinical History; Personal History; Drug therapy; Vital Signs; TUG test; Goniometry; Quality of Life Scale

**Weeks 1 and 2**
**Frequency:** 1 time/week **Session duration:** 20 minutes **Type of training:** Low intensity continuous
**Assessment in each session:** Vital Signs and TUG test at the beginning and end of the session

**Material type:** Blanket with Ceylon of a ring
**Session layout:** 10 minutes for each side, 30m in a straight line followed by 10m of half a circle, for 10min clockwise and 10min in the opposite direction. Justification: performing the exercises symmetrically
**Objective:** To observe how the person behaves on top of the horse, how is his balance and leave him as comfortable as possible, and then continue the sessions with the next proposed plan (8 min. To each side observing this reaction).
**Exercises:** Do 10 seconds of rotation of the posterior MSD and 10 seconds of rotation of the
### MSE

<table>
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<tr>
<th>Weeks 3 to 12</th>
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<tbody>
<tr>
<td><strong>Frequency:</strong> 1 - 2 times/week</td>
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<tr>
<td><strong>Session duration:</strong> 20 minutes</td>
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<tr>
<td><strong>Type of training:</strong> Continuous low/moderate intensity</td>
</tr>
<tr>
<td><strong>Assessment in each session:</strong> Vital Signs and TUG test at the beginning and end of the session</td>
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</table>

**Material type:** English saddle with stirrup box, with stirrups tailored to the person.

**Session layout:** 10 minutes for each side, 30m in a straight line followed by 10m of half a circle, for 10min clockwise and 10min in the opposite direction. Justification: performing the exercises symmetrically

**Exercises:** Start by walking 5 minutes straight, sitting correctly with the stirrups adapted to the client (if you use saddle), 5 minutes with a stick of approximately 50/60cm with the upper limbs in full extension with the stick in the hands and flexion at 90º in the direction of the horse's head 10 seconds, then flexion at 180º plus 10 seconds.

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*After 12 sessions*, a new evaluation should be made to see if the plan can and should be maintained, or if changes need to be made. It is important to note that the plan is individual and personalized to each person, since each one has its specific characteristics.
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