

Benefits of hippotherapy in elderly people: Scoping review

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ABSTRACT

The study aims to conduct a bibliographic and structured review based on the results found around the terms “Hippotherapy” and “Elderly”. The words were always introduced in English and computerized databases; SCOPUS, WOS and SPORTDiscus. To limit the search, four inclusion criteria were introduced: i) Mention at least some of the characteristics for Hippotherapy for the elderly (minimum 20 words), ii) Only articles, iii) Full text or summary available, and iii) Written in Spanish, English or Portuguese. In conclusion, documents about Hippotherapy in older people address different research topics and shows the main benefits of equestrian therapies on this population.

Keywords: Hippotherapy; Elderly people; Benefits.

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INTRODUCTION

Horse Assisted Therapies, or Hippotherapy, is being used widely in almost every country of the world and is practiced in an adequately and regularised form (Del Rosario-Montejo, Molina-Rueda, Muñoz-Lasa & Alguacil-Diego, 2014) as a therapeutic alternative to rehabilitation and re-education. Hippotherapy integrates a work specialized methodology (Uribe, Restrepo & Yajaira, 2012), which has shown positive changes in the quality of life and general state of health of people (Arias, Arias & Moretin, 2008), with psychological, social and educational benefits that improve the daily life activities performance (Gómez-Calvo, Silva-Ortiz, Gamonales & Muñoz-Jiménez, 2019). To carry out this technique is needed a gentle and well-trained horse, that allows the approach and contact with people who may have altered behaviours, involuntary movements or may use any device (like a crutch or a wheelchair). These conditions can usually scare an untrained horse (Villasís-Keever & Pineda-Leguízamo, 2017).

Scientific literature shows evidences of Hippotherapy efficacy in different groups of people with disabilities, such as cerebral palsy (Fernández-Gutiérrez, Apolo-Arenas, Martínez-García & Caña-Pino, 2014; Vargas, Patricio, Solís-Cartas, Martínez-Larrarte & Serrano-Espinosa, 2016), psychomotor retardation (Lopez-Roa, 2011), people with multiple sclerosis (Munoz-Lasa, Lopez De Silanes, Atín-Arratibel, Bravo-Llatas, Pastor-Jimeno & Maximo Bocanegra, 2019), Down syndrome (De Miguel, De Miguel, Lucena-Antón & Rubio, 2018), and older people (Araújo, Martins, Blasczyk, Feng, Oliveira, Copetti & Safons, 2018; White-Lewis, Russell, Johnson, Cheng & McClain, 2017), among others. Hippotherapy is an integral, neurologically based and multidisciplinary treatment that uses the horse and its qualities (movement, rhythm and heat) as the main elements, which stimulate multiple psychomotor and sensory areas (Shurtleff & Engsberg, 2012; López-Roa, 2011). It has become a scientific-based intervention, with evidence of its benefits, that plays an important, comprehensive and integrated role in the social, physical and intellectual sphere of the participants (Jimenez, 2017).

Aging is a natural and inevitable process (Berbes, Coronados, Semino & Andrade, 2018). The growth of population, related to more life expectancy, causing a considerable increase to elderly people in developing countries (Lopez-Gomez & Marín-Baena, 2016), associated with the presence of chronic diseases (McCarthy, Bigal, Katz, Derby & Lipton, 2009).

Aging process involves biological, cognitive and social changes, with the presence of progressive molecular and cellular damage (Steves, Spector & Jackson, 2012), and loss of strength and muscle power (Carville, Perry, Rutherford, Smith & Newham, 2007). These factors can cause an alteration of physical functions that interfere in the functional daily life skills, usually accompanied by a concern of cognitive change (Mora et al., 2012), as well as frame of mind (Ayalas-Rojas & Soto-Añari, 2017).

Given the paucity of review documents about this subject, and analysing the different databases, it is convenient to carry out a new review of the literature that complete the state of the art about the use of Hippotherapy in elderly people, to provide conclusions about the benefits of the Horse Assisted Therapies for this population group,

MATERIAL AND METHODS

Design

The present document is based on theoretical studies, carrying out a research process and compilation of scientific documents using the “Data accumulation and study selection” model (Ato, López & Benavente 2013), to analysing the published articles in relation to the benefits of Hippotherapy in elderly people.

Criteria of Documents inclusion and exclusion

For search and selection of documents, terms “Hippotherapy” and “Elderly” keywords were used. Furthermore, documents selected to be part of the sample had to meet a series of inclusion criteria (Table 1).

Table 1. Document inclusion and exclusion criteria.

<i>Nº</i>	<i>Inclusion criteria</i>
1	Mention at least some of the characteristics of Hippotherapy for elderly people (20 words minimum).
2	Scientific articles.
3	Full text or abstract available.
4	Wrote in Spanish, English or Portuguese language.
<i>Exclusion criteria</i>	
5	Delete the documents in which only the keywords entered in the databases are mentioned.
6	Dismiss document that cannot be referenced.
7	Exclude manuscripts that only refer older people.

Sample

The sample considered articles from scientific journals. A total of 922 documents was found in the first search phase, among the three databases, using the first term selected “Hippotherapy”. After including the second term “Elderly” on the search, 898 were rejected, but only 11 documents were selected, which fit the inclusion criteria established. Keywords included in the selected manuscripts were considered, and in the case of articles that did not have keywords, researchers determined a series of terms for each paper based on the study topic.

Codification of the variables

Selected documents were classified according to the following criteria: Title, Author / s, Year, Keywords, Database, Summary, Type of study, Sample and Benefits (Table 2).

Table 2. Characteristics of the variables of the literary review.

Variable	Description
Title	English title of the selected article.
Author/s	Scientific name of each author.
Year	Official publication date.
Keywords	Keywords used.
Database	Data platform on which the selected article is located.
Summary	Brief writing of the main ideas and objectives of the selected document.
Type of study	Procedure used.
Sample	Set of people or data randomly chosen to the study, that are considered representative of their belonging group.
Benefits	Benefits of Hippotherapy in elderly people

Registration procedure for studies and data analysis

The Research method used for this study is similar to those existing in the previous scientific literature (Gamonales, Gil-Sánchez, Porro-Cerrato, Gómez-Carmona, Mancha-Triguero & Gamonales, 2018; Gamonales, León, Muñoz-Jiménez & Ibáñez, 2018). Proper planning of the literary search favours its success (Thomas, Silverman & Nelson, 2015), and allows drawn relevant conclusions (Gamonales, Gil-Sánchez et al., 2018). All the documents selected for the study met the established inclusion criteria. Figure 1 shows the search process carried out for the research.

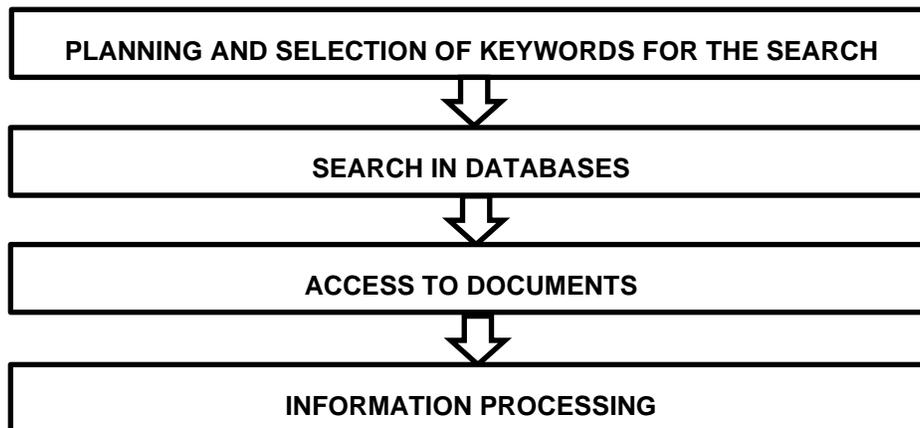


Figure 1. Representative diagram of the bibliographic search process.

Phase 1. Planning and selection of keywords for the search. To locate the largest amount of related scientific articles, keywords were searched in English, specifically "Hippotherapy" and "Elderly". The inclusion criteria mentioned above were established (Table 1), and the same keywords were used in all the databases consulted.

Phase 2. Searching in databases. Three bibliographic searches were performed in the following computerized databases: SCOPUS, WOS, and SPORTDiscus, using the same Boolean search procedure (And), in order to find as many related documents as possible. The final search phrase was: Hippotherapy - And - Elderly. Documents chosen for the study met the established inclusion criteria. Documents searching structure for each database is shown in Figure 2. As the keywords were added in the search engine, the results decreased considerably.

Phase 3. Accessing to documents. Some of the databases used do not allow access to full-text documents. Therefore, in order to consult the largest number of original full-text papers, the web portal of the electronic library of the University of Extremadura was used, as well as different platforms and web search engines to contact the authors (Gamonales, León et al., 2018). The sample was reduced to 11 articles, which were reviewed in depth. The number of documents chosen should not be very large, since the treatment of the information could be contaminated by the researcher (Benito et al., 2007).

Phase 4. Information processing. The title, Author / s, Year, Keywords, Database, Summary, Study type, Sample and Benefits were analysed for each article. In this phase, it is important to organize and categorize all the obtained information. In addition, a synthesis of each document was made, by preparing a table with all the information that would allow it to be optimally and effectively reviewed. Finally, a descriptive analysis

of the keywords was carried out of selected articles to find out their link with the study (Gamonaes, León et al., 2018)., The main keywords used to classify the articles are shown in Figure 3. Furthermore, the main benefits of Hippotherapy for older people were extracted from the selected manuscripts.

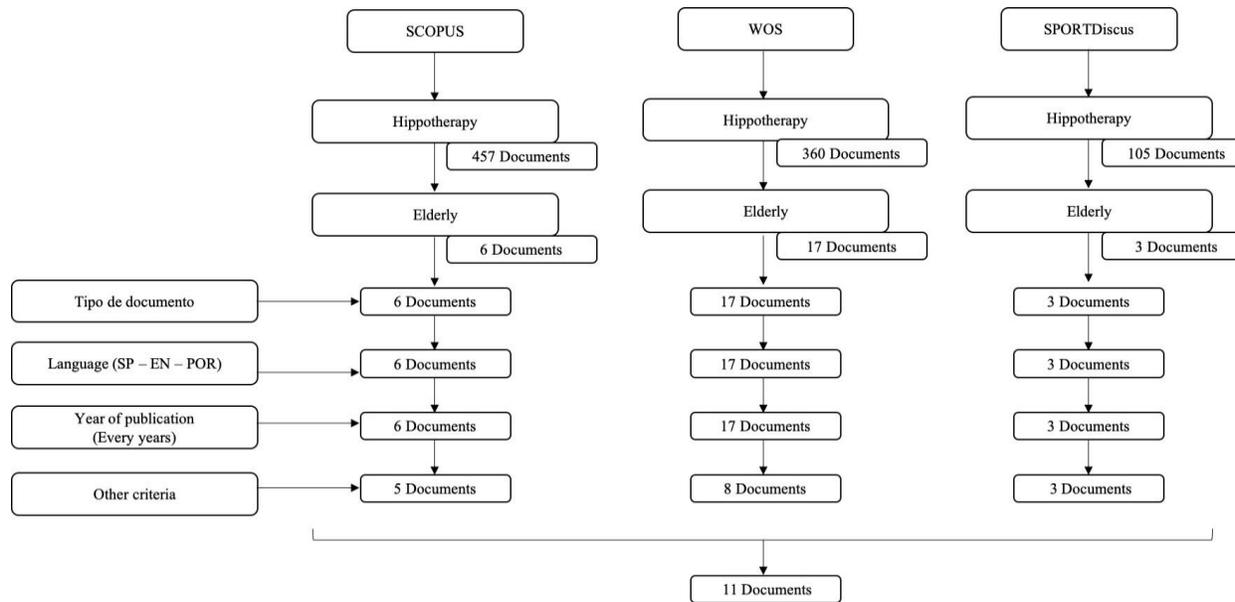


Figure 2. Scheme of documents found in the different databases.

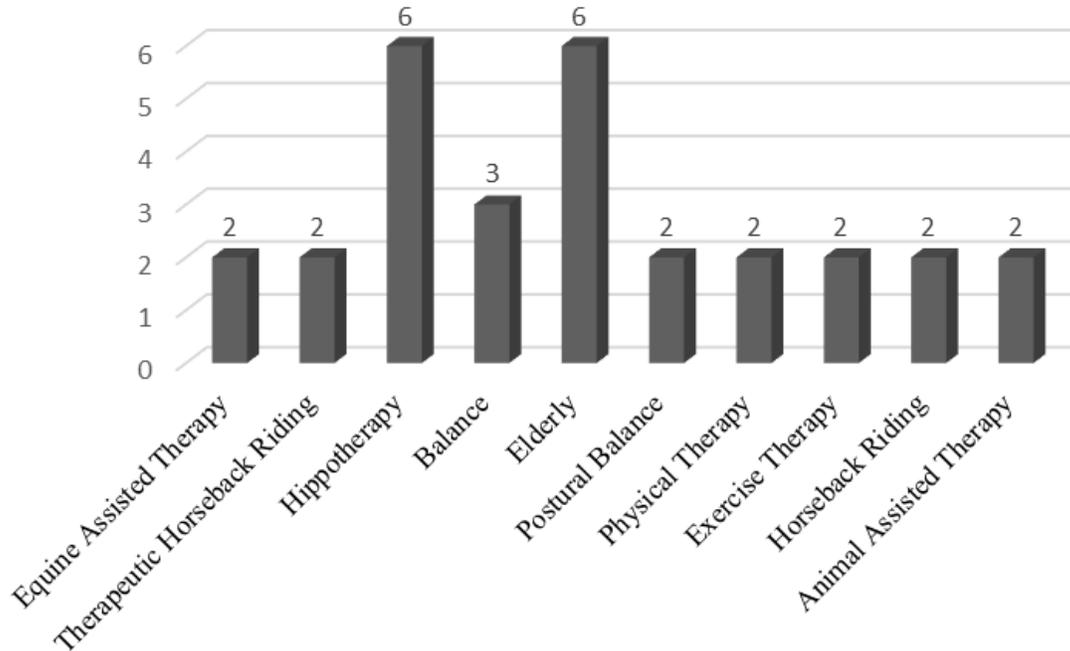


Figure 3. Main keywords related to the benefits of Hippotherapy in older people.

RESULTS

The results are shown in the same order in which the bibliographic review was carried out. Table 3 shows the different articles and their main characteristics regarding the benefits of Hippotherapy in older people, following the criteria defined in the method. In addition, they are displayed in chronological order in order to facilitate their reading.

Table 3. The main research classified considering the benefits of hippotherapy in the elderly.

Title	Author	Y	Key Words	B	Abstract	Type	Sample	Benef.
<i>The use of hippotherapy as therapeutic resource to improve the static balance in elderly individuals.</i>	Toigo, Júnior, Pinto & Ávila.	2008	Physical Therapy, Musculoskeletal, Equilibrium, Exercise movement, Epidemiology experimental, Women, Middle aged, Aged.	WOS	Hippotherapy as a procedure to improve static balance in older people. Experimental study, performing a pre and post-test. Healthy elderly people present balance alterations, which are possible to improve with Hippotherapy.	Exp.	10 women between 60 and 74 years old.	Improves static balance and reduces the risk of fall.
<i>Effect of equine-assisted therapy on the postural balance of the elderly.</i>	Araujo, Silva, Costa, Pereira & Safons.	2011	Equine-assisted therapy, Postural balance, Elderly, Physical therapy, Rehabilitation.	SPORTDiscus / WOS	Determine if Hippotherapy produces changes in older people balance. Old age tends to normalize the stabilometric measurements, however, with horse-assisted interventions, a significant improvement in balance appears, as well as a reduction in the risk of fall.	Exp.	17 elderly people.	Reduces the risk of fall in elderly people.
<i>Effects of hippotherapy on mobility, strength and balance in elderly.</i>	Araújo, De Oliveira, Martins, De Moura-Pereira, Copetti & Safons.	2013	Hippotherapy, Muscle strength, Postural balance, Gait, Elderly.	WOS	Evaluate the chronic effects of Hippotherapy on functional mobility, muscle strength and balance in older people.	Exp.	28 subjects between 60 and 84 years, men and women.	Improves in strength of the lower limbs and balance in elderly people.
<i>The Effects of Hippotherapy on Elderly Persons' Static Balance and Gait.</i>	Kim & Lee.	2014	Elderly, Balance, Hippotherapy.	WOS	Examine the effects of Hippotherapy on the static balance and gait of older people.	Exp.	30 elderly people	Improves the static and dynamic balance of elderly people.
<i>Effects of horseback riding exercise therapy on hormone levels in elderly persons.</i>	Sung-Hyoun, Jin-Woo, Seon-Rye & Byung-Jun.	2015	Hormone, Exercise therapy, Horseback riding.	WOS	Determines the effect of horse riding on normal hormone levels in older people. Horse therapy produces a significant increase in serotonin and cortisol.	Exp.	20 elderly people	Increase in serotonin and cortisol levels.

<i>Effects of horseback riding exercise therapy on background electroencephalograms of elderly people.</i>	Kim, Cho, Kim, Lee, Brienens & Cho.	2015	Exercise therapy, Electroencephalogram, Horseback riding.	WOS	Analyses the effect of horse therapy on the electroencephalogram in older people. It suggests that performing horse therapy improves it.	Est. Exp.	20 elderly people.	The alpha power index increased significantly after riding, suggesting that exercise improved the electroencephalogram.
<i>Equine-assisted therapy intervention studies targeting physical symptoms in adults: A systematic review.</i>	White-Lewis, Russell, Johnson, Cheng & McClain.	2017	Equine assisted therapy, Therapeutic horse riding, Therapeutic horseback riding, Hippotherapy, Equine psychotherapy, Equine facilitated therapy, Horse riding for handicapped, Equus.	Scopus	Systematic review that analyses the evidence and quality of Hippotherapy studies.	Review		Improvement in balance, spasticity, muscle strength, gait and cadence, as well as quality of life. There are improvements at biological, psychological and social levels.
<i>Therapeutic Effects of Horseback Riding Interventions: a Systematic Review and Meta-analysis.</i>	Stergiou, Tzoufi, Ntzani, Varvarousis, Beris & Ploumis.	2017	Therapeutic Horseback Riding, Hippotherapy, Cerebral Palsy, Multiple Sclerosis, Neuromuscular Disease, Elderly, Stroke, Neuromotor; Physical Disabilities.	SPORTDiscus / WOS	Investigate the possible positive effects of Horse Assisted Therapy, these can occur both physically and mentally. Horse Assisted therapies are viable interventions for patients with balance, gait, and psychomotor problems.	Review.		It improves balance, gait and produces an improvement in psychomotor disorders.
<i>Effect of hippotherapy on older balance: a systematic review with methanalysis.</i>	Araújo, Martins, Blasczyk, Feng, Oliveira, Copetti & Safons.	2018	Hippotherapy, Elderly, Balance.	SPORTDiscus	Study the existing evidence of Hippotherapy in relation with the balance of the older people and conclude that it has a significant effect in improving the postural balance of the elderly.	Review.		Improvement in the postural balance in elderly people.

<i>Impact of hippotherapy for balance improvement and flexibility in elderly people.</i>	Diniz, De Mello, Ribeiro, Lage, Júnior, Ferreira, Da Fonseca, Rosa, Teixeira, & Espindula	2019	Balance, Flexibility, Elderly, Horse-assisted therapy.	Scopus	Knowledge about the impact of Hippotherapy in older people. Ageing causes a decrease in functional ability, strength, balance, flexibility, agility and coordination, due to neurological and muscular changes. Hippotherapy improves functional mobility, dynamic balance and flexibility in the elderly people.	Exp.	30 Elderly people.	Improves functional mobility, dynamic balance and flexibility in elderly people.
<i>An umbrella review of the evidence for equine-assisted interventions</i>	Stern & Chur-Hansen.	2019	Animal-assisted interventions; Equine-assisted interventions; Hippotherapy; Systematic reviews; Umbrella review.	WOS	Review of current HAT documentation. The evidence from HATs may be wrong. The current evidence is methodologically weak, therefore, today, therapeutic horseback riding interventions programs cannot be recommended as the best practice, and better quality studies are necessary.	Review		There are different benefits. However, there is a lack of scientific evidence

Note: B.: Database; Benef.: Benefits; Exp.: Experimental Studies; HAT: Horse Assisted Therapy Review: Review of the literature; Y.: Year.

DISCUSSION

The present study completes the state of knowledge about the benefits of Hippotherapy for elderly people, using methodological procedures similar to those existing in the scientific literature (Ato et al., 2013; Gamonales, Gil-Sánchez et al., 2018; Gamonales, León et al., 2018), identifying and classifying the most relevant information. It can be useful for future reviews, while allowing relevant conclusions to be drawn. In addition, it has allowed to be analysing the main components of Hippotherapy, and to know its benefits, identifying how sessions should be considered to achieve a positive effect on elderly people.

Different procedures were used to access the information, developing a bibliographic review of selected documents. A wide variety of research methods were found, from literature reviews to experimental studies. All have the coincidence that aging cause the loss of balance, strength and muscle mass, and increase the risk of falls. The individual characteristics of each participant must be considered. Each person is different and will have a different response, following the “active and healthy aging” approach (WHO, 2002), which proposes that each subject will have a different rate of senescence.

The bibliographic reviews carried out by Araújo et al., (2018), Stergiou et al., (2017), and White-Lewis et al. (2017) conclude that Hippotherapy or therapeutic horse-riding cause benefits in elderly people. All studies highlighting the improvement of balance and postural control, with the consequent decrease in risk of falls. However, a recent review by Stern & Chur-Hansen (2019) suggests that current studies on horse-assisted interventions are methodologically weak, poorly designed, sparse, and lacking, many of these studies, of control groups and details about performed intervention. Therefore, it would be recommendable to carry out longitudinal studies in order to verify the durability of the benefits of this technique in elderly people.

The experimental studies included in this review have a small sample, being the most numerous the work by Diniz et al., (2019), with 30 subjects, and the smaller the study carried out by Toigo et al., (2008), which only has a sample of 10 women, and no control group. However, the manuscripts of Araújo et al., (2011), and Araújo et al., (2013), together with those mentioned above, are focused on the effects that Hippotherapy produces in relation to balance, gait, and risk of falling in older people. Therefore, it would be recommendable to analyse other benefits, using technological support, such as inertial devices.

The studies carried out by Kim et al., (2015), and Sung- Hyoun et al., (2015) have a sample of 20 participants, 10 conformed the control group and 10 the experimental. Both studies detail the procedure used during equestrian therapies in order to identify neurological and hormonal changes. Kim et al., (2015) concludes that during the practice of therapeutic riding, alpha waves index and electromagnetic oscillations increases. That indicates stability and relaxation, favouring better brain function, useful to prevent neurodegenerative diseases associated with ageing. In addition, Sung- Hyoun et al., (2015) analyses the effects of therapeutic riding on hormone levels, which cause psychological benefits, reducing depression levels, stress and behavioural problems. Likewise, it positively affects mood, sleep and agitation, as a consequence of serotonin increasing and cortisol levels. Therefore, researchers in Physical Activity and Sports Sciences should develop studies related to Hippotherapy including different users, with or without disabilities.

About sessions duration carried out during the interventions of the experimental studies, these are held during approximately 30 minutes (Araujo et al., 2011; Araújo et al., 2013; Kim & Lee, 2014). However, in other Hippotherapy studies related to people with cerebral palsy, the sessions are developed once a week and last 45 minutes (Fernández-Gutiérrez et al., 2014). Therefore, the main limitations of the experimental studies are the small sample and the short duration of the sessions, which does not allow to generalize the results. In addition, it would be useful to know in depth the daily habits of the subjects since they can affect the results of the investigations.

Finally, it is necessary to develop new research around the benefits of Hippotherapy and therapeutic riding in elderly people, with larger samples, a higher level of detail about the interventions developed, with quantifiable and verifiable evaluations, in order to provide more evidence to allow recognize Hippotherapy as an effective treatment.

CONCLUSIONS

After reviewing the literature, it is concluded that Hippotherapy and horse therapy can be considered as a beneficial treatment for elderly people if performed properly.

Hippotherapy interventions improve static and dynamic balance, postural balance, functional mobility, decrease spasticity, flexibility, muscle strength, gait and cadence. These physical improvements decrease the risk of falls and improving the quality of life of elderly people.

Despite the fact that current studies about horse-assisted interventions are scarce and present methodological weaknesses, this type of therapy is recommended in order to improve in the biological, psychological and social areas.

AUTHOR CONTRIBUTIONS

Luisa Gómez-Calvo: prepared the full document: introduction, method, discussion and conclusion. José M. Gamonales: review the method and develop the statistical process, as well as revising the final document. Arlette M. Silva-Ortiz: collaborated in the review of the document, specifically in the introduction, method and discussion. Jesús Muñoz-Jiménez: develop the method, and analysis of the documents. In addition, he reviewed the final document.

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DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

REFERENCES

- Araújo, T.B., De Oliveira, R.J., Martins, W.R., De Moura-Pereira, M., Copetti, F., & Safons, M.P. (2013). Effects of hippotherapy on mobility, strength and balance in elderly. *Archives of Gerontology and Geriatrics*, 56(3), 478-481. <https://doi.org/10.1016/j.archger.2012.12.007>
- Araújo, T.B., Martins, W.R., Blasczyk, J.C., Feng, Y.H., Oliveira, R.J., Copetti, F., & Safons, M.P. (2018). Efeito da equoterapia no equilíbrio de idosos: uma revisão sistemática com metanálise. *Revista Brasileira de Ciencia y Movimiento*, 26(3), 178-184. <https://doi.org/10.31501/rbcm.v26i3.6972>
- Araújo, T.B., Silva, N.A., Costa, J.N., Pereira, M.M., & Safons, M.P. (2011). Effect of equine-assisted therapy on the postural balance of the elderly. *Brazilian Journal of Physical Therapy*, 15(5), 414-419. <https://doi.org/10.1590/S1413-35552011005000027>
- Arias, V., Arias, B., & Moretin, R. (2008). Terapia asistida por caballos: nueva propuesta de clasificación, programas para personas con discapacidad intelectual y buenas prácticas. *Revista Española sobre Discapacidad Intelectual*, 39(2), 18-30.
- Ato, M., López-García, J. J., & Benavente, A. (2013). A classification system for research designs in psychology. *Anales De Psicología / Annals of Psychology*, 29(3), 1038-1059. <https://doi.org/10.6018/analesps.29.3.178511>
- Ayalas-Rojas, R., & Soto-Añari, M. (2017). Indicadores de envejecimiento patológico y lugar de residencia en adultos mayores. *Revista de Psicología*, 7(2), 13-24.
- Benito, P.J., Díaz, V., Calderón, M.J., Peinado, A.B., Martín, C., Álvarez, M., Morencos, E., & Pérez, J. (2007). La revisión bibliográfica sistemática en fisiología del ejercicio: recomendaciones prácticas. *Revista Internacional de Ciencias del Deporte*, 3(6), 1-11. <https://doi.org/10.5232/ricyde2007.00601>
- Berbes, L., Coronados, Y., Semino, L., & Andrade, J.A. (2018). Desafíos sociales del envejecimiento de la población. *Revista Cubana de Medicina Física y Rehabilitación*, 10(2), 1-3.
- Carville, S.F., Perry, M.C., Rutherford, O.M., Smith, I.C., & Newham, D.J. (2007). Steadiness of quadriceps contractions in young and older adults with and without a history of falling. *European Journal of Applied Physiology*, 100(5), 527-533. <https://doi.org/10.1007/s00421-006-0245-2>
- De Miguel, A., De Miguel, M.D., Lucena-Antón, D., & Rubio, M.D. (2018). Efectos de la Hipoterapia sobre la función motora en personas con síndrome de Down: revisión sistemática. *Revista de Neurología*, 67, 233-41. <https://dx.doi.org/10.33588/rn.6707.2018117>

- Del Rosario-Montejo, O., Molina-Rueda, F., Muñoz-Lasa, S., & Alguacil-Diego, I.M. (2014). Efectividad de la terapia ecuestre en niños con retraso psicomotor. *Neurología*, 30(7), 425-432. <https://doi.org/10.1016/j.nrl.2013.12.023>
- Diniz, L.H., de Mello, E.C., Ribeiro, M.F., Lage, J.B., Júnior, D.E., Ferreira, A.A., Da Fonseca, M.L., Rosa, R., Teixeira, P., & Espindula, A.P. (2019). Impact of hippotherapy for balance improvement and flexibility in elderly people. *Journal of Bodywork and Movement Therapies*. <https://doi.org/10.1016/j.jbmt.2019.10.002>
- Fernández-Gutiérrez, C., Apolo-Arenas, M.D., Martínez-García, Y., & Caña-Pino, A. (2014). Efectos de la Hipoterapia en la estabilidad postural en parálisis cerebral infantil: a propósito de un caso clínico. *Fisioterapia*, 37(3), 135-139. <https://doi.org/10.1016/j.ft.2014.10.002>
- Gómez-Calvo, L., Silva-Ortiz, A., Gamonales, J.M., & Muñoz-Jiménez, J. (2019). Influencia de la Hipoterapia en la calidad de vida de los niños con síndrome de Down: Revisión literaria. I Congreso Nacional Mujer y Deporte Paralímpico. Universidad de Huelva, Huelva (España).
- Gamonales, J.M., Gil-Sánchez, O., Porro-Cerrato, C., Gómez-Carmona, C.D., Mancha-Triguero, D., & Gamonales, F.J. (2018). Psicomotricidad en el aula de Educación Infantil: alumnos con Trastorno de Déficit de Atención e Hiperactividad. *Revista Profesional de Investigación, Docencia y Recursos Didácticos*, 100(11), 440-454.
- Gamonales, J.M., Muñoz-Jiménez, J., León-Guzmán, K., & Ibáñez, S.J. (2018). Football 5-a-side for individuals with visual impairments: a review of the literature. *European Journal of Adapted Physical Activity*, 11(1), 1-19. <https://doi.org/10.5507/euj.2018.004>
- Gutiérrez, M., & Oña, A. (2005). *Metodología en las ciencias del deporte*. Madrid: Síntesis.
- Jiménez, A. (2017). Efectos de las terapias ecuestres en personas con parálisis cerebral. *Revista Española de Discapacidad*, 5 (2), 171-184.
- Kim, S.G., & Lee, C.W. (2014). The effects of hippotherapy on elderly persons' static balance and gait. *Journal of Physical Therapy Science*, 26(1), 25-27. <https://doi.org/10.1589/jpts.26.25>
- Kim, S.R., Cho, S.H., Kim, J.W., Lee, H.C., Brienens, M., & Cho, B.J. (2015). Effects of horseback riding exercise therapy on background electroencephalograms of elderly people. *Journal of Physical Therapy Science*, 27(7), 2373-2376. <https://doi.org/10.1589/jpts.27.2373>
- López-Gómez, M.P. & Marín-Baena, R.A. (2016). Revisión teórica desde la psicología sobre representaciones sociales del envejecimiento y la vejez en Latinoamérica y España (2009-2013). *Revista Científica General José María Córdova*, 14(17), 155-202. <https://doi.org/10.21830/19006586.8>
- López-Roa, L.M. (2011). Efectos de la hipoterapia en posición sedente hacia adelante en un paciente con retraso psicomotor e hipotonía. *Memorias*, 9(16), 130-137.
- McCarthy, L.H., Bigal, M.E., Katz, M., Derby, C., & Lipton, R.B. (2009). Chronic pain and obesity in elderly people: results from the Einstein aging study. *Journal of the American Geriatrics Society*, 57(1), 115-119. <https://doi.org/10.1111/j.1532-5415.2008.02089.x>
- Mora, G.S., García, R., Perea, M., Ladera, V., Unzueta, J., Patino, M., & Rodríguez, E. (2012). Deterioro cognitivo leve: detección temprana y nuevas perspectivas. *Revista Neurológica*, 54(5), 303-310. <https://doi.org/10.33588/rn.5405.2011538>
- Muñoz-Lasa, S., López De Silanes, C., Atín-Arratibel, M.Á., Bravo-Llatas, C., Pastor-Jimeno, S., & Máximo-Bocanegra, N. (2019). Efecto de la Hipoterapia en esclerosis múltiples: estudio piloto en calidad de vida, espasticidad, marcha, suelo pélvico, depresión y fatiga. *Medicina Clínica*, 152(2), 55-58. <https://doi.org/10.1016/j.medcli.2018.02.015>
- Shurtleff, T., & Engsberg, J. (2012). Long-term effects of hippotherapy on one child with cerebral palsy: A research case study. *British Journal of Occupational Therapy*, 75(8), 359-366. <https://doi.org/10.4276/03080221X13433105374279>

- Stergiou, A., Tzoufi, M., Ntzani, E., Varvarousis, D., Beris, A., & Ploumis, A. (2017). Therapeutic effects of horseback riding interventions: a systematic review and meta-analysis. *American Journal of Physical Medicine & Rehabilitation*, 96(10), 717-725. <https://doi.org/10.1097/PHM.0000000000000726>
- Stern, C., & Chur-Hansen, A. (2019). An umbrella review of the evidence for equine-assisted interventions. *Australian Journal of Psychology*, 71(4), 361-374. <https://doi.org/10.1111/ajpy.12246>
- Steves, C.J., Spector, T.D., & Jackson, S.H. (2012). Ageing, genes, environment and epigenetics: what twin studies tell us now, and in the future. *Age and Ageing*, 41(5), 581-586. <https://doi.org/10.1093/ageing/afs097>
- Sung-Hyoun, S., Jin-Woo, K., Seon-Rye, K., & Byung-Jun, C. (2015). Effects of horseback riding exercise therapy on hormone levels in elderly persons. *Journal of Physical Therapy Science*, 27(7), 2271-2273. <https://doi.org/10.1589/jpts.27.2271>
- Thomas, J.R., Silverman, S.J., & Nelson, J.K. (2015). *Research Methods in Physical Activity (7^a Ed). Campaigning: Human Kinetics.*
- Toigo, T., Júnior, L., Pinto, E.C., & Ávila, S.N. (2008). O uso da equoterapia como recurso terapêutico para melhora do equilíbrio estático em indivíduos da terceira idade. *Revista Brasileira de Geriatria e Gerontologia*, 11(3), 391-403. <https://doi.org/10.1590/1809-9823.2008.11038>
- Uribe, A.M., Restrepo, T.F., & Yajaira, D. (2012). ¿Cómo beneficia la Equinoterapia a las personas con síndrome de Down? *Revista CES Salud Pública*, 3(1), 4-10.
- Vargas, J., Patricio, L., Solís-Cartas, U., Martínez-Larrarte, J.P., & Serrano-Espinosa, I. (2016). Aplicación de la Hipoterapia en los niños con parálisis cerebral. *Revista Archivo Médico de Camagüey*, 20(5), 496-506.
- Villasís-Keever, M.Á., & Pineda-Leguizamo, R. (2017). Utilidad de hipoterapia en la parálisis cerebral infantil. *Revista Mexicana de Pediatría*, 84(4), 131-133.
- White-Lewis, S., Russell, C., Johnson, R., Cheng, A. L., & McClain, N. (2017). Equine-assisted therapy intervention studies targeting physical symptoms in adults: A systematic review. *Applied Nursing Research*, 38, 9-21. <https://doi.org/10.1016/j.apnr.2017.08.002>
- White-Lewis, S., Russell, C., Johnson, R., Cheng, A.L., & McClain, N. (2017). Equine-assisted therapy intervention studies targeting physical symptoms in adults: A systematic review. *Applied Nursing Research*, 38, 9-21. <https://doi.org/10.1016/j.apnr.2017.08.002>
- W.H.O. - World Health Organization. (2012). Informe de la Segunda Asamblea Mundial sobre el Envejecimiento. Madrid, 8-12 April.

