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Sistematic review

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Effectiveness of gait training in water for patients with parkinson's disease: systematic review

Efetividade do treino de marcha na água para pacientes com doença de parkinson: revisão sistemática

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RESUMO | INTRODUÇÃO: A hidroterapia é cada vez mais utilizada no tratamento de pacientes com doença neurodegenerativas visando melhora da funcionalidade e redução de quedas. Permite treino de marcha em condições seguras, promove relaxamento e reduz o medo de cair. Há a necessidade de analisar a qualidade metodológica dos estudos existentes neste contexto. **OBJETIVO:** Sistematizar o conhecimento acerca da efetividade do treino de marcha na água para pessoas com Doença de Parkinson. **METODOLOGIA:** Trata-se de uma revisão sistemática. Foi feita busca na base de dados do Pubmed e Lilacs no período de março de 2017 a maio de 2018 sem filtros. Foram incluídos ensaios clínicos randomizados que verificaram efeitos de um protocolo de treino de marcha na água para pacientes com Doença de Parkinson. Foram excluídos estudos que realizaram treino na água, porém não especificamente de marcha. Foi utilizada ferramenta da Colaboração Cochrane para avaliar a qualidade metodológica dos estudos. **RESULTADOS:** Foram encontrados quinze estudos na busca, três destes foram incluídos. Houve uma diferença entre os artigos quanto aos desfechos, em relação ao aumento da velocidade da marcha. A análise da qualidade metodológica mostrou falhas de randomização e cegamento na metodologia dos estudos. **CONCLUSÃO:** Foi evidenciado que o treino de marcha na água tem efeitos positivos na velocidade da marcha e na mobilidade destes indivíduos. Para um resultado clínico positivo na marcha, devem ser associados exercícios para mobilidade e equilíbrio. São necessários futuros ensaios clínicos randomizados que sigam as diretrizes e apresentem uma qualidade metodológica satisfatória.

PALAVRAS-CHAVE: Doença de Parkinson. Marcha. Hidroterapia. Fisioterapia.

ABSTRACT | INTRODUCTION: Hydrotherapy is increasingly used in the treatment of patients with neurodegenerative disease, being aimed at improving functionality and reduce falls. Allows safe walking, promotes relaxation and reduces fear of falling. There is a requirement to analyze the methodological quality of existing studies in this context. **OBJECTIVE:** To systematize the knowledge about the effectiveness of water walking training for people with Parkinson's disease. **METHODOLOGY:** This is a systematic review. We searched the Pubmed and Lilacs database from March 2017 to May 2018 without filters. We included randomized clinical trials that verified the effects of a water gait training protocol for patients with Parkinson's disease. We excluded studies that performed water training, but not specifically gait. A Cochrane Collaboration tool was utilized to evaluate the methodological quality of the studies. **RESULTS:** Fifteen studies were found in the search, three of these were included. There was different from those between the articles regarding outcomes, in relation to the increase in walking speed. The methodological quality analysis showed randomization and blindness failure in the methodology of the studies. **CONCLUSION:** It was evidenced that gait training in water has a positive effect on gait velocity and the mobility of these individuals. For a positive clinical outcome in walking, exercises for mobility and balance should be associated. Further randomized clinical trials are necessary for follow the guidelines and have satisfactory methodological quality.

KEYWORDS: Parkinson disease. Gait. Hydrotherapy. Physical Therapy specialty.

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Introduction

Parkinson's disease (PD) is an illness of the central nervous system characterized by a decrease in dopamine, a neurotransmitter with the function of assisting the body in voluntary movements[1,2]. The main symptoms are bradykinesia, rest tremor, muscle rigidity, postural instability, in addition to cognitive symptoms[2] and affect 1% of the world population over 65 years old[3]. Because it is a progressive disease, the individual can develop important changes in balance, posture[4] and consequently changes in gait, such as festination. This occurs due to shorter strides, increased velocity, with center of gravity projected forward[5]. Freezing of gait is also common, affecting half of individuals with PD[6]. These gait disturbances are associated with a high risk of falls, since over 60% of people with PD suffer a fall every year[6, 7, 8].

For the treatment of these symptoms and a decrease in the rate of falls, the use of drugs is important, but not enough to optimize the individual's functionality, especially in relation to gait[8]. For this reason, the physiotherapy treatment combined with the drug has proved to be effective, with great importance for improving gait performance in these patients[8,9,10,11]. The area of aquatic physiotherapy is increasingly used in the treatment of people with PD aiming at this improvement of functionality and gait[12]. Therapy in water produces physiological and thermal effects such as muscle relaxation, with reduced muscle spasms, which allow a comfortable sense in the performance of body movements[13,14].

Water provides balance and gait training in safe conditions, which prevent falling and reduces the fear of falling because buoyancy decreases the action of gravity[14-16]. In the literature, there are randomized clinical trials[13,17,18] that evaluated balance, mobility and gait of individuals with PD before and after aquatic exercise protocols, with positive results in these aspects. Authors analyzed randomized clinical trials and concluded that aquatic physiotherapy has positive effects on mobility function of people with neurodegenerative diseases, including Parkinson's disease[19].

There is a requirement to analyze the methodological quality of the studies in this context regarding the effectiveness of water walking training protocol for people with PD. This systematic review is of clinical importance because an analysis of possible biases in randomized clinical trials allows us to evaluate the reliability of the studies so that a certain therapeutic intervention can be safely used or discarded in clinical practice. The aim of this article is to systematize the knowledge about the effectiveness of water walking training for people with PD.

Materials and methods

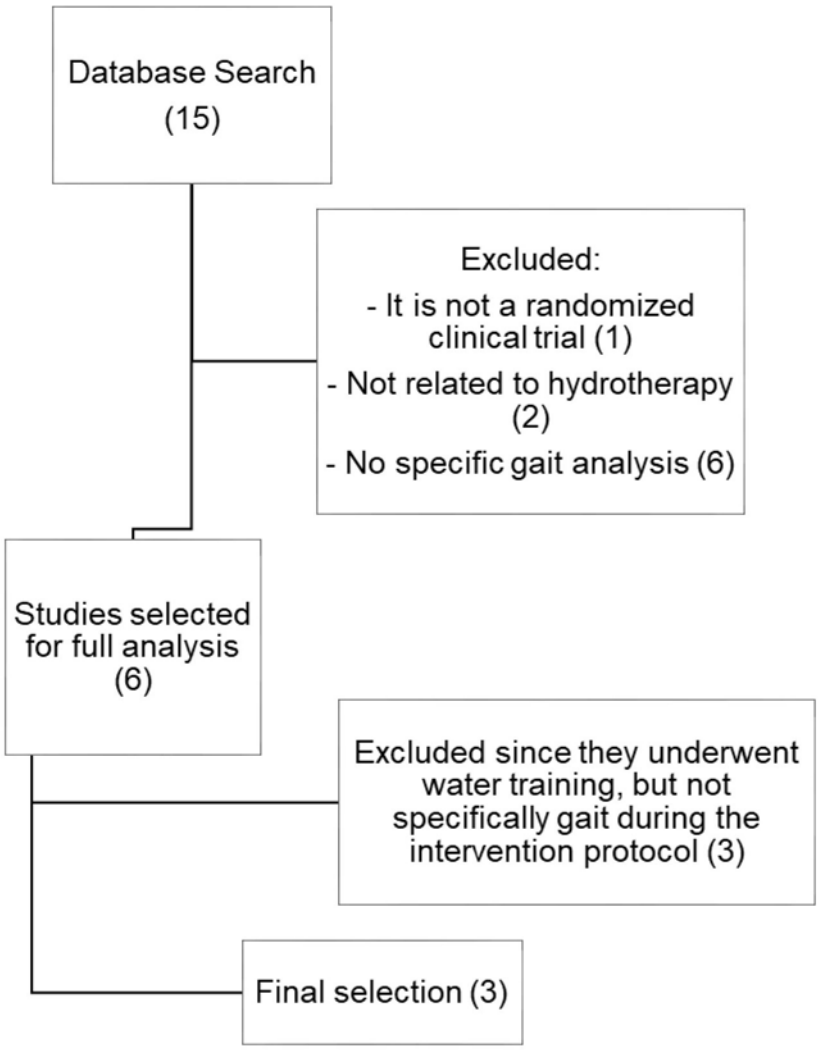
This is a systematic review that addresses the effectiveness of water walking training for people with PD and the Cochrane Collaboration tool was used to assess the methodological quality of scientific articles. Initially, a search by two researchers in the Pubmed and Lilacs database from March 2017 to May 2018 was performed without using filters with the following search strategy: (hydrotherapy OR aquatic exercise OR aquatic therapy OR water exercise) AND Parkinson's disease AND (gait OR walking). After searching the databases, the researchers gathered to determine which studies would enter into this systematic review.

We included all the randomized clinical trials found that associated the effects of a walking gait protocol in the water for people with PD. We excluded studies that performed water training, but not specifically gait during the intervention protocol. To evaluate the methodological quality of the articles, The Cochrane Handbook for Systematic Reviews of Interventions, version 5.1.0 was followed. The studies were evaluated according to the seven domains: types of randomization; secrecy of the allocation; blinding; intention-to-treat analysis; early stopping for benefit; selective description of the outcome; validated scale. Risk of bias was categorized as "low risk of bias" when they were very clear in these areas, "high risk of bias" when not mentioned and "uncertain risk of bias" if information existed, but without clarity.

Results

Initially, 15 studies were found in the databases, after which nine papers were excluded after the title and abstract analysis, since one is not a randomized clinical trial, two are not related to hydrotherapy, and six did not evaluate gait. The remaining six articles were analyzed in their entirety and it was verified that three of them performed water training, but not specifically gait during the intervention protocol. Therefore they were excluded. The final sample resulted in three articles for methodological quality analysis, all of them in English language (Figure 1).

Figure 1. Flowchart of the collection and selection of scientific articles for methodological quality analysis.



A study published in the year 2014 performed an intervention with 25 patients with PD, a group in water that was submitted to a gait training associated to other exercises and another group with the same protocols, but in ground, twice a week, with duration of 16 weeks. It was verified through the biomechanical analysis of the gait an improvement in the speed and the kinematics of the joints only in the group that carried out gait training in the water[17]. Another study, with a sample of 21 individuals, evaluated the effects of gait training in water compared to conventional physiotherapy twice a week for six weeks on gait variation through a program. After the gait analysis, no significant changes were found in both groups, regarding step length, step width and step time[13].

The third study, with a sample of 56 patients, underwent a gait training protocol in water and conventional training for three weeks, every morning for 45 minutes, with 2D and 3D gait analysis of patients with PD after underwater or land based walking training. Both groups had improved gait, but only the group that performed conventional training achieved an improvement in walking speed[15]. The methodological quality of these three articles was analyzed using the Cochrane Collaboration tool (Chart 1).

Chart 1. Analysis of the methodological quality of the studies: risk of bias in each study based on the Cochrane Collaboration tool.

	Louise et al., 2017	Ayán, et al., 2014	Volpe, et al., 2017
Type of Randomization	Low risk of bias	High risk of bias	Uncertain risk of bias
Secrecy of Allocation	Low risk of bias	High risk of bias	High risk of bias
Blinding	Low risk of bias	High risk of bias	High risk of bias
Intention-to-treat analysis	Low risk of bias	Uncertain risk of bias	Low risk of bias
Early withdrawal for the benefit	Low risk of bias	Low risk of bias	Low risk of bias
Selective description of outcome	Low risk of bias	High risk of bias	Low risk of bias
Validated Scale	Uncertain risk of bias	Uncertain risk of bias	Uncertain risk of bias

Discussion

After the analysis of the studies, it was noticed that the gait training in the water has positive effect for individuals with PD in relation to gait speed and mobility function, but there was a difference between the articles regarding the outcomes, which indicates a fragile evidence of these effects. These conflicting findings may be the result of randomization, since the methodological quality analysis showed that two of these studies had a high risk of bias[15,17], in relation to secrecy of allocation and blinding, which may compromise the reliability of the results. Programs used for biomechanical gait analysis obtained an uncertain risk of bias in the validated scale domain, which may have caused this large divergence of outcome results. Therapy in water through its thermal effects brings physiological effects that allow the realization of training for mobility, balance and coordination in safe and relaxing conditions for these individuals[13,14].

The effects of gait training on water for individuals with PD are controversial among studies. Authors found significant changes in gait velocity only in patients who underwent water training[15], but in another study a significant increase in velocity was observed only in people who underwent conventional physiotherapy[17]. Other researchers, however, did do not find significant changes in gait aspects. This study showed that the disease duration of the sample was 7 to 10 years, with an age range of approximately 70 years[13], which may hinder clinical improvement. The intervention time was relatively short compared to the other studies analyzed, approximately, twice a week and lasting for 6 weeks. For this reason, it can be suggested that those individuals with greater difficulties of clinical improvement did not have the time to present improvements in gait aspects, since this study presented discrete changes in aspects of gait, but not significant in the hydrotherapy group.

A long-term evaluation of the gait on the ground after the intervention in the water is a valid aspect to be approached, because when verifying the effect after the exit in the water it is possible to prove or not the effectiveness of the gait training for the functionality of the individual. All three studies evaluated for methodological quality performed the follow-up one week after the intervention, but not in the ground. Authors[18] performed the follow up in the ground after 17 days of intervention and there were no significant results in gait aspects, but with a significant maintenance of the improvement in balance. In agreement, other researchers[20] performed follow up in the ground of one week after the intervention for balance training and obtained significant improvements in this aspect. This maintenance of improved balance suggests that patients could develop safer gait performance with less postural instability[12]. However, a precise analysis of the gait in the ground after the training of this one in the water is necessary to confirm this hypothesis.

A single-arm clinical trial[21] achieved a significant result in kinematic gait patterns with an increase in velocity by 20%, pitch length by 30% and a reduction of cadence by 6%, even without gait training in water. It was observed that performing water exercises for mobility, transfer training, balance and coordination can have a positive effect on gait performance[21]. In disagreement, some studies[17,18] performed gait analysis after the intervention with the same pattern of exercises from the previous study and did not get significant results. This considerable result only in the first study cited can be attributed to a large number of exercises in the intervention protocol that was larger than the rest and the time dedicated to the research, which was five months. This significant result in a clinical trial suggests that only water training may not be sufficient to optimize the gait of people with this health condition[21].

This study has as advantages the reliability of the scale used to evaluate the methodological quality of the scientific articles and the clinical relevance of the proposed theme, since it is possible to use this study to safely offer physiotherapeutic alternatives used in the water to improve gait performance of individuals with PD and consequent decrease in the rate of falls, which is quite frequent in this population. It has as limitation the lack of studies that only analyzed the gait training in the water, in isolation, associated with follow-up in soil, which makes difficult the determination of the real effectiveness of the gait training in the short and long-term, since these patients suffer from a progressive neurodegenerative disease.[10]

Conclusion

It was evidenced that gait training performed in water has a positive impact on mobility for patients with Parkinson's disease when associated with other exercises, as well as in conventional therapy. But for a significant clinical result, it should be associated with other exercises for mobility, balance and muscular endurance. This study contributes to the verification of the effectiveness of gait training associated with other exercises performed in water for patients with Parkinson's disease. However, since it is a chronic and progressive disease, these individuals need effective therapeutic proposals with long-term effects to decrease the rate of falls. For this reason, future studies with priority in randomized clinical trials, with an analysis of the specific gait training, as well as in association with other exercises, besides the ground follow-up to aggregate scientific evidence on this subject and follow the guidelines for satisfactory methodological quality.

Author contributions

Costa PS participated in the study design, data collection and analysis, results interpretation, and in the drafting of the final version. Bôas ECCV participated in the drafting of the final version of the paper and oversaw the writing. Fonseca EP conducted and oversaw all the research and writing.

Competing interests

No financial, legal or political competing interests with third parties (government, commercial, private foundation, etc.) were disclosed for any aspect of the submitted work (including but not limited to grants, data monitoring board, study design, manuscript preparation, statistical analysis, etc.).

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