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Review article

Effects of aquatic exercise on muscle strength and functional performance of individuals with osteoarthritis: a systematic review

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ABSTRACT

Water-based exercises are recommended for people with osteoarthritis (OA), due to the beneficial effects on physical function, quality of life and symptom reduction. However, the effects on muscle strength are still controversial. The aim of this review was to assess and compare the effects of aquatic exercise programs on muscle strength and physical function in people with OA. A systematic search was performed at Pubmed, Scopus and Web of Science databases. Clinical trials with interventions involving aquatic exercises for individuals with OA were included. The methodological quality of the studies was evaluated using the PEDro scale. 296 studies were found and twelve were selected: six studies comparing water-based exercises with land-based exercise, and six comparing water-based exercise groups with the control group. Exercise programs included muscle strengthening, aerobic, balance, flexibility and stretching exercises. Duration of the program, weekly frequency, intensity and progression varied between studies. Beneficial effects of aquatic exercise were found on physical function. However, only two of five studies that assessed muscle strength observed positive effect of aquatic exercise. Although it is difficult to compare studies and establish guidelines for the standardized protocol formulation, it was observed that water-based exercises can be effective on improving physical function and increasing muscle strength, since they are well-structured, with exercise intensity and overload controlled.

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Efeitos do exercício aquático na força muscular e no desempenho funcional de indivíduos com osteoartrite: uma revisão sistemática

R E S U M O

Palavras-chave:
Osteoartrite
Exercício aquático
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Exercícios aquáticos são recomendados para pessoas com osteoartrite (OA), pois melhoram a funcionalidade, a qualidade de vida e reduzem os sintomas da doença. Entretanto, os efeitos na força muscular ainda são controversos. O objetivo desta revisão foi avaliar e comparar o efeito de programas de exercícios aquáticos na força muscular e na funcionalidade de pessoas com OA. Foi realizada uma busca bibliográfica nas bases de dados Pubmed, Scopus e Web of Science. Foram incluídos ensaios clínicos realizados com intervenções envolvendo exercícios aquáticos para indivíduos com OA. A qualidade metodológica dos estudos foi avaliada por meio da escala PEDro. Foram encontrados 296 estudos no total. Destes, doze foram selecionados, sendo seis estudos que compararam exercícios aquáticos com exercícios realizados em solo, e seis que compararam um grupo de exercícios aquáticos com grupo controle. Os programas contemplaram exercícios de fortalecimento muscular, aeróbios, de equilíbrio, de flexibilidade e alongamento. A duração do programa, a frequência semanal, a intensidade e a progressão variaram entre os estudos. Foram encontrados efeitos benéficos do exercício aquático na funcionalidade, porém, dos cinco estudos que avaliaram a força muscular, apenas dois verificaram efeito positivo dos exercícios aquáticos. Embora haja dificuldades para comparar os estudos e estabelecer diretrizes para a formulação de protocolos padronizados, observou-se que exercícios aquáticos podem ser eficientes na melhora da funcionalidade e no aumento da força muscular, desde que os programas sejam bem estruturados com intensidade e sobrecarga controlada e progressiva.

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Introduction

Osteoarthritis (OA) is a chronic degenerative disease of multifactorial origin, beginning usually between 50 and 60 years of age,¹ primarily affecting knee and hip joints.^{2,3} Pain is the main symptom of the disease and, when associated with joint stiffness, instability and weakness, can cause functional limitations and difficulties in performing activities of daily living.⁴

The treatment of OA includes drug therapy, manual therapy, and exercise.^{5,6} Exercise is a highly recommended conservative treatment, with easy application and low cost, and with little chance of adverse reactions.⁴ The types of exercises most recommended for people with OA are those causing a low-impact on the joints, for muscle strengthening, aerobics, or some combination thereof, carried out in water or on the floor.⁷

The strengthening of the muscles around the affected joint is a key part in the treatment of OA, because this contributes to the quality of cartilage, increases the neural activation and improves intra- and intermuscular coordination.⁸ In addition, muscles act as a load-absorbing mechanism during the gait. Therefore, stronger muscles can better absorb and distribute the impact on the hip and knee, which increases the stability⁸⁻¹⁰ and contributes to the improvement of the functionality and mobility.¹¹

When compared to land-based exercises, water exercises can offer some advantages to overweight patients, with mobility difficulties, since the body weight relief provided by the fluctuation reduces the impact on joints and the perception of pain intensity.^{12,13} The heated water and the hydrostatic

pressure promote muscle relaxation and stress relief, and also decrease muscle spasms,¹³⁻¹⁶ which facilitate the execution of movements. In addition, studies in healthy adults and older subjects have shown that water exercises are effective to increase muscle strength.^{13,17}

Previously conducted systematic reviews on the effects of aquatic exercise in people with osteoarthritis found benefits for pain, function and quality of life.^{12,13,15,18} However, there are no reviews to identify the effect of these interventions on the performance of function and muscle strength tests. Thus, the aim of this review was to evaluate and compare the effect of aquatic exercise programs on muscle strength and on the functionality of people with OA.

Methods

To develop this study, a literature search was performed in the following electronic databases: Pubmed, Scopus, and Web of Science. The selection of descriptors was based on terms indexed in Descriptors in Health Sciences (DeCS) and included the following keywords in English: osteoarthritis, aquatic, aqua, deep-water, water-based, exercise, motor activity, physical activity, and training. The keywords were combined using the Boolean operators "AND" and "OR", and were adapted for each database, as required.

There was no restriction on the publication year, considering the low number of studies found in this area. Two researchers surveyed all databases and, at the end of the application of inclusion and exclusion criteria, confronted the articles found. In the case of disagreement with the selected

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