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Review article

Influence of physical activity on quality of life in postmenopausal women with osteoporosis



Eduardo Lucia Caputo*, Marcelo Zanusso Costa

Universidade Federal de Pelotas, Pelotas, RS, Brazil

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ABSTRACT

The objective of this study is to conduct a review on the association between exercise and quality of life in postmenopausal women with osteoporosis. A search was performed in PubMed, SciELO, SpringerLink and Sport Discus databases to identify relevant articles that addressed this association. We used the following descriptors in the English and Portuguese languages: osteoporosis, exercise, menopause, women, physical activity, quality of life/osteoporose, exercício físico, menopausa, mulheres, atividade física, qualidade de vida. Regarding quality of life and physical aspects like muscle strength and balance, with the exception of two studies, all others have reported improvement in quality of life and in physical domain of participants. Intervention with exercise has proved essential to improving the quality of life of women with postmenopausal osteoporosis. Activities that aim at the improvement of muscle strength and balance are essential to prevent falls, and consequently to reduce the incidence of fractures in this population.

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Influência do exercício físico na qualidade de vida de mulheres pós-menopáusicas com osteoporose

RESUMO

O objetivo deste trabalho é realizar uma revisão sobre a associação entre exercício físico e qualidade de vida em mulheres pós-menopáusicas com osteoporose. Foi realizada busca nas bases de dados PubMed, Scielo, SpringerLink e Sport Discus a fim de identificar artigos relevantes que tratassem dessa associação. Utilizaram-se os seguintes descritores, em língua inglesa e portuguesa: osteoporosis, exercise, menopause, women, physical activity, quality of life/osteoporose, exercício físico, menopausa, mulheres, atividade física, qualidade de vida. Com relação à qualidade de vida e aspectos físicos como força e equilíbrio, com exceção de dois estudos encontrados, os demais relataram melhoria na qualidade de vida e nos

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* Corresponding author.

E-mail addresses: caputoeduardo@yahoo.com.br, duducaputo@hotmail.com (E.L. Caputo).

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indicadores físicos das participantes. A intervenção com exercício físico demonstrou ser fundamental para o aprimoramento da qualidade de vida de mulheres na pós-menopausa que sofrem de osteoporose. Atividades que têm por objetivo o aperfeiçoamento da força e do equilíbrio são essenciais para evitar a ocorrência de quedas e, conseqüentemente, reduzir a incidência de fraturas nessa população.

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Introduction

Osteoporosis is a systemic skeleton disease, being characterized by reduced bone density and deterioration of bone tissue architecture.¹ This disease has a higher incidence in the female population, due to the lower peak bone mass in this group, and to the consequences of menopause.²

Menopause is a period of transformation in women's lives, in which they are confronted with medical and psychological problems. In addition of hot flushes, headaches, sweating, fatigue, sexual dysfunction and reduction of estrogen, menopause may cause a massive and rapid loss of bone mass.³

Once established the menopause, the prevalence of osteoporosis and related fractures increases according to the duration of this hormonal disorder and the woman's age.⁴ In this population, the prevalence of osteoporosis at the lumbar spine ranges from 15.8% in women aged 50-59 years to 54.5% in women over 80 years, and the prevalence of fractures varies between 20% and 82% for the same age groups, respectively.⁵

According to the North American Menopause Society, the main clinical objective when treating osteoporosis is to reduce the fracture risk.⁶ The resulting pain of this change in body image and the loss of mobility and independence can have a strong impact on self-esteem and in the mood, making the prevention of falls the main point in preventing fractures. In the women with postmenopausal osteoporosis, the prevalence of falls is postmenopausal 51.1% against 29.3% of women without osteoporosis.⁷

The increase in life expectancy of the population and the costs generated by fractures, especially hip fractures, determine the importance of studying this disease, because hip fractures present with greater morbidity and mortality.⁸

Physical activity plays a key role in osteoporosis, mainly by reducing bone resorption.⁹ The increase in muscle strength, stability, balance and mobility, improvement of the quality of life, reduction of pain and prevention of falls supplement the benefits generated by the systematic practice of exercise in patients with osteoporosis.¹⁰

The aim of this article is to conduct a review on the association between exercise and quality of life, in the psychological and physical domains, in postmenopausal women with osteoporosis.

Methodology

A systematic search was conducted and relevant articles that analyzed the influence of a structured exercise training

program on quality of life in postmenopausal women with osteoporosis were selected. Theses and dissertations were not included due to the logistic infeasibility of a systematic search through these documents.

Those publications that met the inclusion criteria were evaluated, regardless of the journal nature. The selection of descriptors used throughout the review process was performed according to a Medical Subject Headings (MeSH) consultation.

A search was conducted in PubMed, SciELO, SpringerLink and Sport Discus databases and in the references of those identified articles. Search terms in English and Portuguese languages included: osteoporosis, exercise, menopause, women, physical activity, quality of life/ osteoporose, exercício físico, menopausa, mulheres, atividade física, qualidade de vida. In order to combine the descriptors and terms used in the search, we resorted to the logical operators "AND" and "OR".

At first, 135 articles that presented a relation to the study subject were identified. Then, we selected those articles that met the following inclusion criteria: a) longitudinal studies including postmenopausal women with osteoporosis; and b) with a clinical diagnosis of osteoporosis obtained by examination of bone densitometry in the femoral neck or lumbar spine, and with no history of atraumatic fracture. The selected articles were analyzed according to the following criteria established by Downs & Black:¹¹

- Hypotheses and objectives of the study
- Main outcomes measured
- Characteristics of the subjects involved
- Description of the interventions of interest and main outcomes
- Description of the actual values for the main outcomes
- Adequacy of appropriate statistical tests
- Whether the measures used for the main outcomes were accurate
- Whether the patients in different groups were recruited from the same population
- Whether the main results presented sufficient power to detect an important effect where the probability value for a difference being due to a chance of less than 5%

After the first analysis, based on titles, 40 articles were eligible to the second phase of this review, which consisted of reading of abstracts. Subsequently to the evaluation of the abstracts, those studies that fulfilled the inclusion criteria had their full report retrieved. At this point, the review was conducted independently by two researchers. Finally, 10 publications were included in this review.

Table 1 – Publications included in the review.

Main author	Year	Journal	Studied aspects
Arnold, CM ¹³	2008	Physiotherapy Canada	Quality of life and balance.
Auad, MA ¹⁴	2008	Arquivos Brasileiros de Ciências da Saúde	Quality of life.
Aveiro, MC ¹⁵	2004	Revista Brasileira de Ciência e Movimento	Quality of life, torque and balance.
Kronhed, AG ¹⁸	2009	Advances in Physiotherapy	Quality of life, balance and strength.
Devereux, K ¹⁷	2005	Australian Journal of Physiotherapy	Quality of life and balance.
Liu-Ambrose, TYL ¹⁹	2005	Osteoporosis International	Quality of life.
Carter, ND ¹⁶	2002	Canadian Medical Association Journal	Quality of life, balance and strength.
Tüzün, S ²¹	2010	European Journal of Physical and Rehabilitation Medicine	Quality of life and balance.
Carter, ND ¹²	2001	British Journal of Sports Medicine	Quality of life, balance and strength.
Aveiro, MC ²²	2006	Revista Brasileira de Fisioterapia	Quality of life, torque and balance.

Results

Table 1 shows the publications that were included in this review. Among the criteria established for our analysis, the clarity in the description of the objectives was compromised only in the study by Carter *et al.*¹² With respect to the studied outcomes, the quality of life was measured in 10 studies.¹²⁻²¹ The other outcomes studied were: balance,^{12,13,15-17,21-23} muscle torque,¹⁵ lower limb strength,^{12,16,22} gait speed,²² fear of falling,¹⁷ frequency of falls,²³ respiratory function, posture and submaximal exercise capacity.²⁰

The characteristics of the subjects were presented using descriptive tables in nine studies.^{12,13,16,19-23} The studies by Auad *et al.*,¹⁴ Aveiro *et al.*¹⁵ and Devereux *et al.*¹⁷ present this information on the text, in the Results section, having only the participants' age as a descriptive variable. Most authors measured the quality of life using specific questionnaires;¹²⁻²¹ however, only two of them evaluated variables such as pain and number of falls.^{18,23}

Of the studies evaluated, only that of Carter *et al.*¹⁶ included confounding factors in the selection and analysis of data. They were: height, weight, weight change during the study, years of estrogen use, number of medications taken, smoking, physical activity, age, mental state, quality of life score, number of fractures throughout life, number of falls in the last year and the presence of osteoarthritis or rheumatoid arthritis. Only one study describes adverse events of the intervention in participants.¹⁹

Because of ethical and methodological difficulty issues, four studies reported attempts of participants' blinding,^{12,16,19,23} and three studies did not undergo randomization.^{15,20,22}

Table 2 presents the results of studies that evaluated the quality of life in women with osteoporosis. Only the study by Carter *et al.*¹⁶ found no beneficial effects of exercise intervention on quality of life of the women studied. The other selected studies demonstrate a positive impact of this intervention on the quality of life of the women studied. Overall, the intervention with exercise had a positive effect on the following: general health, interaction, global scores, body image, activities of daily living, vitality, social function and mental health.

Muscle strength and balance were the most evaluated physical abilities. In examining Table 3, it is possible to verify that the exercise plays an important role in improving these abilities, as they are key components for the prevention of

falls. Two studies showed no increase in these abilities in the group performing exercise.

Discussion

Osteoporosis negatively affects the patients' quality of life, limiting their performance in activities of daily living. The chronic pain generated by osteoporosis can lead to depression, anxiety, frustration and social isolation.²⁴ Then, exercise practice becomes a crucial intervention, by increasing the confidence of the woman to independently perform her tasks.¹⁴

In addition to a reduction in bone loss, the regular practice of exercise by women with osteoporosis has, as positive effects, overall health, socialization, self-esteem, mood and body awareness improvement; and reduction of depression, anxiety and fear of falls.^{13,17} Also, the family knowledge about the disease has critical importance, because it generates greater family support for the patient to treat her illness.¹⁵

In the study by Liu-Ambrose *et al.*,¹⁹ the authors report that exercises performed in pairs increased the social interaction between the participants. This effect, especially among the elderly with similar health status, is related to the fact that exercises practiced in group provide to its participants the share life experiences, new friendships and an increased sense of well-being, that influence positively on their permanence in the program.¹⁸

The occurrence of fractures has a stronger effect in reducing the quality of life, compared just to the illness itself.^{22,25} A hip fracture, for instance, generates a significant reduction in quality of life of affected individuals in a period of 12-15 weeks after the fracture.²⁶ Postmenopausal women with osteoporosis who do not exhibit complications caused by the disease and are physically active have similar quality of life to postmenopausal women without osteoporosis.^{27,28}

Only the studies by Carter *et al.*¹² and Kronhed *et al.*¹⁸ reported no significant improvement in the physical domains of osteoporotic women after the intervention, both when compared to a control group as when compared to baseline values. Although not indicating significant changes in balance and knee extension strength after 10 weeks of training, Carter *et al.*¹² state that the participants of the exercise group showed an increase in knee extension strength that, despite not being of statistical significance, has important biological significance. However, the study by Carter *et al.*¹⁶ maintained the intervention group for a period of 20 weeks and found significant increases in dynamic balance and in knee extension

Table 2 – Results of studies evaluating the quality of life in women with osteoporosis.

Author	Instrument used	Exercise protocol	Result
Arnold et al. 2008 ¹³	OQLQ - Osteoporosis Quality of Life Questionnaire	Three groups divided into: a group that performed exercises in the water, a group which performed exercises out of water and a control group. The first two groups performed three weekly sessions lasting 50 minutes each, for 20 weeks.	Subjects in the group that performed exercise out of water presented a better OQLQ total score, when compared to the group that did exercises in the water. However, the global scores reported by subjects in the group that exercised in water was three times higher compared to the group that exercised out of water.
Auad et al. 2008 ¹⁴	OPAQ - Osteoporosis Assessment Questionnaire	Two groups: control and exercise. The second group undertook a program of exercise, with a frequency of twice a week sessions lasting one hour each, for eight months.	The group that practiced exercise showed improvement in the general health, physical and psychological domains, social interaction, symptoms, work and body image, when compared to the control group and to pre-intervention values.
Aveiro et al. 2004 ¹⁵	OPAQ - Osteoporosis Assessment Questionnaire	Only one group. The exercise program consisted of three weekly sessions lasting one hour each, for 12 weeks.	After the intervention, the subjects exhibited a reduced level of pain and stress, and improvement in activities of daily living and family support.
Kronhed et al. 2009 ¹⁸	SF-36 and Qualeffo-41 (quality of life questionnaire of the European Foundation for Osteoporosis)	Two groups: control and exercise. The exercise program consisted of two weekly sessions lasting one hour each, for four months.	After four months, the exercise group showed improvement in the SF-36 domains of physical function, bodily pain, general health, vitality, social function and mental health.
Devereux et al. 2005 ¹⁷	SF-36	Two groups: control and exercise. The exercise program lasted 10 weeks, with each session lasting 50 minutes. The number of weekly sessions was not informed.	With respect to the domains of Qualeffo-41, there was no difference between groups. The group benefited with the intervention showed improvement in the areas of physical function, vitality, social function and mental health.
Liu-Ambrose et al. 2005 ¹⁹	Qualeffo e ODI - Oswestry Low Back Pain Disability Questionnaire	The participants were divided into three groups: strength, agility and stretching (control). The physical exercise program consisted of two weekly sessions lasting 50 minutes each, for 25 weeks.	The group benefited with the intervention showed improvement in the areas of physical function, vitality, social function and mental health. With respect to ODI, no difference was noted in the scores among the groups after the intervention.
Carter et al. 2002 ¹⁶	Qualeffo	Two groups: control and exercise. The exercise program consisted of two weekly sessions lasting 40 minutes each, for 20 weeks.	The group that performed resistance exercises showed improvement in the areas of pain and work and social activity; the group of agility exercises showed improvement in the area of physical function, as assessed by Qualeffo.
Tüzün et al. 2010 ²¹	Qualeffo	Two groups: one with intervention through Yoga and the other with nonspecific exercises. In both groups, the program consisted of two weekly sessions lasting one hour each, for 12 weeks.	No difference between groups with regard to quality of life was found, both for baseline and post-intervention period values. Both groups showed improvement in overall score compared with baseline values. There was no difference when comparing post-training values of the two groups.

strength, compared to the control group (4.9% and 12.8%, respectively).

A training program aiming to increase muscle strength, especially in the lower limbs, is required to prevent falls and fractures in this population. A reduction of balance increases

the risk and fear of falling.¹⁵ The mobility results in more independence for the individual, reducing the likelihood of institutionalization.²³

Frail individuals with impaired balance and movements can get the same benefits from the practice of conventional

Table 3 – Results of studies that evaluated physical and functional domains of women with osteoporosis.

Author	Assessed components	Exercise protocol	Results
Carter et al. 2001 ¹²	Static and dynamic balance and strength of knee extension.	Two groups: control and exercise. The exercise program consisted of two weekly sessions lasting 40 minutes each, for 10 weeks.	The intervention group showed no significant difference, when compared to the control group, with respect to the balance and knee extension strength after 10 weeks of training.
Carter et al. 2002 ¹⁶	Static and dynamic balance and strength of knee extension.	Two groups, control and exercise. The exercise program consisted of two weekly sessions lasting 40 minutes each, for 20 weeks.	The intervention group showed improvement in dynamic balance (4.9%) and in knee extension strength (12.8%) after 20 weeks of training, when compared to the control group.
Arnold et al. 2008 ¹³	Static and dynamic balance.	Three groups, divided into a group that performed exercises in the water, a group that practiced exercises out of water, and a control group. For the first two groups, the exercise program consisted of three weekly sessions lasting 50 minutes each, for 20 weeks.	Subjects who practiced exercise in the water presented improvements in dynamic balance, when compared with those who exercised out of water; however, there was no difference when the intervention groups were compared with the control group.
Aveiro et al. 2004 ¹⁵	Torque of the quadriceps muscle and balance.	The physical activity program consisted of three weekly sessions lasting one hour each, for 12 weeks.	After the intervention period, the group reported increase in muscle torque and improved balance.
Aveiro et al. 2006 ²²	Torque of the plantar flexors and dorsiflexors, balance and gait speed.	The physical activity program had a total duration of 12 weeks, consisting of three weekly sessions. The duration of each session was not reported.	After the intervention period, the group reported increase in muscle torque and improvement in balance and gait speed.
Devereux et al. 2005 ¹⁷	Dynamic balance.	Two groups: control and exercise. The exercise program lasted 10 weeks, with each session lasting 50 minutes. The number of weekly sessions was not informed.	The intervention group showed improvement in dynamic balance.
Kronhed et al. 2009 ¹⁸	Balance and grip strength.	Two groups: control and exercise. The exercise program consisted of two weekly sessions lasting one hour each, for four months.	The intervention group showed no differences with respect to balance and manual grip strength tests, when compared to control. After the intervention period, the exercised group showed no difference in balance and manual grip strength tests, when compared with baseline values.
Tüzün et al. 2010 ²¹	Balance.	Two groups: one with intervention through Yoga and the other with nonspecific exercises. In both groups, the program consisted of two weekly sessions lasting one hour each, for 12 weeks.	Only the Yoga group showed significant improvement in balance, when compared to baseline values. There was no difference when comparing post-training values of the two groups.

exercise, while exercising in the water.¹⁰ The aquatic environment, in addition to stability and coordination, stimulates the visual, vestibular and perceptual systems. The water-based activity reduces the stress incident on joints and muscles due to the reduced impact, and improves the subject's range of motion.¹⁷ According to Arnold et al.,¹³ exercises performed in water can be more effective, even considering the fact that exercises practiced out of the water have higher specificity and applicability with respect to functional tasks.

Questionnaires to assess the quality of life are used because of their low cost and easy application. In the case of the population concerned, there are specific tools for verification of this variable; for instance, Qualeffo, OQLQ - Osteoporosis Quality of Life Questionnaire, and OPAQ - Osteoporosis Assessment Questionnaire. The use of generic instruments such as the SF-36 questionnaire complicates the interpretation of the data, since this instrument was adopted for use in healthy individuals, despite the correlation between this and specific questionnaires.^{26,29} It is important that the instrument to be

used is specific to the studied population, considering the reliability of the data.³⁰

None of the studies reviewed analyzed body weight, height, prevalence of alcohol intake and smoking. It is known that these variables are risk indicators for falls and fractures in this population,^{31,32} and changes in body weight or in behavioral variables may indicate the effect of the intervention program. It is suggested that future research focus on anthropometric and behavioral variables, besides the quality of life and physical aspects.

Based on the articles selected, it is possible to conclude that the intervention with exercise is important to improve the quality of life of women with postmenopausal osteoporosis. Similarly, activities aimed at working on muscle strength and balance are essential to prevent the occurrence of falls, and to consequently reduce the incidence of fractures in this population.

Conflict of interests

The authors declare no conflict of interests.

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