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CASE REPORT

Comparison of two protocols of home-based exercise on the physical fitness of older women with breast cancer under hormonal treatment: a clinical trial

Comparação de dois protocolos de exercícios físicos domiciliares sobre a aptidão física de idosas com câncer de mama em tratamento hormonal: ensaio clínico

Comparación de dos protocolos de ejercicios físicos domiciliarios sobre la aptitud física de mujeres mayores con cáncer de mama en tratamiento hormonal: ensayo clínico

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ABSTRACT | This study aims to compare the effects of two home-based physical exercise protocols on the physical fitness of older women with breast cancer using hormone therapy. This is a comparison study between the effects of two clinical trials developed with patients and different execution periods, subjected to different home-based exercise protocols. In total, 68 older women, aged between 60 and 74 years old, diagnosed with breast cancer, stage I or II, were included, allocated into 2 groups. Group A (n=38) performed a protocol consisting of 29 exercises and group B (n=30) used a protocol with 12 exercises, both lasting 12 weeks and providing guidance via an introductory lecture, self-instructional material, and weekly telephone contacts. Physical fitness assessment was carried out using the Senior Fitness Test at the beginning and after the 12th week. Statistical analyzes were performed using STATA version 12, with a $p<0.05$ significance level. The evaluated protocols showed gains related to the components of physical fitness, range of motion and strength, with Group A showing greater gains than Group B. The choice between protocols must be made according to the adopted therapeutic objectives.

Keywords | Breast Cancer, Exercise, Physical Fitness.

RESUMO | O estudo visa comparar os efeitos de dois protocolos de exercícios físicos domiciliares na aptidão física de idosas em uso de terapia hormonal para tratamento de câncer de mama. Trata-se de um estudo de comparação entre os efeitos de dois ensaios clínicos desenvolvidos com pacientes submetidas a protocolos de exercícios físicos domiciliares distintos ao longo de diferentes períodos de execução. Foram incluídas 68 idosas, com idade entre 60 e 74 anos, diagnosticadas com câncer de mama, estágio I ou II, alocadas em dois grupos. O grupo A (n=38) realizou um protocolo composto por 29 exercícios e o grupo B (n=30) utilizou um protocolo com 12 exercícios, ambos com duração de 12 semanas e orientações via palestra introdutória, material autoinstrucional e contatos telefônicos semanais. A avaliação da aptidão física foi realizada por meio da Senior Fitness Test no início e após

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a 12ª semana. Foram realizadas análises estatísticas através do STATA versão 12, com nível de significância de p<0,05. Os protocolos avaliados apresentaram ganhos relacionados aos componentes da aptidão física, amplitude de movimento e força, com o Grupo A apresentando ganhos maiores que o Grupo B. A escolha entre os protocolos deve ser feita de acordo com os objetivos terapêuticos determinados.
Descritores | Neoplasia da Mama; Exercício Físico; Aptidão Física.

RESUMEN | El estudio tiene el objetivo de comparar los efectos de dos protocolos de ejercicios físicos domiciliarios sobre la aptitud física de mujeres mayores que utilizan terapia hormonal para tratar el cáncer de mama. Se trata de un estudio comparativo entre los efectos de dos ensayos clínicos desarrollados con pacientes sometidas a protocolos de ejercicios físicos domiciliarios distintos a lo largo de diferentes períodos de ejecución. Se incluyeron 68 mujeres mayores, de 60 a 74 años, diagnosticadas con cáncer de mama, estadio I o II, divididas en dos grupos. El grupo A (n=38) realizó un protocolo compuesto por 29 ejercicios y el grupo B (n=30) utilizó un protocolo con 12 ejercicios, ambos con una duración de 12 semanas y que proporcionaban orientación a través de una conferencia introductoria, material autoinstructivo y contactos telefónicos semanales. La evaluación de la aptitud física se realizó a través de Senior Fitness Test en el inicio y después de la 12ª semana. Se realizaron análisis estadísticos a través del STATA versión 12, con nivel de significación de p<0,05. Los protocolos evaluados mostraron ganancias relacionadas con los componentes de la aptitud física, rango de movimiento y fuerza, mostrando el Grupo A mayores ganancias que el Grupo B. La elección entre protocolos debe realizarse en función de los objetivos terapéuticos determinados.
Palabras clave | Neoplasia de la Mama; Ejercicio Físico; Aptitud Física.

INTRODUCTION

According to the World Health Organization (WHO), cancer is an important public health problem, especially among developing countries[1]. According to the new cancer estimate for Brazil, 704,000 new cases are expected for each year of the 2023-2025 triennium. Among women, breast cancer is the most frequent (excluding non-melanoma skin cancer), with 74,000 new cases predicted per year by 2025[1]. In a global aspect of breast cancer, mortality rates have decreased by almost 40% during the last three decades as a result of advances in prevention, early detection, and treatment, which leads to improved survival and aging of this population, making breast cancer a disease of older survivors, who face a new and important set of challenges and health care, mainly related to functionality and quality of life[2].

Given this context, and because it is a disease with heterogeneous clinical-epidemiological characteristics, the potential for curing breast cancer depends on screening strategies, early diagnosis, and adequate treatment management, among other aspects[3]. Of the therapeutic modalities for the treatment of cancer, hormone therapy (HT) is a well-established adjuvant procedure for hormone-sensitive malignancies, especially in breast cancer[4]. This treatment is indicated for all patients with detectable expression of estrogen receptors (defined as ≥1% invasive cancer cells), regardless of the use of other therapies or treatments[4].

However, the agents used in HT are associated with specific toxic and adverse effects, including loss of bone mineral density, venous thromboembolism, arthralgia, cardiovascular disease, and gynecological symptoms. These effects generally affect the physical fitness and functionality of patients undergoing such treatment, especially the older adult population, negatively affecting quality of life[5].

Added to these factors is the decline in physical fitness and functionality in older adults also resulting from the aging process, as well as the development of comorbidities that need to be considered during treatment. This decline is even greater due to the effects of treatment and/or progression of breast cancer[6]. HT drugs have proven efficacy in decreasing the risk of breast cancer recurrence and their use is indicated at a frequency of five years. However, due to adverse effects, adherence to this drug therapy becomes deficient[6].

Thus, among the possibilities of intervention to minimize the adverse effects of hormone therapy, physical exercise emerges as a therapy that can potentiate the immune system, reduce inflammatory activity, improve physical fitness and functionality, appetite and self-esteem, generating a greater sense of well-being[7]. There is strong evidence attesting to the benefits of physical exercise in patients with breast cancer, especially in the older adult population[8,9].

According to the Physical Activity Guidelines of the U.S. Department of Health & Human Services (DHHS), exercise prescriptions must be performed individually. In addition, the general recommendation for cancer patients of the American College of Sports Medicine is to avoid physical inactivity and sedentary behavior. It is essential to return to normal daily activities quickly after surgery and to exercise as much as possible during and after non-surgical treatments[7]. Prescriptions should include exercises to improve physical fitness in general, including cardiorespiratory, aerobic and muscular endurance, flexibility, agility and balance exercises.

In addition, it is important that these prescriptions offer flexibility regarding the format, amount of physical exercise, duration and frequency, to increase patients' adherence, as well as their autonomy and independence. Interventions based on the theory of Supported Self-Care, focusing on households, have represented an inclusive mode of execution for therapeutic physical exercise programs, whether neoadjuvant, adjuvant, or even main, facilitating the participation of patients located in both rural and urban regions and/or patients who have difficulties leaving their homes for motivational, functional or other reasons. In addition, home physical exercise is an advantageous therapy for public health through patient empowerment, in addition to being safe, effective, reproducible and low cost for older women undergoing breast cancer treatment[10,11].

Given this context, the study aims to analyze and compare the effect of two home exercise protocols on the physical fitness of older adult women with breast cancer, all undergoing cancer treatment using hormone therapy.

METHODOLOGY

This is a study comparing the effects of two clinical trials developed with patients subjected to different home physical exercise protocols over different periods of execution, to analyze the effectiveness of these exercises in improving the physical fitness of older adult women with breast cancer undergoing hormone therapy treatment, monitored in a general hospital in Recife, Pernambuco, Northeast region of Brazil.

To this end, data from the samples that were part of the intervention groups of each clinical trial were used. The control groups of both trials were not included, as we focused only on the comparability between the groups that received intervention from both trials. The main objective of this manuscript was to identify which home exercise protocol (long or short) was most effective in improving the components of physical fitness of older women with cancer. Furthermore, in both trials, the intervention groups had better results than the control groups, which allowed the analysis of only the intervention groups in this study. In addition, comparative analyses between the intervention and control groups are published (References removed to ensure the non-identification of the authors).

The clinical trials included in the study were: "Comparative evaluation between two approaches to physical exercise practice for older women undergoing cancer treatment: randomized clinical trial," approved by the Research Ethics Committee (CAAE: 30356114.1.0000.5201) and registered at ClinicalTrials.gov. (NCT02408133), carried out between April and November 2015, which developed and used a long instructional manual, containing 29 home physical exercises, corresponding to Group A of this study. For comparison, a non-randomized clinical trial called "Effect of an adapted protocol of home physical exercise on quality of life, physical fitness and body composition of older adult women undergoing breast cancer treatment: type II clinical trial" was developed, with data collected at the Adult Oncology Outpatient Clinic from August 2016 to February 2017, which developed, based on the Group A long instructional manual, a reduced instructional manual, with only 12 home physical exercises, corresponding to Group B. The project was previously registered at ClinicalTrials.gov. (NCT03226782).

Both programs were carried out in the same general hospital in Recife, Pernambuco, Northeast region of Brazil. All participants in both trials were informed and signed the informed consent form. Furthermore, to ensure comparability between the studies, the eligibility criteria and other theoretical-methodological procedures were equally structured in both trials.

Thus, the inclusion criteria were: age between 60 and 74 years; diagnosis of breast cancer, stage I or II; and being under treatment for breast cancer (hormone therapy). Those who presented some absolute contraindication for physical exercise[12], severe depression assessed by the geriatric depression scale (GDS15) and malnutrition (leanness grades I, II and III) detected by the body mass index (BMI), according to the WHO criteria[13], were excluded. Both the appearance of any

musculoskeletal injury impeding the performance of motor activities and the appearance of signs and symptoms suggestive of absolute contraindication[12] were considered as side effect variables.

Sample size

To calculate the sample size, carried out in the Stata 12 version 13 program, the results found in a pilot study were considered. The results of the stand and sit test, at the end of the study, showed a mean of 14.55±3.12 in the intervention group (Group A) and 11.16±2.66 in the control group. Assuming a power of 99% and a type I error of 5%, 27 patients would be needed in each group. Predicting possible losses, this number was increased by at least 10% for each group, resulting in the need for 29 individuals in each of the analysis groups. For this study, in order to compare the manuals developed as intervention methods, the data of the older adult women who composed the intervention groups of both clinical trials mentioned above were used.

Intervention protocol

Two groups (A and B) that received instructional material for the execution of two different home physical exercise programs were considered. Group A had a program with 29 home physical exercises, and Group B had a program with 12 exercises, in addition to the following guidelines (Table 1):

For both home-based physical exercise programs (Group A and Group B), the older women should perform six to eight repetitions for each exercise, in a gentle way, keeping their attention on the movement. All control and training guidelines for the use of the manuals were offered through an introductory lecture and subsequent telephone contacts, which occurred twice a week (every Monday and Friday). Participants should complete their respective program for a total period of 12 weeks and mark in the manual itself the frequency with which they performed the exercises according to the respective programs.

Group A: a manual (printed and DVD) was offered, called Gymnastics at home (available at: https://drive.google.com/file/d/1AwZ0Ic9OoCjfdkVMrWNfbfpuQv-w-iZn/view?usp=drivesdk), which consisted of 29 physical exercises to be performed at home. The manual contains a progressive weekly exercise routine, with an average duration of 30 minutes, to be performed autonomously, for 12 consecutive weeks, to improve range of motion (19 exercises), muscle fitness (10 exercises) and stimuli, as well as guidelines for walking.

The 19 exercises developed for range of motion are based on: stretching of the glutes in the supine posture; stretching of the side chain of the trunk in the supine position; stretching of hip adductors adopting the "butterfly posture"; global mobilization of the spine adopting the cat posture; mobilization of the ankle; mobilization of the toes; circular mobilization of the ankle; self-passive mobilization of the ankle with the individual seated and hip and knee flexed; mobilization of the thoracic spine in the sitting posture; stretching of the side chain of the trunk in the sitting posture; dissociation of the shoulder girdle; dissociation of the pelvic waist; cervical lateral tilt; cervical flexion and extension; cervical rotational movement (global mobilization); abduction and flexion of the shoulder; internal and external rotation of the shoulder; scapular abduction and stretching of wrist flexors; mobilization of the hand and fingers.

The 10 exercises developed for muscle fitness are: sit-to-stand, to strengthen mainly the muscles of the quadriceps and glutes; modified sit-to-stand; strengthening of the pectoralis and biceps; modified strengthening of the pectoralis and biceps; strengthening of the gastrocnemius and soleus; modified strengthening of the gastrocnemius and soleus; balance and coordination exercise; strengthening of the triceps brachii and iliopsoas; strengthening of the triceps brachii.

In addition, as described, the manual guides the performance of exercises progressively and, in the end, totals approximately 30 to 45 minutes of physical exercise per day. Therefore, it guides the performance of daily walks with a cumulative and progressive effect. Furthermore, for the execution of these activities, a minimum frequency of five days a week was suggested—thus respecting the recommendations of the World Health Organization[14] on the relationship between activity/physical exercise and quality of life – as well as the recording, in the manual itself, of the days of the week and shift in which the proposed activities were carried out.

Group B: the older women received a reduced printed manual, called Gymnastics at home: a manual adapted for patients with breast cancer (available at: https://drive.google.com/file/d/1oSo8PdwYhouT6hgyjQQE6VE0VoRGvlYH/view?usp=sharing), and such instructional material was specifically developed for this research based on the long manual offered to Group A.

Unlike the manual offered to Group A (29 exercises), the short manual contains a routine of only 12 exercises to be performed autonomously for range of motion and muscle fitness, using the environmental resources of the home itself. In addition, the short manual has stimuli and guidelines for the practice of active commuting (walking) so that at least 20 minutes of this activity are accumulated daily. In this group, although the patients performed fewer exercises, they should repeat them every day, without exercise progression, intensity, frequency or duration.

The exercises performed by this group were: unilateral stretching of the gluteus and mobilization in hip flexion; stretching of the side chain of the trunk and mobilization of the thoracic spine; active ankle mobilization; passive ankle mobilization, opening and closing of the change in a global mobilization of the spine; mobilization of the scapular waist, cervical, shoulder and fingers; exercise of sitting and getting up from the chair; arm flexion with the body inclined and hands supported on the wall; plantar pumping standing to strengthen the gastrocnemius and soleus.

Data collection

The older adult women underwent evaluations to characterize the sample (questionnaires, physical fitness assessment, anthropometric assessment and dynamometry) at the beginning of the research and after the 12th week. The study followed the recommendations of the consolidated standards of reporting trials (CONSORT), and losses were also recorded according to CONSORT (Figure 1). The primary outcome studied was physical fitness and its components: muscle fitness, flexibility, agility and balance, and aerobic endurance. Secondary outcomes correspond to anthropometric aspects and handgrip strength.

Functionality assessment

For the functional physical fitness variables, the senior fitness test (SFT)[15-17]battery was used in the test and re-test regime, consisting of seven specific tests that can measure performance in motor functional skills on a wide-ranging continuous scale, from the condition of greatest fragility to the highest degree of functional physical fitness. This evaluates the ability to perform functional movements, such as walking, climbing stairs and getting up, in addition to checking the muscle fitness, aerobic endurance, flexibility and balance of the older adult. In addition, the SFT is easy for evaluators to administer, does not require medical authorization, and is safe. Each test item has follow-up performance standards for men and women aged 60-94. In addition, the SFT provides reference values on each test item, which helps identify whether the individual is at risk for loss of mobility.

In this sense, the tests used were: (1) to reach the back, by recording the distance in centimeters between the middle fingers of the hands positioned behind the back, to evaluate the flexibility of the upper hemibody; (2) to sit and reach, by recording the distance in centimeters from the middle finger of the hand to the floor, in order to measure the flexibility of the lower hemibody; (3) forearm flexion, by recording the number of maximum repetitions of flexions performed by the dominant arm in 30 seconds, to assess upper muscle fitness; (4) to stand and sit, by recording the number of maximum repetitions achieved in 30 seconds, in order to measure lower muscle fitness; (5) to come and go in 2.44 meters, by recording the shortest time in seconds to circumvent a cone positioned 2.44 meters from the patient and return to the sitting position, to check agility and dynamic balance; (6) 2-minute stationary gait, by recording the maximum number of stationary double steps performed in two minutes, to analyze aerobic endurance.

Anthropometric assessment

Anthropometric data on body weight were collected using a Tanita® electronic scale, the height of the individual in an orthostatic position and the lean body mass index.

Assessment of handgrip strength

To measure handgrip strength, dynamometry was performed using the Jamar® dynamometer. Three measurements were performed in each test, starting with the dominant upper limb. The evaluator was instructed to verbally encourage the patients to apply as much force as possible during the tests.

Data processing and analysis

After data collection, the collection script was revised and, later, organized and registered in an

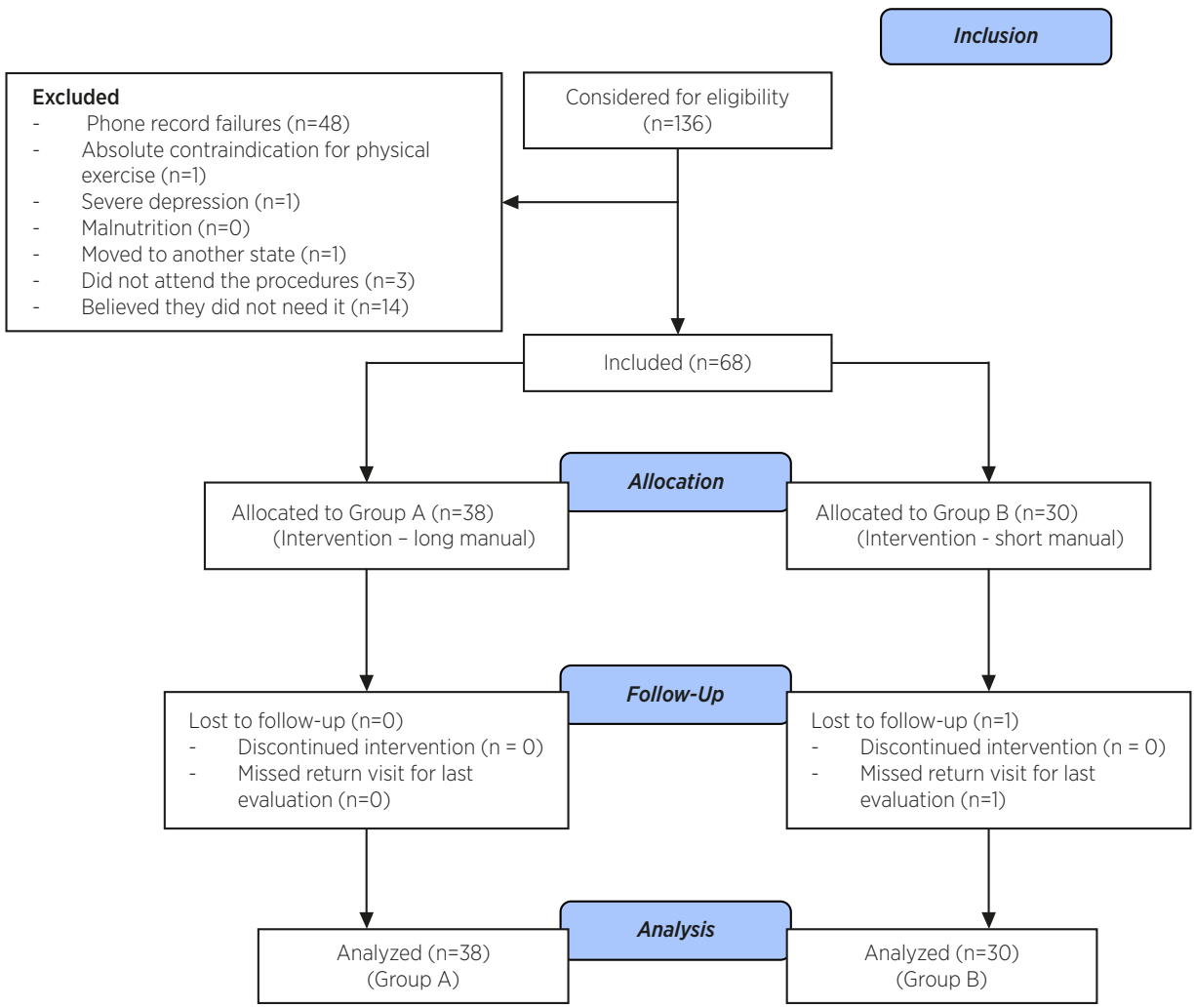
electronic spreadsheet for statistical analysis. After the exploratory analysis of the data to identify whether they met the normality through the Kolmogorov-Smirnov test, the statistics of the characteristics of the sample and the variables of physical fitness were performed.

For the analysis of numerical variables, the Student's *t*-test was used; for categorical variables, the chi-square test and, when relevant, Fischer's exact test were used. The analysis of the comparison between the two groups was performed using the two-sided Student's *t*-test. To evaluate the pre- and post-intervention in each group, the bilateral paired Student's *t*-test will be performed. For comparison between the different groups, to identify the homogeneity between them, the equivalence test (Levene's test) was performed. The results were obtained from the SPSS 13.0 statistical package and a $p<0.05$ was accepted.

RESULTS

In total, 138 patients were eligible and invited to participate in the study, of which 68 comprised the comparison sample, 38 comprised group A (longer protocol), and 30 comprised group B (reduced protocol), following the CONSORT recommendations for clinical trials (Figure 1).

Figure 1. CONSORT flowchart of allocation, monitoring and analysis of study participants.



Regarding the baseline sociodemographic data, the older women in Group A were significantly older (68.03±3.4 years vs. 65.83±3.43 years; p=0.011) and had a higher level of education. Overall, most were either single or married and retired (Table 1).

Regarding life habits and baseline clinical-epidemiological characteristics, higher alcohol consumption (p=0.035), higher staging I of cancer (p<0.001) and lower axillary emptying (p=0.014) were observed in Group A (Table 2).

Table 1. Baseline sociodemographic data of older women with breast cancer n (%) using hormone therapy subjected to the two home exercise protocols.

	Group A (n=38) (55%)	Group B (n=30) (45%)	P-value
Age (in years)[1], Mean (SD)	68.03±3.40	65.83±3.43	0.011
Race/Skin-color[2]			
White	14 (36.8)	11 (36.7)	0.986
Black	5 (13.2)	3 (10)	
Mixed-race	18 (47.4)	16 (53.3)	
Yellow	1 (2.6)		
Marital status[2]			
Single	10 (26.3)	5 (16.7)	0.095
Married	16 (42.1)	10 (33.3)	
Divorced	7 (18.4)	3 (10)	
Widowed	5 (13.2)	12 (40)	
Education level[2]			
Illiterate	3 (7.9)	9 (30.0)	0.015
4th grade elementary school	5 (13.2)	9 (30.0)	
Completed middle school	5 (13.2)	4 (13.3)	
Complete high school	11 (28.9)	4 (13.3)	
Complete higher education	14 (36.8)	4 (13.3)	
Occupational status[2]			
Active	8 (21.1)	6 (20.0)	0.842
Unemployed	2 (5.3)	3 (10.0)	
Retired	28 (73.7)	21 (70.0)	

[1] Student *t*-test.

[2]Chi-squared and Fisher's exact test.

Table 2. Life habits and baseline clinical-epidemiological characteristics of older women with breast cancer using hormone therapy subjected to the two home exercise protocols.

	Group A (n=38) (55%)	Group B (n=30) (45%)	p-value
Smoker			
No	35 (92.1)	29 (96.7)	0.624
Yes	3 (7.9)	1 (3.3)	
Alcohol consumer			
No	29 (76.3)	29 (96.7)	0.035
Yes	9 (23.7)	1 (3.3)	
Comorbidity			
No	7 (18.4)	6 (20.0)	1.000
Yes	31 (81.6)	24 (80.0)	
Type of co-morbidity			
DM type II	1 (3.2)	1 (4.2)	0.095
HAS	17 (54.8)	6 (20.0)	
Osteoarthritis	1 (3.2)	3 (12.5)	
>2 comorbidities	12 (38.7)	11 (58.3)	
Histological type of breast cancer			
Invasive ductal carcinoma	33 (86.8)	27 (90.0)	0.507
Invasive lobular carcinoma	3 (7.9)	0 (0.0)	
Tubular carcinoma	0 (0.0)	1 (3.3)	
Mucinous carcinoma	1 (2.6)	1 (3.3)	
Micropapillary Carcinoma	1 (2.6)	1 (3.3)	

continues...

Table 2. Continuation

	Group A (n=38) (55%)	Group B (n=30) (45%)	p-value
Immunohistochemical profile			
RH+ and HER2 -	28 (73.7)	25 (83.3)	0.645
RH+ and HER2+	9 (23.7)	5 (16.7)	
RH- and HER2 -	1 (2.6)	0 (0.0)	
Staging (TNM)			
I	35 (92.1)	14 (46.7)	<0.001
II	3 (7.9)	16 (53.3)	
Hormone therapy used			
Tamoxifen	21 (55.3)	23 (76.7)	0.049
Anastrozole	10 (26.3)	3 (10.0)	
Exemestane	7 (18.4)	2 (6.7)	
Aromasim	0 (0.0)	2 (6.7)	
Previous chemotherapy			
No	18 (47.4)	11 (36.7)	0.376
Yes	20 (52.6)	19 (63.3)	
Previous radiotherapy			
No	13 (34.2)	6 (20.0)	0.195
Yes	25 (65.8)	24 (80.0)	
Type of surgery performed			
Quadrantectomy	23 (60.5)	14 (48.3)	0.335
Total mastectomy	15 (39.5)	15 (51.7)	
Axillary emptying			
No	17 (44.7)	5 (16.7)	0.014
Yes	21 (55.3)	25 (83.3)	

Chi-squared and Fischer's exact test; DM: Diabetes Mellitus; SAH: Systemic arterial hypertension; HR: hormone receptors; HER2: Human Epidermal growth factor Receptor-type 2;

In the intragroup analysis, before and after the intervention, in Group A, there was a statistically significant improvement in all variables related to physical fitness and handgrip strength for the nondominant side. Regarding Group B, statistically significant intra-group improvements were also observed in aspects related to flexibility of the upper hemibody (15.8±15cm vs. –12.43±15.7cm; p=0.002), at the strength of the lower hemibody (12.67±2.8 repetitions vs. 14.10±3.0 repetitions; p<0.001), to the flexibility of the lower hemibody (-3.72±13.9cm vs. 2.62±8.96 cm; p= 0.001) and aerobic endurance (75.9±28.1 repetitions vs. 91.6±24.7 repetitions; p<0.001) (Table 3).

Table 3. Intragroup comparison of BMI, handgrip strength and physical fitness of older women with breast cancer subjected to the two home exercise programs.

Parameter (Test)	Group A (n=38)		p*	Group B (n=29)		p*
	Before Mean (SD)	After Mean (SD)		Before Mean (SD)	After Mean (SD)	
BMI (Kg/m^2)	29.3 (3.9)	28.8 (3.7)	0.280	31.2 (5.1)	31.9 (6.4)	0.456
Handgrip strength, kg	19.7 (4.1)	21.4 (3.8)	0.093	18.72 (6.0)	18.24 (4.1)	0.433
Handgrip strength, kg (Non-dominant)	18.6 (3.6)	19.6 (3.4)	<0.001	15.97 (6.5)	17.48 (6.2)	0.035
Upper flexibility (reach back – cm)	-8.74 (10.6)	-0.42 (8.1)	<0.01	-15.8 (15)	-12.43 (15.7)	0.002
Lower flexibility (sit and reach – cm)	-6.76 (8.8)	4.76 (8.1)	<0.01	-3.72 (13.90)	2.62 (8.96)	0.001

continues...

Table 3. Continuation

Parameter (Test)	Group A (n=38)		p*	Group B (n=29)		p*
	Before Mean (SD)	After Mean (SD)		Before Mean (SD)	After Mean (SD)	
Upper strength (forearm flexion – 30 sec)	13.74 (3.4)	17.11 (4.1)	<0.01	15.9 (5.3)	16.83 (4.2)	0.133
Lower strength (stand and sit – 30 sec)	12.03 (2.8)	14.55 (3.1)	<0.01	12.67 (2.8)	14.10 (3.0)	0.001
Agility and balance, in seconds (come and go, 2.44 m)	6.85 (1.3)	6.0 (0.95)	<0.01	7.3 (2.1)	7.2 (1.3)	0.565
Aerobic endurance, in repetitions (2 min stationary march)	79.08 (20.6)	123.30 (23.3)	<0.01	75.90 (28.1)	91.60 (24.7)	0.001

BMI: body mass index; MS: upper limb; MI: lower limb; * Student's *t*-test for independent samples.

For intergroup analysis, the difference in means before and after home exercise protocols was compared. There was a greater difference in Group A related to handgrip strength on the dominant side (1.68 kg vs. -0.48 kg; p= 0.001). In addition, regarding the components of physical fitness evaluated, there was a greater difference, for the older women who performed the physical exercise program of Group A, in the flexibility of the upper hemibody (8.32 cm vs. 3.45 cm; p<0.001), in the lower hemibody strength (2.53 repetitions vs. 1.55 repetitions; p=0.045), at upper hemibody strength (3.37 repetitions vs. 0.86 repetitions; p<0.001), in agility and dynamic balance (-0.85 seconds vs. -0.16 seconds; p=0.011), in the flexibility of the lower hemibody (11.53 cm vs. 5.64 cm; p<0.001) and for aerobic endurance (44.29 repetitions vs. 15.93 repetitions; p<0.001) (Table 4).

Table 4. Intragroup comparison of BMI, handgrip strength and physical fitness of older adult women with breast cancer subjected to the two home exercise programs.

Parameter	Δ GROUP A (95% CI)	Δ GROUP B (95% CI)	Difference	95% CI	p*
BMI (Kg/m²)		0.48 (-0.82;1.77)	-1.00	-2.12;0.13	0.082
Handgrip strength, kg		-0.48 (-1.73;0.76)	2.17	0.89;3.44	0.001
Handgrip strength, kg (Non-dominant)		1.52 (0.12;2.92)	-0.57	-1.89;0.75	0.391
Upper flexibility (reach back – cm)		3.45 (1.40;5.49)	4.87	2.25;7.48	0.001
Lower flexibility (sit and reach – cm)		5.64 (2.63;8.65)	5.89	2.94;8.84	0.001
Upper strength (forearm flexion – 30 sec)		0.86 (-0.28;2.00)	2.51	1.57;3.00	0.001
Lower strenght (stand and sit – 30 sec)		1.55 (0.76;2.34)	0.97	0.02;1.92	0.045
Agility and balance, in seconds (come and go, 2.44 m)		-0.16 (-0.74;0.41)	-0.69	-1.21; -0.16	0.011
Aerobic endurance, in repetitions (2 min stationary march)		15.93 (8.52;23.34)	28.36	18.75;37.96	0.001

95% CI: 95% confidence interval; Δ Group A: difference in the mean before and after the intervention in older adult women with breast cancer subjected to the longest home physical exercise program; Δ Group B: difference in the mean before and after the intervention in older adult women with breast cancer subjected to the shortest home physical exercise program; Difference: Δ Group B – Δ Group A; BMI: body mass index; * Student's *t*-test for independent samples.

Regarding anthropometric data, no significant differences in BMI were observed in the intragroup and intergroup analysis (Tables 3 and 4).

There was no need to interrupt follow-up due to absolute or relative contraindications to physical exercise and no side effect variable was observed. The spontaneously reported events were muscle pain, which ceased on average with one and a half weeks of intervention for both groups. This finding can be explained by the sedentary lifestyle, very common to the analyzed group[18]. However, our study showed a loss of follow-up for Group B, motivated by the participant's lack of time to schedule her evaluations after the end of the 12th week of follow-up. Thus, their data were only accounted for the baseline analyses and were not accounted for or imputed to the results after 12 weeks.

Thus, the number of older women who completed the study for Group B was 29 (Tables 3 and 4).

DISCUSSION

Our study broadens the discussion about the importance of being physically active during hormone therapy treatment for breast cancer. Performing physical activity at home, in the time, intensity, and frequency possible, is better than doing nothing. Whether through progressive exercises or not, this practice is shown to be important for the direct improvement of physical fitness and indirect quality of life of older women with breast cancer in hormone therapy.

Breast cancer survivors spend about 70% of their time in sedentary behavior[19-21]. In addition, more than 70% of these patients do not meet the American Cancer Society recommendations to perform moderate to vigorous physical activity (MVPA) for at least 150 minutes/week[22-24]. In this sense, it is important to emphasize that replacing or decreasing sedentary behavior with physical activities can significantly improve the health of this population[25,26].

A viable option to increase patients' physical activity levels before, during and after treatment is the practice of home-based physical exercises[27,28]. In addition to being safe and low-cost, they can facilitate the gradual adoption of MVPA by older adults. Thus, they can improve physical function and other multidimensional components (social, psychological and spiritual), reducing sedentary behavior habits and positively impacting the motivational levels for the practice of physical activities[29,30].

Based on this assumption, we analyzed and compared the effects of two home exercise protocols (long and short) developed to promote physical fitness gains in the studied population. The instructional manuals provided as an intervention method differed in session times, one protocol being performed in approximately 30 to 45 minutes, and another in approximately 10 to 20 minutes, to identify similarities and differences in effects for the variables tested. To this end, components of physical fitness were evaluated, such as flexibility of the upper and lower hemibody, muscle strength of the upper and lower hemibody, agility and dynamic balance and aerobic endurance.

Among the components of physical fitness, flexibility is a component that naturally suffers reduction with the aging process, and its decline negatively impacts the range of motion (ROM) of the upper and lower hemibody. In breast cancer, the reduction of flexibility and ROM can be influenced by several other aspects related to treatment, disease progression, among others, which has negative impacts on the functionality of women affected by this disease[32].

Within this context, our study observed, in the intragroup analysis, improved flexibility for the upper and lower hemibody of the older women of both Group A and Group B. These data are promising, since all the older women underwent breast surgery (quadrantectomy or total mastectomy) and, for the most part, underwent axillary emptying. There is evidence that the limitation of shoulder range of motion ipsilateral to breast surgery represents one of the main postoperative complications of breast cancer treatment, with shoulder abduction and flexion movements being the most affected[33].

Furthermore, hypomobility of the limb, caused by prolonged immobilization for fear of pain or dehiscence from surgery, as well as the type of surgery performed, the size of the incision, axillary lymph node dissection and trauma to the long thoracic nerve, may lead to this limitation[34]. Thus, the results suggest that the home physical exercise instructional manuals evaluated are an effective strategy for the rehabilitation process and promotion of physical activity in patients.

Regarding muscle fitness, only the older women in Group A showed intragroup gains in muscle strength of the upper hemibody after 12 weeks of intervention. This result can be explained by the fact that the reduced manual (Group B) has only one specific exercise for muscle strengthening of the upper hemibody, while the long manual progressively presented six specific exercises for this purpose. However, it is worth noting that, although no statistically significant gains were observed for Group B on this component of physical fitness, the absolute value of the forearm flexion test after 12 weeks was higher. This may also suggest that the low sample size and/or the duration of the intervention protocol may have influenced the result.

Still in the muscle fitness component, for the lower hemibody, it is necessary to consider that the decreases attributed to aging in lower limb strength, speed and power are associated with the reduced ability to perform basic, instrumental and advanced activities of daily living, such as getting up from a chair, walking unaided and climbing stairs, as well as with increased morbidity[35].

The ability to perform the movement of sitting and standing, for example, can be considered as a determinant of physical independence and preservation of global functionality[35], since gains were observed for both groups in relation to the strength of the lower hemibody, measured by the sit and stand test in 30 seconds.

In this sense, our study suggests that the protocol applied to Group B, even with a smaller amount of exercises and without progression during the 12 weeks, is effective in increasing the peripheral muscle fitness of the lower limbs in patients with breast cancer undergoing hormone therapy.

Another component of physical fitness was agility and dynamic balance, assessed through the back-and-forth test. In this regard, gains were observed only for Group A. Among the contributing factors, it is important to highlight that the manual applied to Group B did not present specific exercises for intervention in these components, having only advised walking, which would have an indirect focus on these variables.

Reductions in muscle mass and strength, associated with balance deficit, increase the risk of falls in older adults. In addition, it is suggested that walking speed, related to dynamic balance, has a stronger association with the risk of falls compared to other components of physical fitness, such as lower limb strength[36], which suggests the need for further studies on interventions focused on this outcome.

Therefore, there was a statistical difference in relation to aerobic resistance, through the stationary gait test, suggesting that both protocols were effective in improving this component of physical fitness. The more pronounced improvement for Group A corroborates the hypothesis that stimuli for short daily walks improve the aerobic endurance of sedentary older women with breast cancer.

Functionality has been an important target for improving the clinical picture among older women with cancer. Furthermore, it is known that intentional weight loss may, in fact, be a key factor in improving the overall physical functioning and muscular fitness of the lower limbs[37]. It is important to highlight that cancer patients, despite needing energy reserve, can benefit from physical exercise protocols capable of adequately controlling their BMI, with evidence that the introduction of aerobic exercise can reduce the negative effects of hormone therapy on bones and body composition[38]. Therefore, starting a walking protocol, even if short, is of great clinical importance.

Gains in palmar pressure strength of the non-dominant side were observed in both groups. These data are important for future discussions, since they are in line with the literature, which suggests that, in order for older women with breast cancer to present gains in their handgrip strength, they should insert more resistance exercises to their routine[27,28]. Thus, our findings point to the possibility of significant strength gains even with few exercises, given that the short manual had only three resistance exercises performed daily, with no indication of load progressions, frequency and/or repetitions.

Authors describe that breast cancer survivors have reduced muscle strength associated with cancer-related symptoms[39,40]. In addition, after mastectomy, 40% of breast cancer survivors have a wrist strength deficit of 10% or more for the surgical side in relation to the contralateral side[41], which makes our findings valuable for reflections on the important and necessary inclusion of home physical exercises in clinical oncology practice.

It is noteworthy that, in the analysis of the intergroup effect difference, Group A, when compared to Group B, obtained a more marked improvement in all the components of physical fitness evaluated. However, despite the intergroup difference, we emphasize that the results obtained by Group B are very encouraging, as they strengthen the important understanding that even interventions with reduced amounts of exercise in relation to that recommended by the literature[18], can promote gains related to the physical fitness of patients. This expands the therapeutic possibilities of rehabilitation and promotion of physical activity, depending on the multidimensional impairment experienced by older women with breast cancer.

Thus, it is important for professionals to understand that, depending on the variables that may interfere with the patients' practice of physical activity, the use of a manual of home physical exercises, whether extensive or reduced, can be an effective alternative for the improvement, maintenance and/or delay of the functional decline of patients, including in combination with other modalities and/or exercise programs. As these are patients in palliative care, the detail makes a difference at the time of prescription and clinical follow-up aimed at controlling signs and symptoms that are deleterious to functionality and quality of life. Thus, "less" may mean "more" in the future.

Individual issues and/or limitations experienced by patients, whether related to physical, psychological, social and/or spiritual aspects, may influence the

motivation to practice physical activities[42]. Thus, manuals with reduced amounts of exercise can be an alternative to positively stimulate patients to initiate and/or maintain physical activities, uniquely or in combination with other methods and programs, such as the Health Gym Program.

CONCLUSION

It was evidenced that the older adult women who performed the exercises of the long manual (Group A) showed greater gains in the components of physical fitness compared to those subjected to the reduced manual (Group B). However, it was observed that both proposed home-based physical exercise protocols (long and short) were effective in improving the physical fitness components of older women with breast cancer undergoing hormone therapy. Thus, the choice of intervention method through the adoption of exercise manuals will depend on the therapeutic objectives to be achieved and agreed between the team and the patient in the development of a unique therapeutic project. To this end, the professional must take into account multidimensional aspects and their impacts (positive or negative) on the motivational levels for the practice of physical activities, cancer progression, side effects of treatment and overall functionality of patients.

Furthermore, we point to the importance of further studies addressing this methodology being carried out in other types of cancers and chronic, progressive and life-threatening diseases, as well as for other age groups, to strengthen and deepen the understanding of the effects of home physical exercises on people's health and quality of life.

AUTHORS' PARTICIPATION

ACCGG was responsible for the conception and design, analysis and interpretation of the data, writing of the article and relevant critical review of the intellectual content. GHLM, BABSF, ÉFT, VRFS and CNC were responsible for data analysis and interpretation, article writing and relevant critical review of intellectual content. BABSF, JGBA, JTAOL, and JRSJ were responsible for overseeing data interpretation and relevant critical review of intellectual content. All authors were responsible for the final approval of the version to be published and for all aspects of the work in ensuring the accuracy and completeness of any part of the work.

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