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Original Article

PHYSICAL EXERCISE PROGRAM FOR HYPERTENSIVE PATIENTS ATTENDED BY PRIMARY HEALTH CARE: ANTHROPOMETRIC VARIABLES AND HEALTHCARE EXPENDITURE

PROGRAMA DE EXERCÍCIO FÍSICO ENTRE HIPERTENSOS ATENDIDOS PELA ATENÇÃO PRIMÁRIA DE SAÚDE: VARIÁVEIS ANTROPOMÉTRICAS E GASTOS COM SAÚDE

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RESUMO
Pouco se sabe sobre o possível impacto da implementação de programas de exercício físico regular sobre adiposidade corporal e gastos com saúde de pacientes atendidos em Unidades Básicas de Saúde, sendo assim, o objetivo do estudo foi implementar e verificar o efeito de um programa de exercício físico com duração de 12 meses, sobre a obesidade e gastos públicos em saúde desses pacientes. Amostra composta por 25 adultos, com idade ≥50 anos, hipertensos e insuficientemente ativos. Anteriormente ao início do treinamento, aos seis meses e ao final foi realizada avaliação da composição corporal, pressão arterial e análise dos gastos em saúde. O treinamento era realizado três vezes na semana com duração de 60 minutos. Para o fator intervenção houve diferença estatisticamente significativa entre os grupos somente para a variável circunferência de cintura (p=0,019). Para os valores de gordura corporal, o grupo intervenção apresentou reduções ao longo do seguimento, as quais foram significativas quando comparadas ao grupo controle. Os gastos com consultas reduziram ao longo do tempo em ambos os grupos (p=0,026). O programa de exercícios físicos foi capaz de proporcionar benefícios ao percentual de gordura corporal dos pacientes, porém gastos com saúde não foram afetados.
Palavras-chave: Saúde pública. Despesas de saúde. Composição corporal. Adulto.

ABSTRACT
Little is known about the possible impact of the implementation of regular physical exercise programs on body adiposity and health expenditures of patients attended in Basic Health Units, so the objective of the study was to implement and verify the effect of a physical exercise program with a duration of 12 months, on obesity and the public health expenditure of these patients. The sample was composed of 25 adults, aged ≥50 years, hypertensive and insufficiently active. Prior to beginning the training, at six months, and at the end of training, body composition, blood pressure, and health expenditure analysis were performed. The training was carried out three times a week with a 60-minute duration. For the intervention factor there was a statistically significant difference between the groups only for the waist circumference variable (p-value = 0.019). For body fat values, the intervention group presented reductions throughout the follow-up, which were significant when compared to the control group. Consultation expenditures decreased over time in both groups (p = 0.026). The physical exercise program facilitated a reduction in the percentage of body fat of the patients, but health expenditures were not affected.
Keywords: Public health. Healthcare expenses. Body composition. Adult.

Introduction

The role of physical exercise, performed in an acute or chronic way, has been evidenced in the literature through studies that prove its efficiency in combating numerous metabolic alterations[1,2]. Among the diseases that can be attenuated and prevented by frequent physical exercise is obesity[3], considered an important comorbidity as it is related to the development of other diseases. Previous studies have reported the significant economic weight of obesity in health systems around the world[4,5]. Likewise, scientific data from research carried out in the Unified Health System (UHS) also show that subjects with greater physical activity practice have lower health expenditures and occurrence of obesity[6]. This is important information, since, in Brazil, data from the National Health Survey (NHS) conducted in 64 thousand households of 1,600 municipalities across the country between August 2013 and February 2014 show that a large part of the population, 71.1%, is served by the public health network, impacting on substantial expenditures[7].

In terms of the functioning of the Brazilian public health system, Basic Care (BC), part of the UHS, provides one form of care through Basic Health Units (BHU), which represent the most distal portion of the health structure and are responsible for the significant capillarity of the UHS in the national territory[8]. In a representative study of the Brazilian population, in the year 2013, 53.4% of the 34.8 million households interviewed were enrolled in a BHU[8].

Although programs performed in these units could provide access to physical exercise for a significant portion of the population, according to a study developed by the Guide for Useful Interventions for Physical Activity in Latin America (GUIA), which covered all regions of Brazil, only 39.5% of Basic Health Units offer programs of physical activity[9].

Parallel to the framework above, we also highlight the decrease in demand for these health promotion programs by older age groups [10]. In fact, in the age range of 50 to 79 years[11], there is a decrease in the demand for health promotion programs, which is a matter of concern, since it is known that the level of physical activity is associated with chronic noncommunicable diseases (NCDs) and risk of mortality, especially among population groups of more advanced age[12].

In summary, although the UHS is a health care structure with high capillarity in the national territory and with the potential to serve a significant portion of the Brazilian population, very little is known about the possible impact of the implementation of regular physical exercise programs on body fatness and health expenditures of patients treated at BHUs. This knowledge is fundamental for public managers, who are decisive in the implementation or not of new programs in the UHS.

Thus, the objective of the present study was to implement and verify the effects of a twelve-month exercise program on obesity and public health expenditures of adult UHS users aged ≥50 years.

Methods

Participants

The selection of the sample was based on a cohort study in progress, which had the following inclusion criteria: i) having an active registry in the UHS and having attended at least one clinical visit in the previous six months and ii) aged ≥ 50 years (age group with a higher prevalence of chronic noncommunicable diseases (NCDs)[13]. The cohort began in September 2013 and was conducted in two Basic Health Units (BHU) located in the metropolitan region of the city of Presidente Prudente, in the west of the State of São Paulo. The choice of BHUs was made by the Municipal Health Department in the city, as these units have large numbers of registered patients.

Among the 512 participants in the cohort, all of them were: i) diagnosed with systemic arterial hypertension (SAH), verified through records in the medical records and ii) reported not practicing physical activities in the sport/exercise domain in free time, verified by means of a questionnaire[14]. Patients were randomly contacted through telephone calls. Those who agreed to participate and met the inclusion criteria were selected. The selection continued until the minimum number of individuals ($n_{intervention}$=20), required by the sample calculation, was reached. Individuals who met the inclusion criteria but did not agree to participate in the training program were allocated to the control group.

The sample calculation was based on data from an earlier transverse experiment[15]. Four sample calculations were performed for mean differences (Student's t-test for independent samples), and the sample size was adopted with provision for a higher number of participants for conduction of the present study. Thus, considering a mean difference of 7.8 reais between active (SD=1.8) and sedentary (SD=5.1) patients for medical examination expenses, a power of 80%, an alpha error of 5%, and an additional 100% for sample losses throughout the intervention, the final calculation determined the need to include at least 20 patients in each group ($n_{total} = 40$).

The training program started with 40 participants, however, during the follow-up, five dropped out and fifteen were excluded, for reasons related to health (n=2), personal reasons (n=5), and exceeding the limit of absences (n=8) (Figure 1). Of the 25 remaining subjects who participated effectively in the intervention, 18 were female and seven were male, mean age 62.17 (9.20) years (at baseline), and 40% (n=10) of the patients were taking beta-blockers.

Medical release was a mandatory requirement and patients who did not receive medical release (prior to the initiation of the physical exercise protocol) and those with a presence of less than 70% in the training sessions (at the end of the exercise protocol) were excluded.

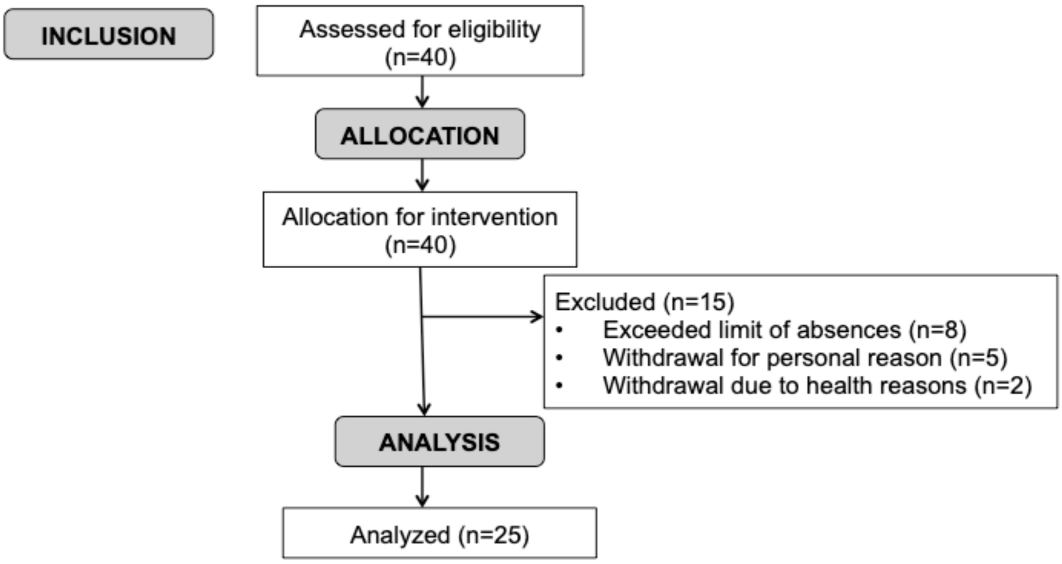

Figure 1. Flowchart of patient exclusion in the 12-month intervention period
Source: Authors

Procedures

The proposed intervention lasted 12 months and occurred between 2014 and 2015, under the supervision of members of the Research Laboratory in Exercise (LIVE), São Paulo State University - UNESP. Regarding evaluation, data were collected at three moments: i) before the training (baseline); ii) after 6 months of training (intermediate); iii) after 12 months of training (final moment).

The training protocol was based on the physical exercise programs suggested by the VI Brazilian Guideline of Hypertension[16] and Guideline of the Brazilian Society of Diabetes[17]. The training was performed three times a week, supervised by professionals and students of Physical Education, properly trained, and each session had an approximate duration of 60 minutes.

The initial and final activities were composed of stretching and muscle relaxation techniques. At the beginning of the session, the type of exercise performed was characterized as aerobic - walking (approximately 30 minutes of activity) at moderate intensity (between

70% and 80% of maximal heart rate), controlled throughout the session through the use of cardiofrequency meters of the POLAR brand, model FT1. For patients using beta-blockers the intensity was controlled using the Subjective Effort Perception Scale (BORG), considering a target training area in the range of 12 to 13[18].

Aerobic activities were followed by activities involving the use of free weights (approximately 25 minutes of activities), which were conducted for the different muscle groups, with series of 8 to 15 repetitions, at an intensity verified by the ability of the individuals to perform repetitions until moderate fatigue, that is, without the speed of movement being impaired. Every 3 months, the individuals were reevaluated and for those who easily performed the proposed number of repetitions, the load was increased until moderate fatigue[16].

Blood pressure (BP) values were measured, after ten minutes of rest, before the beginning of activities and immediately after the end of the physical exercise, using BIC cuffs and stethoscopes. Resting blood pressure values were used to release the participant for the day's exercise session (patients with systolic blood pressure (SBP) ≥160mmHg and / or diastolic blood pressure (DBP) ≥105mmHg did not perform the session).

The analysis of body composition was performed through bioelectrical impedance (InBody brand device ®, model 230). The patients performed the evaluation before beginning the training program, after 6 months of training, and after 12 months of training. The analysis was always performed in the morning, and the patient was instructed not to ingest caffeine or practice vigorous exercises for 24 hours before the evaluation, and to empty the bladder at the moment before the analysis, following the recommendations of the manufacturer[19].

For the calculation of body mass index (BMI), total body mass values, collected at the moment of bioelectrical impedance evaluation, and stature, collected with a stadiometer of the Sanny brand, were used. Waist circumference (WC) was measured following a specific protocol[20], the values were collected using an anthropometric tape of the Sanny brand, model TR-4010[20].

For the analysis of health expenditures, data from consultations and medicines were used, through access to the patients' medical records. All health services were computed and their respective values identified by the financial department of the Municipal Health Department. The values were calculated and expressed in reais (R$). This methodology has been used in previous publications[5,21].

Statistical analysis

Numerical variables are presented as mean and standard deviation values. The comparisons of the variables during the physical exercise program (moments, "initial, after 6 months, and after 12 months) were performed by ANOVA for repeated measures, with Bonferroni post-hoc measurements. Sphericity was tested by the Mauchly test and when values below 0.05 were identified, the Greenhouse-Geisser correction was employed. In all analyzes the statistical significance (p-value) was pre-set as values lower than 5% and the software used was BioEstat (version 5.0).

Results

Table 1 shows the differences between the control group and the intervention group for the values of the anthropometric variables and health expenditures at the initial moment. The control group had a mean age of 67.01 (9.35) and the intervention group of 62.17 (9.2), with no statistically significant difference between them. There was a statistically significant difference between the groups only for the WC variable (p=0.017).

Table 1. Difference between Control Group and Intervention Group, initial moment.

	Control Group (n=29) Mean (SD)	Intervention Group (n=25) Mean (SD)	p-value*
Age (years)	67.01 (9.35)	62.17 (9.2)	0.062
Weight (kg)	77.42 (14.54)	72.23 (12.16)	0.165
BMI (kg/m^2)	31.31 (5.81)	30.71 (5.75)	0.699
Body fat (%)	39.93 (10.36)	41.23 (8.18)	0.616
WC (cm)	100.83 (11.54)	93.25 (11.01)	**0.017***
Blood Pressure			
Systolic (mmHg)	143.44 (26.89)	134.16 (16.55)	0.130
Diastolic (mmHg)	79.69 (11.84)	78.83 (18.40)	0.839
Health Spending (R$)			
Consultations	37.20 (25.85)	39.75 (29.13)	0.735
Drugs	38.63 (37.29)	57.36 (82.99)	0.279
Total	98.76 (63.83)	119.14 (90.80)	0.339

Legend: * = ANOVA; ** = Friedman; SD = Standard Deviation; BMI = Body Mass Index. Intervention Group (n=25); Control Group (n=29)
Source: Authors

Figure 2 (panels A, B, C, and D) presents the differences between the control group and the intervention group for the anthropometric variables and body fat. There was a statistically significant difference between the groups (intervention factor) only for WC (p-value =0.019) (Figure B), in which the intervention group presented lower results over the 12 months. It can be observed that for body fat values, the intervention group demonstrated reductions over time (Figure D), which were significant when compared to the control group.

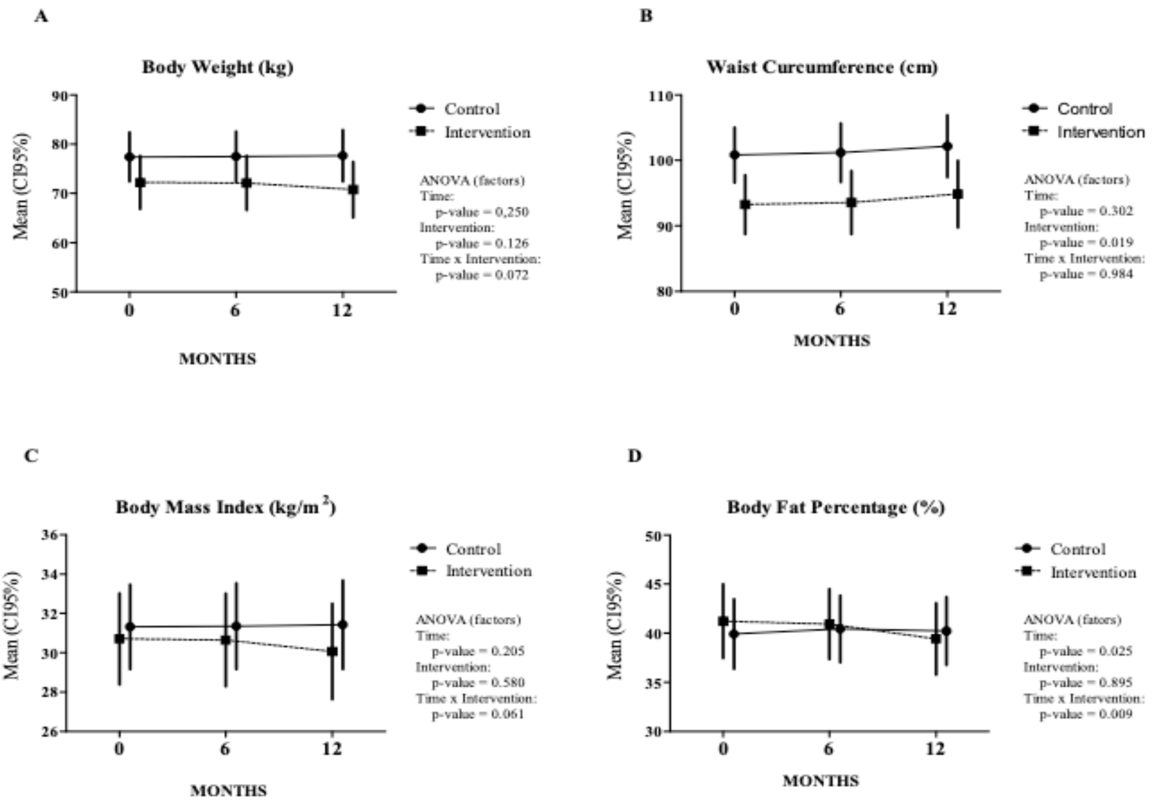

Figure 2. Effect of a physical exercise program on anthropometric parameters and body adiposity of patients attended at the UHS (Presidente Prudente, 2014-2015)
Source: Authors

Figure 3 (panels A, B, and C) presents the differences between the control group and the intervention group for the economic variables. In general, no differences were found over time (12 months) for the variables analyzed. The only significant difference identified was for the values referring to expenses for medical consultations, which reduced over time in both groups (p =0.026) (panel A).

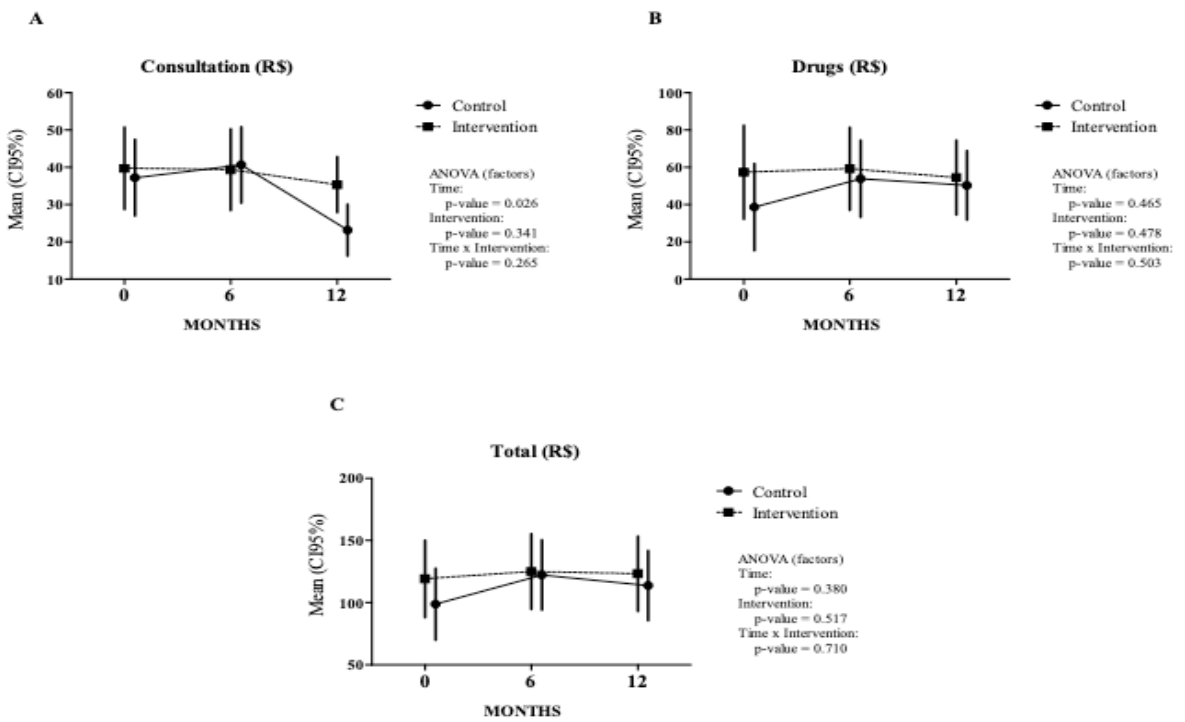

Figure 3. Effect of a physical exercise program on health expenditures of patients treated at the UHS (Presidente Prudente, 2014-2015)
Source: Authors

Discussion

In this 12-month intervention, the intervention group maintained lower WC values compared to the control group throughout the intervention, however these values were already statistically different from the initial moment, prior to the intervention. Although no significant decreases were observed over time, as in previous studies[1,22], it should be emphasized that the fact that WC did not increase during the follow-up is an outcome that should be highlighted, specifically because the sample was composed of more mature adults, since studies show that with advancing age there is an increase in WC, both in women and men[23,24]. In a study by Oliveira et al.[23], performed with individuals aged between 19 and 59 years, the authors observed that as age increased, the body fat concentration also increased, analyzed through WC.

When considering body fat values, the results were more expressive, since both groups presented similar values at baseline, while the intervention group demonstrated more significant reductions over time. It is already evident in the literature that physical exercise programs are capable of impacting body fat[25–27], which is similar to the results of the present study. Following this same line, Parra-Sanchez et al.[28] found significant impacts on body composition, especially total cholesterol, in individuals who used primary care rural health centers in Spain, affected by Diabetes Mellitus, who performed a 3-month aerobic exercise program. This highlights the importance of physical exercise programs carried out in this context. It is noteworthy that, despite the prolonged period of the intervention, the magnitudes of the differences observed for body fat were not high.

Thus, it should be considered that in this sample, older than 50 years, these patients may need a longer time to adapt to the initial phase of training, and thus a greater time to obtain benefits[29], highlighting the relevance of medium and long-term interventions.

Regarding health expenditures, the only variable among those analyzed (consultations, medications, and total expenditure) that presented significant results was the variable "medical consultations", but only for the analysis of the time factor (p=0.026). There was a decrease in the use of consultations in relation to baseline in both groups. In fact, the literature does not clearly identify a significant impact of physical activity/exercise programs on expenditures with medical appointments[30,31]. In a study by Turi et al.[30] carried out with individuals who use UHS Basic Care, the authors observed that the relationship of walking practice with health expenditures only had an impact on total expenditures (which included examinations, consultations, and medication) and not on specific consultations, differing from the present study. It is possible that the longitudinal nature of the present study may have contributed to these findings in relation to medical consultations.

Significant results are usually observed for drug costs [(30,32)], which seem to be more affected by higher intensity physical exercise, as in the case of sports activities[30]. Codogno et al. (2015)[30], observed that, among adult UHS users, health expenditures, specifically for medication, are higher when the users do not practice physical sports activities . This aspect may help to explain the absence of significant results for the economic variables, but also appears to indicate that economic variables need more time to demonstrate an impact from by physical exercise programs, since the previously mentioned studies were analyzed in a transverse manner.

This study has limitations, which should be pointed out. The discrepancy between the number of male and female participants deserves to be highlighted, although it is a reality in UHS Basic Care[33]. In addition, the inclusion of only Primary Care expenditures should be mentioned, since other levels of health care may have generated monetary values not computed herein. Finally, although 12 months of follow-up is a long intervention, economic variables seem to need more time to demonstrate an impact. As a strong point of the research, the complexity of implanting a physical exercise program (following medical guidelines) in the UHS Primary Care structure is emphasized[34].

Conclusions

The physical exercise program used in the present research, adapted to the structure of the UHS, was able to facilitate a reduction in the percentage of body fat of the patients, with the potential to prevent obesity, but health expenses were not affected.

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