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Effects of an Exercise Program on the Levels of Arterial Blood Pressure Older Women, Hypertension and Sedentary in Pharmacological Treatment Process

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Abstract*—The objective of this study was to investigate the changes caused by a program of physically-based physical exercises in the arterial blood pressure (SBP) values of elderly, hypertensive and sedentary women undergoing pharmacological treatment. Two study groups were formed, totalizing 33 subjects with ages ranging from 60 to 75 years, which were constituted as follows: a) an experimental group (EG), composed of 18 hypertensive and sedentary students, under pharmacological treatment and attending the Center of Physical Activity of the Banco do Brasil Athletic Association of Itaberaí, Goiás, Brazil, which during the experiment were regularly submitted to physical exercise routines (Age: 63.8 ± 14.8, Body Weight: 74.7 ± 13.8,

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Height: 165.8 ± 12.6); and b) a control group (CG), composed of 15 students also hypertensive and sedentary, under pharmacological treatment, who during the study were not submitted to physical training routines (Age: 71.6 ± 15.1; Body Weight: 68, 3 ± 13.8, Height: 160.3 ± 12.8). The experimental procedure had a total duration of 10 weeks, in which the EG was submitted to aerobic physical exercises controlled by the perceived effort index, associated with resistance exercises aimed at localized muscular resistance, and the training sessions were performed on Mondays, Wednesdays and Fridays 60 minutes each. At the end of the procedures the statistical analysis allowed to observe that the PASS scores presented by the SG and GC accounted for p = 0.000 and p = 0.150, indicating statistical significance only for SG, whose mean values were reduced by 6.5 mmHg, differently from the scores of CG, which decreased by only 0.5 mmHg, representing 5.16% and 0.36% of functional improvement in the variable in question. A similar behavior was found when analyzing the PASD values, which at the end of the experimental procedure had a p = 0.017 and p = 0.051 for the EG and CG, respectively. Likewise, statistical significance was detected only in the EG, whose mean scores decreased numerically by 4.0 mmHg, distinct from the CG that involved only 0.7 mmHg, meaning 4.60% and 0.82 %% of physiological improvement in the variable under discussion. These findings suggest that a physical exercise program built on a scientific basis may be a valuable tool in nonpharmacological therapy for arterial hypertension.

Keywords— hypertension, older women, physical training, Exercise Program, Pharmacological treatment.

I. INTRODUCTION

According to Pollock & Wilmore (1993), Hypertension (HBP) is an occurring pathological condition inside the arterial blood vessels, characterized by a chronic elevation of blood pressure above considered desirable levels or healthy for the person's age, during the cardiac cycle.

To Abernethy and Andrawis (1997) the pathophysiology of hypertension is not fully defined, with some risk factors associating the same and increasing their probability of occurrence, such as diet, physical inactivity, obesity, metabolic and hormonal changes, trophic phenomena (hypertrophy heart and vascular), alcoholism, smoking, race, age, among others.

Corroborating the ACMS (1995) adds that the HAS curve has increased in recent decades throughout the world, reaching global epidemic proportions, since, alone or together with other organic complications change the morbidity statistics and global mortality rates alarming, raising spending on health at very high values.

According Osiecki (1996), HAS is constituted a problem occurring public health in developed countries, but also in the lower evolution, a ratio of 25 to 30% of the adult population, with Brazilian studies showing a prevalence between 12 and 35% in different national regions, which is in our country about 20 million individuals affected by this disease.

According Farinattietalli (2005), this condition is widely regarded as the main cause the onset of cardiovascular diseases, and is an important precursor in death occurrences within the next decades.Sgambatti, Pierin and MionJr (2005), published in Brazil this disease has a high social cost, accounting for about 40% of cases of early retirement and work absenteeism.

On this subject, Ramos and Miranda (1999) complement stating that in Brazil this disease has a secular trend of growth since the mortality from this disease was less than 12% in 1930, reached 30.5% in 1980, and currently reaches about 15 to 20% of the adult population over 18 years, reaching levels of 55% in individuals older than 50 years. For Neri (2000), in the case of elderly people, though in different scales, the changes that occur with aging are found in all individuals are suitable for this normal physiological process.

Neto and Bridge (2000) found that the interaction of aging own modifications, as well as those resulting from pathological processes, are responsible for the clinical presentation of various diseases, among them hypertension, which, according Dorea and Lotufo (2001) it becomes more severe in this population, since acts speeding own changes of senescence, which can generate as well as functional disabilities also social dependence.

To Shoji and Forjaz (2000), the control of this disease is made using the pharmacological and non-pharmacological treatments. Drug therapy is indicated for moderate / severe hypertension, and for those with risk factors for cardiovascular diseases and / or injury to important target organs. While effective in reducing blood pressure values, it is costly and can have side effects motivating abandonment of treatment.

According to Da Silva (2004), non-pharmacological interventions such as alcohol restrictions, abandoning smoking and regular physical activity, because they pay to changes in personal lifestyle in order to prevent or deter the development of hypertension, have been reported for its effectiveness, low cost and low risk, and Surinam cherry (1999), reports the latter being present as main prophylactic tool against hypertension.

Such statements do not necessarily constitute academic news regarding the subject, Amado (1993) stating that studies of the time have demonstrated the efficacy of

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physical activity in lowering arterial blood pressure levels, however, the ideal intensity not being well established for realization of this physical activity in order to bring more significant results in the decrease in their scores.

On this subject, Rodrigues de Almeida (1999) warns of the importance of detailed planning of physical activity, showing for this, four basic aspects during its execution: intensity or quality, volume or duration, frequency and repetition of stimuli. Said authors suggest that an optimal state of systemic functional organic condition of an individual can only be achieved when the variables mentioned above are suitably designed and bandaged a working system scientifically systematized regarding the prescription and control of training loads, it the author calls "physical exercise".

On the foregoing and considering that hypertension is a major risk factor for cardiovascular complications, accounting for 40% of deaths in the elderly population (Brandao et ali, 2003), is intended to contribute to the development of non-drug strategies that may be effective in prophylaxis or therapy, estending to this line of research, investigating what changes caused by a scientifically metodizados exercise program, the values of arterial blood pressure of hypertensive elderly women and not subjected to pharmacological treatment.

II. MATERIAL AND METHODS

Population and Sample

The study population consisted of older female, regularly enrolled and attending the project "Seniors in Action", developed by the Municipal Itaberaí Education, Goiás, Brazil, with the sample consisting of 33 subjects aged 60 75 years.

Initially it conducted a first personal contact with the Secretary of Municipal Education mentioned above, to explain the nature of the study and the relevance of research and request the authorization to carry out the data collection. Thereafter, two were randomly structured study groups: a) one experimental group (EG) composed of 18 students pharmacological treatment and regularly during the experiment underwent the exercise routines; b) a control group (CG) consisted of 15 students also pharmacological treatment, which, during the study of exercise routines were not submitted.

Study variables, equipment and standardization of measures

In this first study measured the anthropometric parameters: a) Total Body Weight (PCT); b) Height (EST), which along with the reported age were used only to characterize the sample. Then it was performed the measurement of arterial blood pressure (PSA), which is the dependent variable of this study, and used for this patterning and the following equipment:

1. The PCT, understood as the resultant of system forces exerted by gravity on the total body mass (Matsudo, 1987), was measured using an electronic balance Filizola with a capacity of 150 kg and an accuracy of 1g and values are expressed in kg - kg. The measurement was performed with the equipment placed on level ground, with the evaluating standing in the center of the platform, an upright position and back to the measurement scale, with the horizontally shaped head, the legs slight lateral clearance and arms relaxed at along the body (PETROSKI, 1999).
2. EST understood as straight vertical length between the plantar region and the vertex (highest point of the head) (cherry, 2008), was measured using a portable estadiometer the Avanutri make and accurate to 1 mm, and its values expressed in cm - cm. The measurement was performed with the subject barefoot, heels, buttocks, the shoulder girdle and occipital discrete contact strip perpendicular. According recommends standardizing a transverse cursor was slipped by the ruler to support vertex forming a right angle. The reading was performed with evaluating at maximal inspiration and the head directed to the Frankfurt plane (PETROSKI, 1999).
3. PSA, defined as the pressure exerted by the blood inside the blood vessels, due to the cardiac ventricular systole and opposite vascular resistance to blood flow (ROBERGS & Roberts, 2009), was measured using a stethoscope model Dusonic and two sphygmomanometers model aneroid both the HEIDJI marks, one for individuals with arm circumference measuring 27-34 cm and the other for subjects measured in said segment between 35 and 44 cm, and their amounts expressed in millimeters of mercury - mmHg .

To measure we used the protocol MionJr&Marcondes (1986), by which before physical activity and without having ingested caffeine in the last 60 minutes the individual is initially positioned sitting for 5 minutes with a straight and supported back, left forearm being extended half the palm open, relaxed and upward, both on a height-adjustable table with the naked completely left arm and the height of the chest region. Then the evaluator positions the occluder cuff of the sphygmomanometer on the left brachial artery closes the valve of the pump to inflate and the index and middle fingers together palpating the brachial artery to realize the cardiac pulse. Then inflates the cuff occluderto no longer feel the heartbeat, then positions when the headset terminal ears

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of the stethoscope, with the olives facing forward, placing the hood in said apparatus antecubital fossa approximately 2.5 cm from the elbow crease, on the brachial artery, and slowly opens the valve air control gently lowering the pressure of the cuff. The first and the last heard sound corresponding to the systolic and diastolic components of arterial blood pressure, respectively, must be measured twice at intervals of 60 seconds between them, adopting the lowest measured value as a final result of the measurement. and slowly opens the air control valve smoothly decreasing the cuff pressure. The first and the last heard sound corresponding to the systolic and diastolic components of arterial blood pressure, respectively, must be measured twice at intervals of 60 seconds between them, adopting the lowest measured value as a final result of the measurement. and slowly opens the air control valve smoothly decreasing the cuff pressure. The first and the last heard sound corresponding to the systolic and diastolic components of arterial blood pressure, respectively, must be measured twice at intervals of 60 seconds between them, adopting the lowest measured value as a final result of the measurement.

Treatment of the independent variable

Preceding the application of Physical Exercise Program (PEF) was established a period of three (3) days to allow the students to familiarize themselves and learning the mechanical aspects of the exercises, posture and breathing to be used in training routines. Aiming to reduce and even prevent possible failures during the process control of training loads, as well as data collection, counted on the collaboration of two (2) physical education professionals, whichpreceding the execution of the work of the day were responsible for checking the condition of the materials to be used, noting the internationally agreed standards in kinanthropometry.

The AEP had a total duration of 10 weeks, being composed of three training weekly sessions on alternate days (2ª, 4ª and 6ª shows), lasting 60 minutes each, which were divided into 3 teaching parts, discrimination as follows:

1) Preparatory Part Initially aiming to activate the circulation and increase blood supply to muscle tissue in general, we used a dynamic stimulation of the continuous type, which was executed in the form of brisk walking for three (3) minutes. Subsequently in order to stretch the muscle groups to be further used during the workout, as well as, improve joint mobility of the subjects, for seven (7) minutes was used stagnant exercises located in the volutivamente individuals seeking functional mobility threshold articulate multidirectional joints of the wrist, elbow, shoulder, hip, knee and ankle, remaining in this position for a while 10-12 seconds and repeats the procedure for each joint by 2 times sequenced (NUNES, 1998).

2) Main Part: First, to promote morphological and functional improvements in the neuromuscular system, the subjects were positioned statically and performed resistance exercises using sticks made of plastic pipe, measuring 5 mm in diameter and 1 m long, and also leggings napa made with a Velcro fastener, both implements being filled with 1 kg of sand.

Then, aiming to develop muscular endurance more functional muscle groups in the routine of subjects obeyed to Dantas suggestion (1995) being prescribed ten (10) years circuit, which were performed in ten (10) minutes, running the same alternating segments of conducting the following order: 1) flexion of the carpus; 2) ½ squat; 3) partial trunk flexion; 4) bending the forearm; 5) extension plant; 6) dorsiflexion; 7) extension of the carpus; 8) bending the leg; 9) the back-extension; and 10) bench press. Subjects began PEF realizing the largest possible number of uninterrupted repetitions of these exercises in unit time of twenty (20) seconds, this time enhanced with ten (10) seconds to each training week, up to one (1) minute, this time maintained until the end of the experiment. From the first week of training was set to be no break in the transition between these, with individuals carrying two (2) passes through the circuit, across which it is imposed a liability range of one (1) to two (2) minutes of rest .

Continuing, in order to promote morphological and functional improvements in the cardiovascular system, we used a dynamic stimulation of the continuous type, which was executed in the form of brisk walking for thirty (30) minutes, being the intensity of effort controlled by the sense subjective fatigue (ACSM, 1995), with the subject standing perception of fatigue in the first week of work at level 6 (moderate), which progressed weekly in a drive to reach level 8, remaining this for four (4) weeks , reaching the level 9 (strong) in the eighth week of training and continued until the end of the experiment.

3) Final Part: Ending the training session and auxiliary aim at removing exudates cell combustion, immediately following the close of the thirty (30) minutes for the front, the subjects continued to walk for three (3) minutes now moderately, gradually decreasing the intensity to make the smooth ride. Later in order to stretch the muscle groups most requested in training for seven (7) minutes the same stagnant years in the beginning of the training session were repeated, repeating the same procedures and the same joints.

Statistical analysis

In this experiment, the data were analyzed by the following procedures: a) initially descriptive statistics was performed to characterize the sample; b) subsequently

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possible to detect statistically significant differences in scores for the physical characteristics of the experimental and control groups, the test was used "t" test for independent samples; c) finally, to compare the values of SBP pre and post-test during the experimental period was using the Student "t" test for dependent samples.

Data were processed and analyzed using computerized statistical package Statistica for Windows, version 4.3 Incorporation Starsoft, seeking a significance of $p < 0.05$.

III. RESULTS AND DISCUSSION

With characterize the sample order, is shown in Table 1 Analysis test "t" test for independent samples, the average values and their standard deviations for the variables: age, height and body weight of the experimental groups (EG) and Control (GC) at the beginning of the experiment. The statistical significant differences between treatment accused scores, demonstrating the heterogeneity of the sample.

Table.1: Physical characteristics of the sample.

VARIABLES	EXPERIMENTAL GROUP	CONTROL GROUP	t	p
AGE (years)	63,8 ± 14,8	71,6 ± 15,1	0,85	0,041*
STATUS (cm)	165,8 ± 12,6	160,3 ± 12,8	2,93	0,033*
WEIGHT (kg)	74,7 ± 13,8	68,3 ± 13,8	4,55	0,037*

* Significant at the level of $p < 0.05$

In accordance with the objectives of this study are presented in Table 2 Analysis test "t" test for dependent samples the average values and their standard deviations for the variables Arterial Blood Pressure Systolic (PASS), and Blood Pressure Blood Diastolic (DSAP), the experimental and control groups at the beginning and end of the experiment.

Table.2: Values in mm / Hg of Blood Pressure Blood components of the experimental and control groups, the pre - and post-test.

STUDY GROUPS	BLOOD PRESSURE SYSTOLIC BLOOD – PASS - mmHg -				BLOOD PRESSURE DIASTÓLICA BLOOD – PASD- mmHg -			
	PRE TEST	POST TEST	T	P	PRE TEST	POST TEST	t	p
GE	132,42 ±6,36	125,92 ±5,31	10,51	0,000*	86,89 ±3,88	82,84 ±3,26	2,73	0,017*
GC	136,64 ±4,53	136,14 ±4,62	1,52	0,150	84,85 ±3,50	84,07 ±3,14	2,14	0,051

* Significant at the level of $p < 0.05$

IV. CONCLUSIONS

According to the questioning of this research, as well as considering the analysis and discussion of these results, we can see a statistically significant behavior of the sample scores for the test and retest ($p < 0.005$), suggesting that an exercise program built on foundations scientific, it can be a valuable tool in the non-drug treatment of hypertension.

Thus, it is concluded that the methodology used in this study for the prescription of training loads allowed a qualitative control of these, a fact that reflected in the efficiency of the same. Given these findings suggest the new studies analyzing the effects of aerobic training and resistance in senile population in different intensities of physical exertion, with a larger sample and grouped by age group, aiming only ratifies the results of this research also extend this line of research.

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