CAPÍTULO 1

DATA ANALYSIS OF BLOOD PRESSURE LEVELS UNDER THE EFFECT OF A PHYSICAL EXERCISE PROGRAM IN HYPERTENSIVE AND SEDENTARY ELDERLY WOMEN UNDERGOING PHARMACOTHERAPY

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ABSTRACT: The objective of the book chapter of the study was to investigate the changes caused by a scientifically methodized physical exercise program in the arterial pressure (SBP) values of elderly, hypertensive and sedentary women undergoing pharmacotherapy. Two study groups were formed, totaling 33 subjects aged between 60 and 75 years, which were constituted as follows: a) an experimental group (EG), composed of 18 hypertensive and sedentary students, undergoing pharmacotherapy and attending the Health Center Physical Activities of the Banco do Brasil Athletic Association of Itaberaí – GO, which during the experiment regularly underwent physical exercise routines (Age: 63.8 ± 14.8; Body Weight: 74.7 ± 13.8; Height: 165.8 ± 12.6); and b) a control group (CG), composed of 15 students who were also hypertensive and sedentary, under pharmacotherapy, who during the study were not subjected to physical training routines (Age: 71.6 ± 15.1; Body Weight: 68. 3 ± 13.8; Height: 160.3 ± 12.8). The experimental procedure lasted a total of 10 weeks, in which Ge was subjected to aerobic physical exercises controlled by the perceived rate of effort, associated with resistance exercises aiming at localized muscular resistance, with the training sessions being carried out on Mondays, Wednesdays and Fridays. Mondays, lasting 60 minutes each. At the end of the procedures, statistical analysis allowed us to observe that the scores related to PASS presented by the EG and CG showed p=0.000 and p=0.150, indicating statistical significance only for EG, whose average values were reduced by 6.5 mmHg, unlike the scores of the CG that decreased by only 0.5 mmHg, representing respectively 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 presented p=0.017 and p=0.051 for the EG and CG, respectively. Likewise, statistical significance was detected only in the EG, whose average scores decreased numerically by 4.0 mmHg, against only 0.7 mmHg in the CG, meaning respectively 4.60% and 0.82%% of physiological improvements in the variable in question discussion. These findings suggest that a physical exercise program built on scientific bases can be a valuable tool in the non-pharmacotherapy of arterial hypertension.
KEYWORDS: Data Analysis, *Arterial Hypertension, Elderly Women, Physical Training.*

INTRODUCTION

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

For Abernethy and Andrawis (1997), the pathophysiology of SAH is not fully defined, with some risk factors being associated with it and increasing its probability of occurrence, such as: diet, sedentary lifestyle, obesity, metabolic and hormonal changes, trophic phenomena (hypertrophy heart and vascular disease), alcoholism, smoking, race, age, among others.

Corroborating this, the ACMS (1995) adds that the SAH curve has been growing in recent decades throughout the world, reaching global epidemic proportions, since, alone or associated with other organic complications, it changes global morbidity and mortality statistics to rates alarming, increasing healthcare costs to sky-high values.

According to Osiecki (1996) and Silva (2021), SAH constitutes a public health problem occurring both in developed countries and in less developed countries, in a proportion of 25 to 30% of the adult population, with Brazilian studies showing a prevalence between 12 and 35% in different national regions, which represents approximately 20 million individuals in our country affected by this disease.

According to Farinatti et al (2005), this pathology is understood worldwide as the main cause of the appearance of cardiovascular diseases, and will be an important precursor in the occurrence of mortality over the coming decades. Custódio & Cavalcante (2023): published that in our country this disease has a high social cost, with Sgambatti, Pierin and Mion Jr (2005) postulating that it is responsible for around 40% of cases of early retirement and absenteeism in the country. work.

On this subject, Ramos and Miranda (1999) complement by stating that in Brazil this pathology presents a secular growth trend, since mortality from this disease was less than 12% in 1930, reached 30.5% in 1980, and it currently affects around 15 to 20% of the adult population over 18 years of age, reaching rates of 55% in individuals over 50 years of age. For Néri (2000), when it comes to the elderly, although on different scales, the changes that occur with aging are found in all individuals as they are typical of this normal physiological process.

Neto and Ponte (2000) state that the interaction of changes typical of aging, as well as those resulting from pathological processes, are responsible for the clinical presentation of several diseases, including SAH, which, according to Dórea and Lotufo (2001) and Silva et Alli (2023), becomes more serious in this population, as it acts by accelerating the changes typical of senescence, and can generate, in addition to functional disabilities, also social dependence.

For Shoji and Forjaz (2000), this pathology is controlled using pharmacological and non-pharmacological treatments. Drug therapy is indicated for moderate/severe hypertensive patients, and for those with risk factors for cardiovascular diseases and/or significant damage to target organs. Despite being effective in reducing blood pressure values, it is expensive and may have side effects leading to treatment abandonment.

According to Da Silva (2004), non-pharmacological interventions such as: alcohol restriction, smoking cessation and regular physical activity, as they lend themselves to changes in personal lifestyle in order to prevent or stop the evolution of SAH, have been reported for their effectiveness, low cost and minimal risk, with Pitanga (1999) reporting the latter as currently being the main prophylactic tool against SAH.

Such statements do not necessarily constitute academic novelties in relation to the topic, with Amado (1993) stating that studies at the time already demonstrated the effectiveness of physical activity in reducing blood pressure levels, however, the ideal intensity for carrying out this, in order to bring more significant results in reducing their scores.

On this subject, Rodrigues de Almeida (1999) warns of the importance of detailed planning of physical activity, highlighting four basic aspects during its execution: intensity or quality, volume or duration, frequency and repetition of stimuli. The aforementioned author suggests that an optimized state of an individual's systemic functional organic condition will only be achieved when the previously mentioned variables are adequately planned and included in a scientifically methodized work system regarding the prescription and control of training loads, which the author calls it "physical exercise".

In view of the above and considering that hypertension is a relevant risk factor for cardiovascular complications, being responsible for the high rates of deaths in the elderly population (BRANDÃO et ali, 2003; MELO et ali, 2023), we intend to collaborate to the development of non-drug strategies that prove to be efficient in their prophylaxis or therapy, theseThis line of research aims to investigate the changes caused by a scientifically methodized physical exercise program in the arterial blood pressure values of hypertensive elderly women not undergoing pharmacological treatment.

MATERIAL AND METHODS

POPULATION AND SAMPLE

The population of this study was composed of elderly females, regularly enrolled and attending the “Third Age in Action” Project, developed by the Municipal Department of Education of Itaberaí – GO, with the sample consisting of 33 subjects aged 60 to 75. years.

Initially, a first personal contact was made with the Secretary of Education of the Municipality mentioned above, to explain the nature of the study and the relevance of the research, as well as to request authorization to carry out data collection. From then on, two study groups were randomly structured: a) an experimental group (EG), composed of 18 students under pharmacological treatment and who, during the experiment, regularly underwent physical exercise routines; and b) a control group (CG), composed of 15 students also under pharmacological treatment, who, during the study, were not subjected to physical exercise routines.

STUDY VARIABLES, EQUIPMENT AND MEASUREMENT STANDARDIZATION

In this study, the following anthropometric parameters were initially measured: a) Total Body Weight (PCT); and b) Height (EST), which together with the reported age, were used only to characterize the sample. Arterial Blood Pressure (PSA) was then measured, which represents the dependent variable of this study, using the following equipment and standards for this purpose:

a. The PCT, understood as the resultant of the system of forces exerted by gravity on the total body mass (MATSUDO, 1987), was measured using an electronic scale from the Filizola brand, with a capacity of up to 150 kg and an accuracy of 1g being their values expressed in kilograms - kg. The measurement was carried out with the equipment positioned on level ground, with the person being evaluated standing in the center of the platform, in an upright posture and facing away from the measuring scale, with the head horizontal, the legs slightly laterally apart and the arms relaxed at the side. along the body (PETROSKI, 1999).

b. EST, understood as the vertical linear length between the plantar region and the vertex (highest point of the head) (PITANGA, 2008), was measured using a portable stadiometer from the Avanutri brand and with an accuracy of 1mm, with its values expressed in centimeters - cm. The measurement was obtained with the subject barefoot, the heels, buttocks, shoulder girdle and occiput in discreet contact with the perpendicular ruler. As recommended by standardization, a transverse cursor was slid across the ruler to the support at the vertex, forming a right angle. The reading was performed with the subject at maximum inspiration and with the head directed towards the Frankfurt plane (PETROSKI, 1999).

c. PSA, conceptualized as the pressure exerted by the blood inside the blood vessels, depending on the cardiac ventricular systole and the vascular resistance opposing the blood flow (ROBERGS & ROBERTS, 2009), was measured using a Dusonic model stethoscope and two aneroid model sphygmomanometers, both from the brand HEIDJI, one for individuals with an arm circumference measuring 27 to 34 cm and the other for individuals with a measurement in that segment between 35 and 44 cm, their values being expressed in millimeters of mercury - mmHg.

For measurement, the protocol by Mion Jr & Marcondes (1986) was used, whereby before physical activity and without having ingested caffeine in the last 60 minutes, the individual is initially positioned seated for 5 minutes with the back erect and supported, the left forearm semi-extended with the palm of the hand open, relaxed and facing upwards, both on an adjustable height table, with the left arm completely bare and at the height of the precordial region. The evaluator then positions the occluding cuff of the sphygmomanometer over the left brachial artery, closes the inflation pump valve and, with the index and middle fingers together, palpates the brachial artery to perceive the heart pulse. Then inflate the occluder cuff until you no longer feel the heartbeat, when you then place the ear terminal of the stethoscope in your ears, with the ear tips facing forward, placing the bell of the instrument in the antecubital fossa approximately 2.5 cm from the fold the elbow, over the brachial artery, and slowly open the air control valve, gently decreasing the cuff pressure. The first and last sounds heard correspond to the systolic and diastolic components of blood pressure, respectively, and two measurements must be taken with intervals of 60 seconds between them, adopting the lowest value measured as the final result of the measurement.

TREATMENT OF THE INDEPENDENT VARIABLE

Prior to the application of the Physical Exercise Program (PEF), a period of three (3) days was established to enable students to familiarize themselves with and learn the mechanical aspects of the exercises, posture and breathing to be used in training routines. Aiming to reduce and even avoid possible failures during the process of controlling training loads, as well as data collection, we had the collaboration of two (2) Physical Education professionals, whoBefore carrying out the day's work, they were responsible for checking the condition of the materials to be used, paying attention to internationally agreed standards in kineanthropometry.

The PEF lasted a total of 10 weeks, consisting of 3 weekly training sessions held on alternate days (2nd , 4th and 6th) , lasting 60 minutes each, which were divided into 3 pedagogical parts, as per breakdown below:

1) Preparatory Part: Initially aiming to activate circulation and increase blood supply to muscle tissues in general, a continuous dynamic stimulus was used, which was

performed in the form of vigorous walking for three (3) minutes. Subsequently, with the aim of stretching the muscle groups that would be most used during training, as well as improving the subjects' joint mobility, localized stagnant exercises were used for seven (7) minutes, in which the individuals voluntarily sought the limit of joint functional mobility. multidirectional movement of the wrist, elbow, shoulder, hip, knees and ankle joints, remaining in this position for 10 - 12 seconds, repeating the procedure in each joint twice in sequence (NUNES, 1998).

2) Main Part: Firstly, to promote morphological and functional improvements in the neuromuscular system, the subjects positioned themselves statically and performed resistance exercises, using poles made of plastic pipe, measuring 5 mm in diameter and 1 m in length, as well as shin guards made of nappa leather and with velcro closure, both implements being filled with 1 kg of sand.

Then, aiming to develop localized muscular resistance of more functional muscle groups in the subjects' daily lives, Dantas' suggestion (1995) was followed, with ten (10) circuit exercises being prescribed, which were performed in ten (10) minutes, being performed by alternating the segments in which they are performed in the following order: 1) flexion of the carpus; 2) ½ squat; 3) partial flexion of the trunk; 4) flexion of the forearm; 5) plantar extension; 6) dorsiflexion; 7) carpal extension; 8) leg flexion; 9) back-extension; and 10) bench press. The subjects began the PEF by performing the greatest possible number of uninterrupted repetitions of these exercises in a time unit of twenty (20) seconds, this time being increased with ten (10) seconds each week of training, until reaching one (1) minute, This time was maintained until the end of the experiment. From the first week of training, there was no rest in the transition between these, with individuals performing two (2) passes through the circuit, between which a passive interval of one (1) to two (2) minutes was established for rest. .

Next, with the aim of promoting morphological and functional improvements in the cardiovascular system, a continuous dynamic stimulus was used, which was performed in the form of vigorous walking for thirty (30) minutes, with the intensity of the effort controlled by the sensation subjective fatigue (ACSM,1995), with the subjects placing the perception of fatigue in the first week of work at level 6 (moderate), which progressed weekly by one unit until reaching level 8, remaining there for four (4) weeks , reaching level 9 (strong) in the eighth week of training and maintained until the end of the experiment.

3) Final Part: Ending the training session and with the aim of assisting in the removal of exudates from cellular combustion, immediately after the end of the thirty (30) minutes relative to the previous part, the subjects continued walking for another three (3) minutes, now in a moderate way, gradually reducing the intensity until the movement becomes smooth. Subsequently, with the aim of stretching the muscle groups most used in training, the same stagnant exercises from the beginning of the training session were repeated for seven (7) minutes, repeating the same procedures and on the same joints.

STATISTICAL ANALYSIS

In this experiment, data were analyzed using the following procedures: a) initially descriptive statistics were performed to characterize the sample; b) subsequently, to detect possible statistically significant differences in the scores related to the physical characteristics of the EG and CG, the Student "t" test was used for independent samples; and c) finally, to compare SBP values in the pre- and post-test during the experimental period, the Student "t" test was used for dependent samples.

The data were processed and analyzed using the computerized statistical package STATISTICA for windows version 4.3 from Starsoft Incorporation, seeking a significance of $p< 0.05$.

RESULTS AND DISCUSSION

In order to characterize the sample, Table 1 presents the analysis of the Student "t" test for independent samples, of the mean values and their respective standard deviations for the variables: Age, Height and Body weight of the experimental groups (GE) and Control (CG), at the beginning of the experiment. The statistical treatment revealed significant differences between the scores, demonstrating the heterogeneity of the sample.

VARIABLES	EXPERIMENTAL GROUP	GROUP CONTROL	t	P
AGE (years)	63.8 ± 14.8	71.6 ± 15.1	0.85	0.041*
STATURE (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*

Table 1: Physical characteristics of the sample.

* Significant at p<0.05 level

In line with the objectives of this study, Table 2 presents the analysis of the Student "t" test for samples dependent on the mean values and their respective standard deviations for the variables Systolic Blood Pressure (PASS) and Diastolic Blood Pressure (PASD), of the EG and CG at the beginning and end of the experiment.

STUDY GROUPS	BLOOD PRESSURE SYSTOLIC BLOOD – PASS - mmHg -				BLOOD PRESSURE DIASTOLIC 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

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

*Significant at p<0.05 level

When analyzing the aforementioned table, it is observed between the beginning and end of the experiment, that the scores related to PASS presented by the EG and CG showed p=0.000 and p=0.150, indicating statistical significance only for EG, whose average values were reduced by 6.5 mmHg, unlike the CG scores that decreased by only 0.5 mmHg, scores that respectively represent 5.16% and 0.36% of functional improvements in the variable in question.

A similar behavior was found when analyzing the PASD values, which at the end of the experimental procedure presented p=0.017 and p=0.051 for the EG and CG, respectively. Likewise, statistical significance was detected only in the EG, whose average scores decreased numerically by 4.0 mmHg, compared to just 0.7 mmHg in the CG, showing respectively 4.60% and 0.82%% of physiological improvements in the variable in question. discussion.

The statistical significance and the best scores found in the GE allow us to assume the positive effect of the independent variable of this study, that is, the efficiency of the PEF. The results found in this experiment coincide with those of Rodríguez, Costa and Vieira (2008), who found significant reductions in PASS and PASD values in hypertensive and sedentary elderly women after 12 weeks of aerobic exercises, which were carried out in two weekly sessions lasting of 30 minutes at an intensity between 50% and 60% of maximum oxygen consumption.

In this aspect, the ACSM (1993) also showed an average reduction of 10 mmHg for both systolic and diastolic blood pressure, resulting from regular physical exercise programs, and Eaton (1995) found significant correlations between the reduction in blood pressure levels arterial blood flow and improvement of physical condition.

In a review of several experimental studies including hypertensive and normotensive subjects, Seals & Hagberg (1984), analyzed twelve studies with different methodologies and concluded that the range of reduction in systolic blood pressure was between 6 and 15% and for diastolic blood pressure between 6 and 14%. , establishing an average reduction for SBP of 6% and for DBP of 7%, values similar to those found in this study. The ACSM Stand Position (1993) also shows an average reduction of 10 mmHg in both systolic and diastolic blood pressure, resulting from regular aerobic exercise programs.

In this sense, Martin, Dubbert and Cushman (1990) and Santos (2023) consider that the incidence and severity of SAH is inversely related to physical fitness levels, and that many studies confirm the reduction of SBP in subjects participating in regular programs of aerobic exercises, and this fact also happened in this experiment.

CONCLUSIONS

According to the problematization of this research, as well as considering the analysis and discussion of these results, a statistically significant behavior of the sample scores for test and retest ($p < 0.005$) can be seen, suggesting that a physical exercise program built on the basis scientific studies, can be a valuable complementary tool in the non-pharmacological therapy of T2DM.

Thus, it is concluded that the methodology used in this study to prescribe training loads allowed qualitative control of these, a fact that had an impact on their efficiency. Therefore, it is clear and evident that a physical exercise program can have beneficial effects on the control of subjects' arterial blood pressure and under the conditions described in the present study.

In view of these findings, it is suggested that new studies be carried out analyzing the effects of aerobic and resistance training in the senile population, at different intensities of physical effort, with a larger sample and grouped by age group, with the aim of ratifying the results of this investigation, also extend this line of research.

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