

ORIGINAL ARTICLE

Interdisciplinary Therapy and Decrease of Cardiovascular Overload in Obese Patients

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Abstract

Background: Association between obesity, interdisciplinary therapy and intense physical exercise was described for obese patients. However, the study of physical activities representing daily tasks and cardiovascular risk in everyday activities becomes necessary to verify the occurrence of this association.

Objective: To investigate whether a period of 18 weeks of interdisciplinary therapy is capable of promoting benefits in cardiovascular parameters at rest and during exercise in obese adults.

Methods: Sample of 32 individuals of both sexes with body mass index of 30 to 39.9 kg/m² and age between 30 and 50 years. Intervention with interdisciplinary therapy (physical education, psychology, nutrition and physiotherapy), duration of 18 weeks and measurement of anthropometric data of body mass, height, waist and hip circumferences, maximum exercise ergometer evaluation before and after the therapy period.

Results: Interdisciplinary therapy decreased systolic blood pressure (SBP): 125.83 ± 9.86 (baseline) vs 120.28 ± 16.82 (final), heart rate (HR): 74.75 ± 11.02 (baseline) vs 72.77 ± 10.72 (final), and double-product (DP) at rest. Reduced also during the submaximal PAS stress stages 1: 143.44 ± 9.28 (baseline) vs 131.56 ± 15.26; Stage 2: 152.23 ± 21.91 (baseline) vs. 141.56 ± 17.43 (final), PAD stage 2: 89.89 ± 9.58 (baseline) vs 83.13 ± 9.65 (final), FC stage 1: 118.40 ± 12.90 (baseline) vs 110.87 ± 7.66 (final); Stage 2: 137.09 ± 16.54 (baseline) vs 130.37 ± 11.51 (final) and the PD referring to the initial stages.

Conclusion: Interdisciplinary therapy reduced the overload of the cardiovascular system at rest and submaximal effort in obese adults, optimizing rest and daily activities. (Int J Cardiovasc Sci. 2017;30(2):128-135)

Keywords: Blood Pressure; Obesity; Hypertension; Patient Care Team / therapy.

Introduction

The excess of body fat is considered an expressive factor for the development of chronic diseases and an increase in general cardiometabolic risk.¹⁻³ Obesity can be defined as a chronic degenerative disease that presents an abnormal accumulation of fat.⁴ The main environmental factors for the development of the disease are the unhealthy eating habits and the sedentary lifestyle.⁵

In this context, high blood pressure (BP) is significantly present in obesity, which can be explained, among

other factors, by the increase in the activation of the sympathetic nervous system and also by the imbalance of the Renin-Angiotensin-Aldosterone System.⁶ Previous studies have reported that a 10% increase in total body fat increases by about 6 mmHg in systolic BP (SBP) and 4 mmHg in diastolic BP (DBP) at rest, further evidencing this relationship.^{7,8}

Interdisciplinary therapy is presented as an effective intervention for the treatment of obesity and associated comorbidities.⁹ This type of approach involves a team composed of, for example, physicians, professionals

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at physical education, nutrition, physiotherapy and psychology, and this integrated performance generates satisfactory results in the reduction of body mass, prevalence of metabolic syndrome, hepatic steatosis, asthma and factors of cardiovascular risk.^{10,11} In addition to these benefits, there was an improvement in neuroendocrine regulation, energetic balance and quality of life of obese adolescents and adults.¹¹

In this context, it is clear in the scientific literature that the weight decrease softens hemodynamic values at rest.¹² However, the responses to submaximal physical exercise, which provides indicators of what happens in daily activities, need to be studied to verify whether or not there is a decrease in cardiovascular events in obese individuals.

In relation to the interdisciplinary therapy, the implication of this protocol in the cardiovascular responses in submaximal conditions is not well elucidated. However, this is an important issue, since most obese people predominantly perform low-intensity physical activities throughout the day, and the response to submaximal physical exercise is directly related to total cardiovascular risk.¹³

In this aspect the objective of this study was to investigate the effects of 18 weeks of interdisciplinary therapy on cardiovascular parameters (BP, heart rate [HR] and double product [DP]) at rest and during the ergospirometric test in obese adults.

Methods

Sample

The study was approved by the Ethics and Research Committee of the Universidade Federal de São Paulo, following the Helsinki Declaration. The interdisciplinary team undertook a screening to verify the inclusion criteria: BMI between 30 and 39.9 kg/m², age between 30 and 50 years and release to the practice of exercise through a medical report, obtained from clinical evaluation and the exercise electrocardiogram. The exclusion criteria were: the presence of some neurological or musculoskeletal disorder that made physical activity, pregnancy and bariatric surgery impossible. Participants were recruited through local publicity on the radio, newspapers and mainly on the internet. There were 107 registrations to participate in the face-to-face screening, in which the criteria for inclusion and non-inclusion of the research were verified. After checking the criteria, 47 participants were selected to

start the program. Volunteers who did not fit were referred to programs at the university itself, or to public programs. At the end of the therapy, 32 volunteers remained within the criteria for the program and performed the final reevaluations according to the methodology.

Experimental design

The therapy lasted 18 weeks and was developed based on the Interdisciplinary Model of the Obesity Study Group (GEO) described by Sanches et al.¹⁴ Interventions occurred three times a week for a duration of two hours, and on each day there was one hour of combined physical training concomitant to one hour of the other areas (Physiotherapy [therapeutic exercises], Nutrition [lectures and interventions] and Psychology [group counseling - behavioral changes]), performed once a week (Figure 1). Once a month there was an interdisciplinary intervention with the participation of two or more areas. In addition, the health team met weekly to discuss cases from the interrelationship between different areas, strengthening the interdisciplinary character of the project.

For the execution of the proposed experimental design, were made the following assessments before and after the 18-week therapy.

Anthropometric Assessment

To assess body mass (MC), the volunteers were instructed to wear light clothing and remain barefoot on a Toledo® brand digital scale with a capacity of up to 200 kg and accuracy of 0.05 kg. Stature was measured with a stadiometer fixed on the wall with a resolution of 0.1 cm from Standard ES 2030- Sanny®. The Body Mass Index (BMI)¹⁵⁻¹⁶ was then calculated. In addition, waist circumference (WC) and hip circumference (HR) were evaluated by a single trained evaluator using a Sanny® inelastic tape according to the protocol described by the World Health Organization.

Evaluation of Cardiorespiratory Fitness and hemodynamic responses during the physical effort

Previously to the experiment, all volunteers were instructed on the exercise protocol, as well as received guidelines for eating at least 2 hours in advance, avoiding physical exercise 48 hours earlier, and not drinking alcoholic beverages and/or stimulants 12 hours prior to the test. In addition, they were instructed to keep their medications on a routine basis.

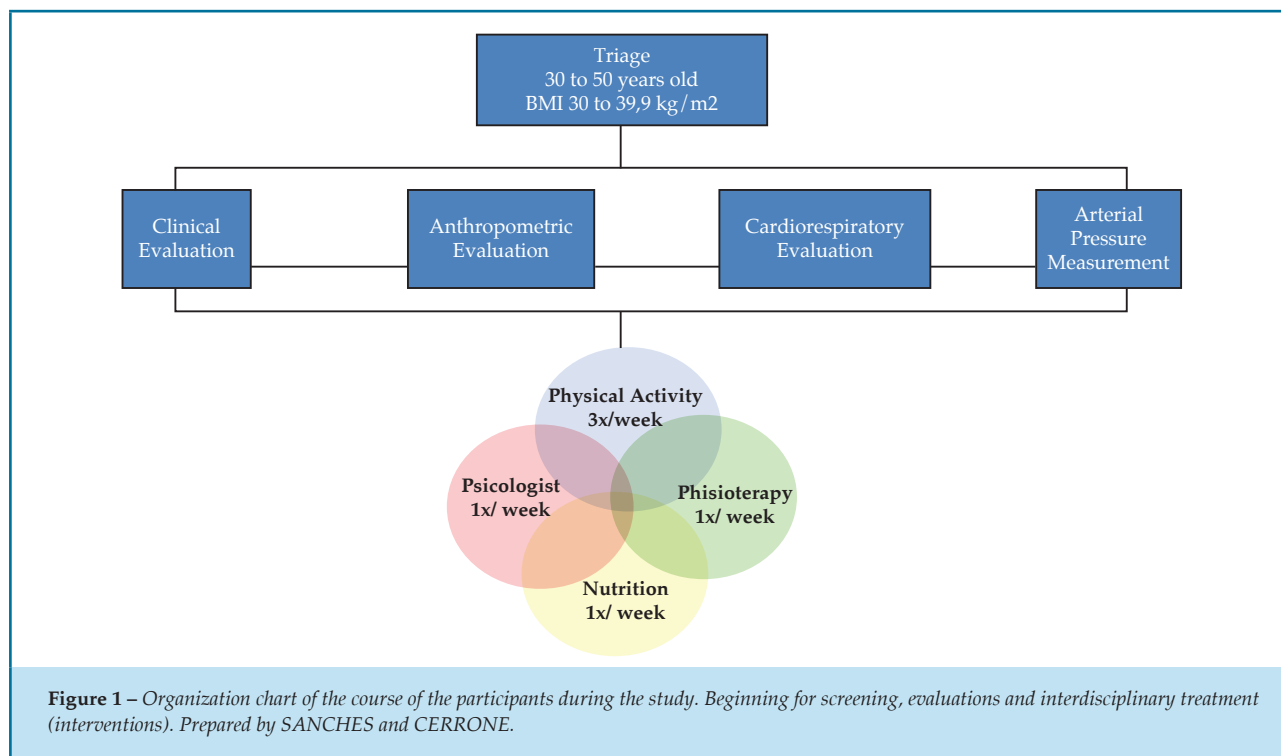


Figure 1 – Organization chart of the course of the participants during the study. Beginning for screening, evaluations and interdisciplinary treatment (interventions). Prepared by SANCHES and CERRONE.

The hemodynamic evaluations measured during the submaximal test were PA, HR and the consequent PD calculation. For the evaluation of the aerobic capacity, the ergospirometric test of increasing loads up to stage 3 of the Ellestad protocol was used to determine the maximum oxygen consumption (Fitmate Cosmed®). The evaluation was performed on treadmill (TRX 600 - Total Health®).

Protocol of the test: The Ellestad¹⁵ protocol was used for the ergospirometry test up to stage 3 to represent the daily activities in obese individuals.¹⁶

Being stage 1 with a speed of 2.7 km/h; Stage 2 with a speed of 4.8 km/h and Stage 3 with a speed of 6.4 km/h, each with a slope of 10° and respective time of 3, 2 and 2 minutes each stage.

Blood Pressure Measurement

The BP was measured by the same evaluator before and during the exercise protocol using the auscultatory method with the specific sphygmomanometer for obese Medicate Adult and the stethoscope of the brand 3 m Littmann classicis estethoscope, following the technical recommendations of the VI Brazilian Guidelines of hypertension,¹⁷ BP was always measured in the final minute of each of the first three stages that compose part of the protocol described above.

Heart Rate

HR was measured before and during the exercise protocol from the Cosmed® cardiofrequency meter attached to the gas analyzer, HR was always recorded in the final seconds of each of the test stages described previously.

Statistical analysis

The software used was the Statistical Package for the Social Sciences (SPSS) the continuous variables were presented through mean and standard deviation. To verify the normality of the variables the Shapiro-Wilk test was used. For comparisons of dependent samples, paired student t test was performed between the general characteristics of anthropometric and hemodynamic variables at was established the statistical significance criterion ($p < 0.05$).

Results

Of the 47 volunteers who initiated the program, 32 completed the protocol with more than 68% adherence.

The interdisciplinary therapy promoted significant decrease MC, BMI, CC and CQ all with $p \leq 0.001$ (Table 1).

It was found that here was a statistically significant decrease in SBP: SBP: 125.83 ± 9.86 (baseline) vs

Table 1 – Anthropometric changes before and after 18 weeks of Interdisciplinary Intervention

Variables	Basal Mean ± SD	After therapy Mean ± SD	P
BM (kg)	97.00 ± 12.80	94.09 ± 12.19	0.001*
Height (m)	1.66 ± 0.13	1.66 ± 0.13	0.813
BMI (kg/m ²)	34.96 ± 2.93	33.68 ± 2.73	0.001*
WC (cm)	110.05 ± 8.96	107.20 ± 8.99	0.001*
HC (cm)	120.92 ± 7.97	117.01 ± 7.75	0.001*

Anthropometric variables before and after 18 weeks of intervention. BM: body mass; BMI: body mass index; WC: waist circumference; HC: hip circumference, P (significance level adopted at 0.05 (), n (32). Presented in Mean and Standard Deviation.*

120.28 ± 16.82 (final); Heart rate (HR): 74.75 ± 11.02 (baseline) vs 72.77 ± 10.72 (final) and double-product (PD): 9139.06 ± 1739.162 (baseline) vs. 8464.37 ± 2481.76 (final) at rest after 18 weeks of interdisciplinary therapy in both sexes with $p \leq 0.01$. (Figure 2).

The hemodynamic variables (SBP, DBP, HR and SD) during exercise, pre and post-therapy are presented in figure 3. Our results showed a decrease in the values of PAS stages 1: 143.44 ± 9.28 (baseline) vs 131.56 ± 15.26; Stage 2: 152.23 ± 21.91 (baseline) vs. 141.56 ± 17.43 (final), PAD stage 2: 89.89 ± 9.58 (baseline) vs 83.13 ± 9.65 (final), FC stage 1: 118.40 ± 12.90 (baseline) vs 110.87 ± 7.66 (final); Stage 2: 137.09 ± 16.54 (baseline) vs 130.37 ± 11.51 (final) and the DP stage 1: 13856.14 ± 3858.45 (baseline) vs 9091.45 ± 7249.90 (final) And stage 2: 19691.14 ± 6906.31 (baseline) vs 11577.50 ± 9259.98 (final).

Discussion

Interdisciplinary therapy was efficient in reducing MC, BMI, CC, CQ and SBP at rest and SBP, FC and DP at submaximal intensities in obese individuals. Regarding the anthropometric data (MC, BMI, CC and QC), our results corroborate with those presented by Sanches et al.^{10,14} and Franz et al.¹² regarding the decrease in values when compared to values before and after interdisciplinary therapy.

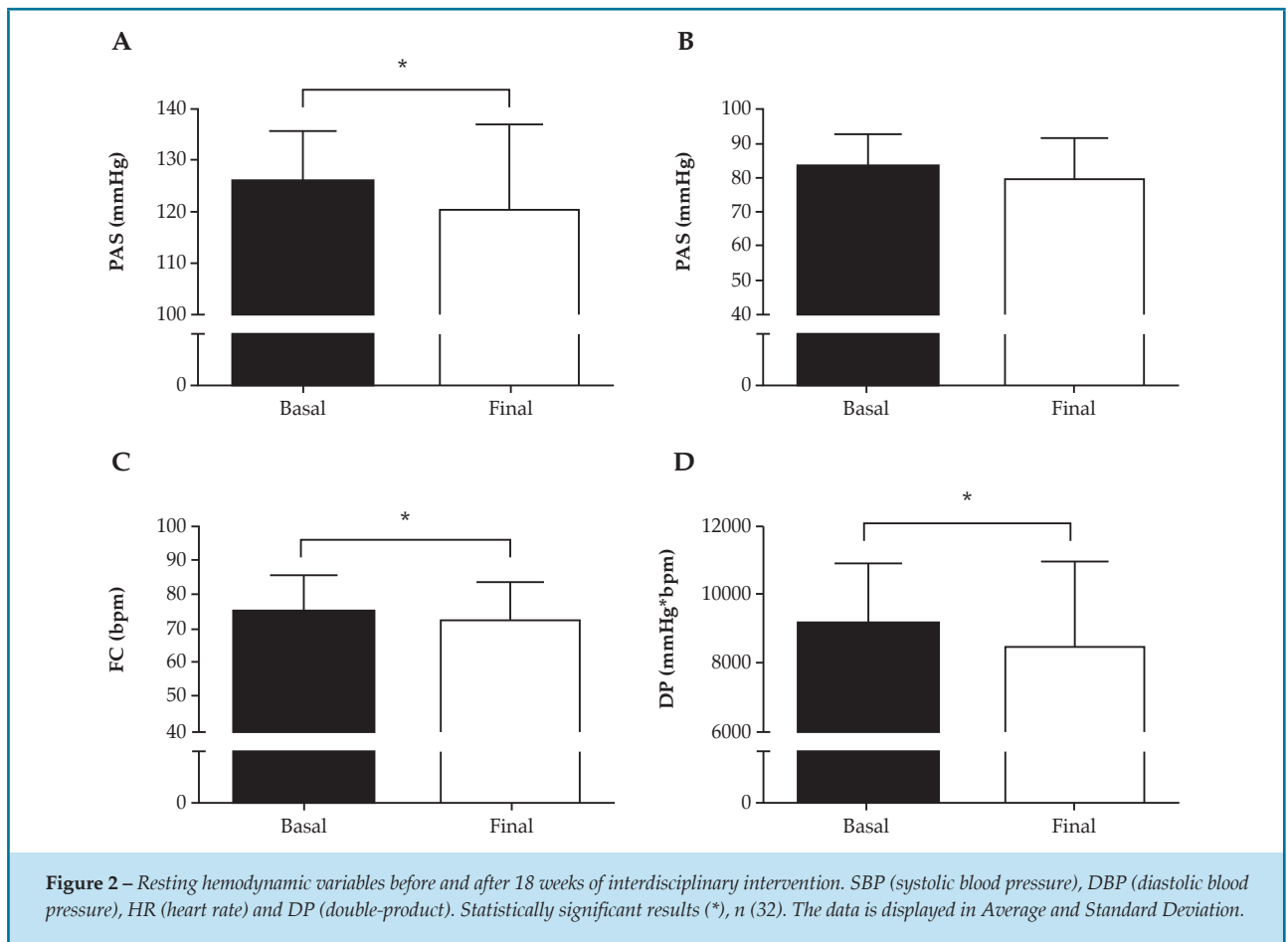
Submaximal hemodynamic responses reflect the energetic demand for cardiovascular effort imposed on everyday activities, such as walking from one place to another, cycling, cleaning the house and even jogging to reach a bus.¹⁸ In this regard, it is important to emphasize that these elevated cardiovascular variables represent a public health problem that can silently affect several systems such as: renal, circulatory, nervous and visual.^{19,20}

The expected behavior of BP in a stress test is an increase in SBP according to increased cardiac output and the maintenance or a slight decrease in DBP. This decrease depends mainly on the peripheral vascular resistance and will represent the efficiency of the vasodilator mechanisms.^{8,21,22} Corroborating the studies of Franz et al.¹² we observed that changes in lifestyle are closely related to improvements in the cardiovascular system.

Decreased cardiac overload at rest indicates an improvement in the mechanisms responsible for cardiovascular control, emphasizing the importance of baroreceptor control, but also emphasizing the contribution of the mechanisms of the renin-angiotensin-aldosterone system, peripheral vasodilation and possible inhibition of the sympathetic nervous system.^{8,21,22} It is important to note that decreases in BP, HR and DP even in small magnitudes, promote large reductions in the rate of cardiovascular complications and general mortality.²³

The scientific literature shows that the physical exercise, present in the interdisciplinary therapy, promotes a decrease of the BP values in a chronic way. In this context, we discussed several factors for this improvement, such as the increase of the parasympathetic tonus in the myocardium, a decrease in peripheral vascular resistance or an increase in the vasodilatory effect of endothelial function.²⁴

In this area, and corroborating previous studies, interdisciplinary therapy was efficient in improving cardiorespiratory parameters in the face of submaximal and maximal exertion.¹⁰ Therefore, we understand that interdisciplinary therapy provides the individual with comprehensive care, including benefits to biological systems, such as the cardiovascular system, cited above. With a didactic purpose we explain these systems in isolation, but in practice they are interrelated in a holistic way and offer a complex improvement with benefits to individuals who still need to be studied.^{3,24}



In addition to physical exercise, dietary intake has a great influence on BP control. Excessive sodium intake (greater than 2000 mg/day) and excessive dietary intake are associated with an increased risk of BP elevation, which is considered a risk factor for death.²⁵ Thus, we know that the negative energy balance, with consequent loss of body mass, has a great contribution in reducing food intake and improving the overall quality of food.

The interdisciplinary approach in the treatment of obesity has the proposal to go beyond weight loss, seeking to achieve improvements in the health of the individual as a whole, including its psychosocial dimension.²⁶ Interventions that cover these different dimensions are fundamental even for adherence to therapy, since stress²⁷ and symptoms of depression,²⁸ for example, have already been evidenced as factors that interfere in the performance of physical activity.

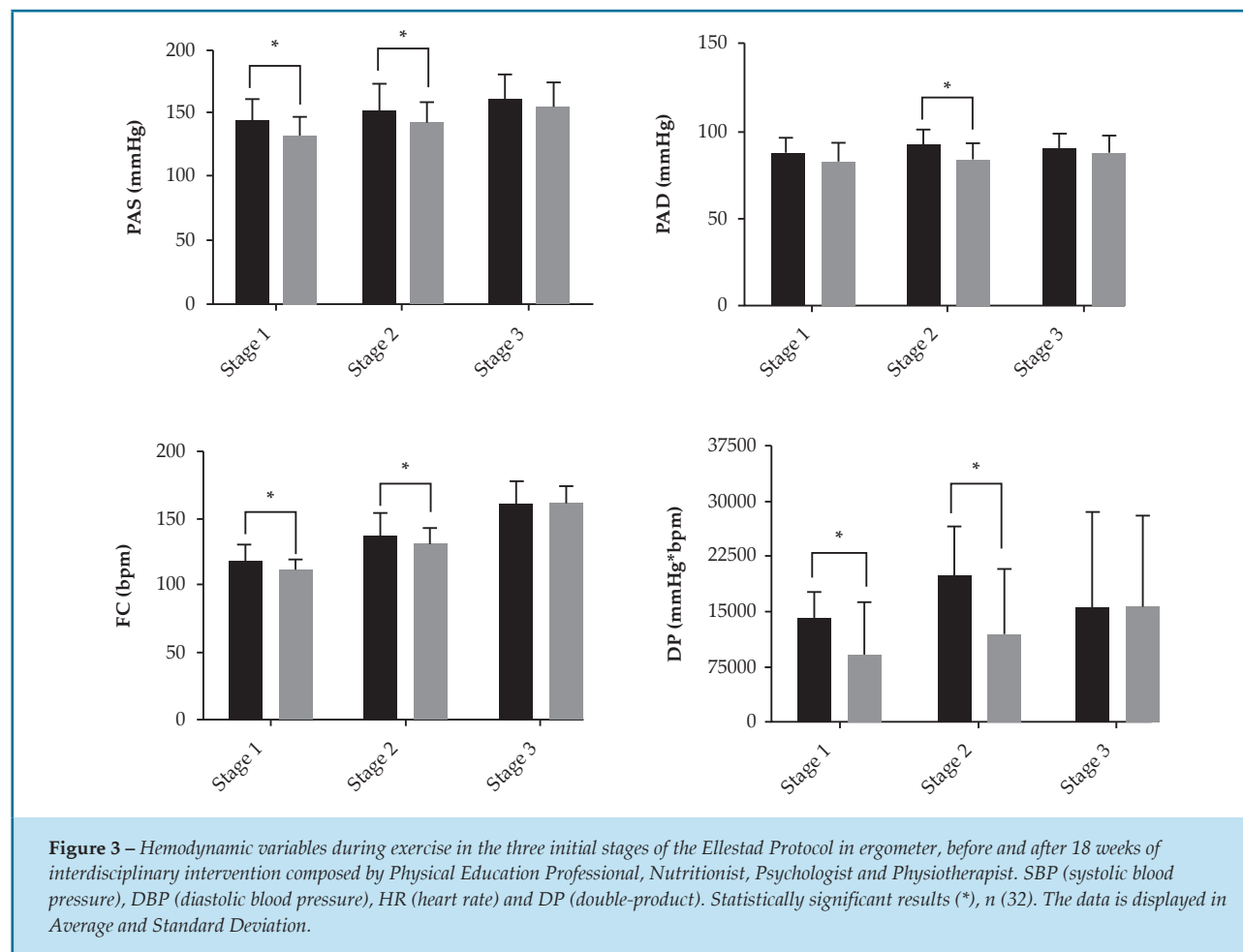
According to the results and the evidence cited, it is important to highlight the limitations of the present study, such as: absence of a control group, follow-up of the menstrual cycle of the volunteers, and hypotensive drugs.

Conclusions

Interdisciplinary therapy allowed the reduction of SBP, HR and rest DP and in the submaximal intensities, also preserving the lower use of the heart in daily efforts. The decrease in these variables at rest leads to a lower overload on the cardiovascular system of individuals in their daily life and the decrease during exercise preserves the heart in daily activities. Therefore, we understand that interdisciplinary therapy is an important intervention strategy to increase the level of daily physical activity, aiming at the daily cardioprotective effect, especially for individuals who need to decrease the overload to the cardiovascular system such as obese individuals.

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Author contributions

Conception and design of the research: Cerrone LA, Sanches RB, Fidalgo JPN, Poli VFS, Caranti DA; Acquisition of data: Cerrone LA, Sanches RB, Andrade-Silva SG, Fidalgo JPN, Nascimento MA, Poli VFS, Gomes RJ; Analysis and interpretation of the data: Cerrone LA, Sanches RB, Fidalgo JPN, Poli VFS, Medeiros A, Caranti DA; Statistical analysis: Cerrone LA, Sanches RB, Fidalgo JPN, Poli VFS; Obtaining funding: Gomes RJ, Caranti DA; Writing of the manuscript: Cerrone LA, Sanches RB, Fidalgo JPN, Nascimento MA, Caranti DA; Critical revision of the manuscript for intellectual

content: Cerrone LA, Sanches RB, Andrade-Silva SG, Fidalgo JPN, Nascimento MA, Poli VFS, Medeiros A, Gomes RJ, Caranti DA.

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Study Association

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