

# INFLUENCE OF TIME UNDER PHYSICAL EXERCISE PRACTICE ON THE BODY COMPOSITION: THE EXPERIENCE OF THE EDUCATION PROGRAM THROUGH WORK FOR HEALTH

*Influência do tempo de prática de exercício físico na composição corporal: experiência do programa de educação pelo trabalho para a saúde*

*La influencia del tiempo de práctica de actividad física en la composición corporal: experiencia del Programa de Educación por el Trabajo para la Salud*

Original Article

## ABSTRACT

**Objective:** To analyze the influence of time under physical exercise practice on the body composition of women. **Methods:** A quasi-experimental study with ex post facto design. The sample was composed by 61 women, aged above 40, participants of an exercise program sponsored by Education Program through Work for Health (PET-Saúde) at the University of Fortaleza, being divided into two groups: Group 1 - Case (had been practicing exercise for at least 6 months) and Group 2 - Control (had been practicing exercise for less than 6 months). Measures of weight, height, body mass index, waist and hip circumferences, and body composition (bioelectrical impedance model 310) were evaluated. For health parameters, the Canadian Standardized Test of Fitness was used. The statistical treatment was performed using descriptive analysis (mean and standard deviation) and inferential approach (Independent-Sample T and One-Sample T Test). The level of significance was  $p < 0.05$ . **Results:** No significant difference ( $p=0.48$ ) was found for the BMI variable between Case Group ( $28 \pm 4 \text{ kg/m}^2$ ) and Control Group ( $27.5 \pm 4.2 \text{ kg/m}^2$ ). Both groups presented proper standards of health. For the results on waist-hip ratio, it was not found significant difference ( $p=1.10$ ) between the groups, however, there was significant differences in each group when compared to health standards. The percentage of fat was not different ( $p=0.56$ ) between the groups, but when this variable was related to health standards, a significant difference was observed in both groups. **Conclusion:** Regarding the anthropometric variables, no influence of time was observed on body composition, neither on the health standards. The absence of significant difference between the groups is probably related to the maintenance of body mass and lean body mass, suggesting changes in the frequency and volume of the exercise program, in order to provide significant changes in the body composition.

**Descriptors:** Body Composition; Exercise; Women's Health.

## RESUMO

*Objetivo:* Analisar a influência do tempo de prática de exercício físico na composição corporal de mulheres. *Métodos:* Estudo quase experimental e com delineamento ex post facto. A amostra foi composta por 61 mulheres, com idades acima de 40 anos, que participavam de um programa de exercícios promovido pelo Programa de Educação pelo Trabalho para a Saúde (PET-Saúde), da Universidade de Fortaleza, sendo divididas em dois grupos: Grupo 1 - Caso (praticavam exercício físico há, no mínimo, 6 meses) e Grupo 2 - Controle (praticavam exercício há menos de 6 meses). Foram avaliadas medidas de peso, estatura, índice de massa corporal, circunferências da cintura e do quadril e de composição corporal (bioimpedância modelo 310). Para os parâmetros de saúde, utilizou-se o Canadian Standardized Test of Fitness. Realizou-se o tratamento estatístico através da análise descritiva (média e desvio padrão) e inferencial (Independente-Sample T e One-Sample T Test). O nível de significância

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adotado foi de  $p < 0,05$ . **Resultados:** Não se observou diferença significativa ( $p = 0,48$ ) na variável IMC entre Grupo Caso ( $28 \pm 4$  kg/m<sup>2</sup>) e Grupo Controle ( $27,5 \pm 4,2$  kg/m<sup>2</sup>). Ambos apresentaram padrões adequados de saúde. Os resultados para a relação de cintura/quadril não constatarem diferença significativa ( $p = 1,10$ ) entre os grupos, porém, houve diferença significativa quando comparados aos padrões de saúde. O percentual de gordura não foi diferente ( $p = 0,56$ ) entre os grupos, mas, quando relacionados aos padrões de saúde, observou-se diferença significativa em ambos os grupos. **Conclusão:** Em relação às variáveis antropométricas, não se observou influência do tempo na composição corporal e nos padrões referenciados à saúde. A ausência de diferença significativa entre os grupos provavelmente se encontra vinculada à manutenção da massa corporal e da massa magra, sugerindo-se mudanças na frequência e no volume do programa de exercício físico, a fim de proporcionar mudanças significativas na composição corporal.

**Descritores:** Composição Corporal; Exercício; Saúde da Mulher.

## RESUMEN

**Objetivo:** Analizar la influencia del tiempo de práctica de actividad física en la composición corporal de mujeres. **Métodos:** Estudio casi-experimental y con delineamiento ex post facto. La muestra fue constituida de 61 mujeres con más de 40 años de edad que participaban en un programa de ejercicios ofrecido por el Programa de Educación por el Trabajo para la Salud de la Universidad de Fortaleza, siendo divididas en dos grupos: Grupo 1 – Caso (practicaban actividad física desde hace 6 meses) y Grupo 2 – Control (practicaban ejercicio desde menos de 6 meses). Fueron evaluadas las medidas de peso, altura, índice de masa corporal, circunferencias de la cintura y de cadera y de composición corporal (bioimpedancia modelo 310). Para los parámetros de salud, se utilizó el Canadian Standardized Test of Fitness. Se realizó el análisis estadístico a través del análisis descriptivo (media y desviación típica) e inferencial (Independiente-Sample T y One-Sample T Test). El nivel de significancia adoptado fue de  $p < 0,05$ . **Resultados:** No se observó diferencia significativa ( $p = 0,48$ ) en la variable IMC entre el Grupo Caso ( $28 \pm 4$  kg/m<sup>2</sup>) y el Grupo Control ( $27,5 \pm 4,2$  kg/m<sup>2</sup>). Ambos grupos presentaron patrones adecuados de salud. Los resultados de la relación cintura/cadera no demostraron diferencia significativa ( $p = 1,10$ ) entre los grupos, sin embargo, hubo diferencia significativa al comparar los patrones de salud. El porcentaje de grasa no fue distinto ( $p = 0,56$ ) entre los grupos pero al relacionar con los patrones de salud, se observó diferencia significativa en ambos grupos. **Conclusión:** Respecto las variables antropométricas no se observó la influencia del tiempo en la composición corporal y los patrones referentes a la salud. La ausencia de diferencia significativa entre los grupos probablemente está vinculada al mantenimiento de la masa corporal y la masa magra, sugiriendo cambios en la frecuencia y el volumen del programa de actividad física, con el objetivo de generar cambios significativos en la composición corporal.

**Descritores:** Composición Corporal; Ejercicio; Salud de la Mujer.

## INTRODUCTION

The world scenario, focused on the field of health and building a health education, replaced its reductionist view on the traditional welfare model for a modern movement of health promotion, prevention, recovery and rehabilitation of diseases and health conditions<sup>(1)</sup>.

The current public health policy stands out for implementing new dynamics in the organization of services and healthcare activities<sup>(2)</sup>, along with preventive and health-promoting interventions in physical, social and psychological areas. Primary Health Care (PHC) was largely responsible for the restructuring of the sector and organization of health services, a strategy that has also been adopted in countries like Spain and Canada<sup>(3)</sup>.

In 1994, the Family Health Program, now renamed as the Family Health Strategy (FHS), emerged as a result of the influence of countries like Cuba, England and Canada, which have obtained satisfactory results in improving public health through its promotion<sup>(4)</sup>. Through this program that the family becomes the target of the strategies to be developed, where preventive actions are prioritized along with the promotion, recovery and rehabilitation of health.

In the context of health promotion and physical activity, body composition becomes more relevant since, throughout the life, there is a proven decrease in habitual physical activities, a decrease in energy expenditure at rest and in the thermic effect of food, resulting in significant conditions towards the accumulation of fat in the body<sup>(5)</sup>.

Verification of the body composition is of utmost importance, because through it, you can analyze the relative proportion of body fat and establish the optimal body mass for health, therefore directly combating the various chronic diseases<sup>(6)</sup>.

With regard to female gender, elements of the body composition are significantly altered due to the end of the reproductive period. Owing to the changes of endocrine nature, there is a breakdown of the estrogen receptors in central nervous system and bone tissues, which are important in protein synthesis, distribution of body fat, cholesterol control and preservation of bone calcium<sup>(7)</sup>.

Body composition in females after the third decade of life undergoes changes such as an increase in fat mass around 5-10% (1.5 to 2.5kg) per decade and a decrease in lean body mass of 2.5% (1,0 to 5kg) per decade<sup>(8)</sup>.

A meta-analysis demonstrated that the loss of adipose tissue is proportional to the frequency and duration of exercise sessions, the initial body fat content and weekly energy expenditure<sup>(9)</sup>. In summary, regular physical

activity is more likely to show significant results in body composition if regarded as a long-term project<sup>(5)</sup>.

The aim of this study is to analyze the influence of time under physical exercise practice on the body composition.

## METHODS

This study is characterized as a quasi-experimental research, with ex post facto design and quantitative approach. A quasi-experimental study is one in which the researcher seeks greater correspondence with the real world environment and there is greater control of threats to the internal validity<sup>(10)</sup>. The experimental ex post facto, also called causal comparison, are studies based on comparisons of static groups, where the investigator is not in control of treatment, giving as an example the comparison of beginners and skilled practitioners' characteristics<sup>(10)</sup>.

The study population consisted of women over 40 years living in the community of Tancredo Neves, in Fortaleza-CE.

The sample comprised 61 women, aged above 40, who were attending an exercise program sponsored by the Education Program through Work for Health (*PET-Saúde*) at the University of Fortaleza (UNIFOR). They were divided into two groups: Group 1 - Case (n=34) composed by women practicing regular physical exercise for at least six months, with mean age of 60.5±10 years, and Group 2 - Control (n=27), which included women beginners in physical exercise, for a period under six months, whose average age was 59.9±15 years.

*PET-Saúde* aims to promote further education and specialization for health professionals and initiation to work through the academic internships targeted to students in the health area, in accordance with the needs of the Unified Health System (Sistema Único de Saúde-SUS). Students enrolled in this program develop teaching, research and extension activities in the Family Health Centers (Centros de Saúde da Família-CSF), with the purpose of integrating links between service-teaching-community and development of healthcare practices through initiation in SUS network<sup>(11)</sup>.

The exercise program developed by *PET-Saúde* has as its target audience: middle-aged individuals and elderly patients assisted by CSF Maria de Lourdes Jereissati, the enrolled population and attendees in the community association *Viva a vida* ('Live the life Association'). According to inferential report, the majority of the project participants live in social risk, have low socioeconomic status and are affected by major disturbances resulting from non-transmittable chronic diseases, such as diabetes, hypertension, obesity, osteoporosis, cardiovascular disease and dyslipidemia.

The *PET-Saúde's* activities took place twice a week, lasting 60 minutes. Aerobic, strength training, flexibility, balance and body awareness activities were performed. Simultaneously, theoretical approach on various topics was included in class, such as the benefits of physical activity to the cardiorespiratory system, components of cardiovascular and respiratory system, the effects of exercise on myocardium, blood pressure and heart rate (HR), self-control of HR in rest and during exercise, body image, improved self-esteem and well-being, and active lifestyle.

This research was conducted in the space of *Association Viva a Vida*, where they developed the activities of CSF Maria de Lourdes Ribeiro Jereissati, in partnership with UNIFOR.

The study included women, beginners and veterans, members of the intervention program and those who agreed to participate and signed the Free Informed Consent Form. Pregnant women and those having a pacemaker were excluded, besides those who refused to participate in the study.

The following anthropometric parameters were assessed: weight, height, body mass index (BMI), waist and hip circumferences (to assess the waist/hip ratio-WHR) and body composition (bioimpedance model 310).

For measurement of weight, a digital scale (Plenna™) was used, with capacity of 150 kg and 100g precision. The volunteers were positioned standing barefoot, with lateral spacing of the feet and eyes fixed ahead. The results were verified and recorded in kilograms to the nearest 0.1kg. The scale was calibrated every 10 weighting (with predetermined 4-kg weights), also being checked its level, to be even to the ground.

For height, it was used a tape fixed to the wall, graduated in centimeters and tenths of centimeters, and a cursor. The measurements were performed with the subjects barefoot, in the standing position, with feet together and being in contact with the measuring instrument in the posterior surface of the heel, the pelvic waist, shoulder waist and the occipital region. The participants were asked to be in inspiratory apnea, keeping head parallel to the ground and the cursor in a 90° angle relative to the scale. Three measurements were performed, being considered as the real value the average of them.

The calculation of BMI comprised the ratio of weight (in kg) and height (in meters) squared.

For the assessment of waist circumference, it was used the tape measure, located at the midpoint between the last rib and the iliac crest, and for measurement of the hip circumference, it was used the point of greatest protrusion of the gluteus maximus. The WHR is a ratio obtained by dividing the result of the waist circumference by the hip circumference result. This index represents

better the distribution of body fat in an individual, being a major predictor of the risk that obesity represents to health. Individuals with higher WHR or greater waist circumference have higher risk of hypertension, type 2 diabetes, hyperlipidemia and coronary arteries diseases compared to individuals with lower ratio and waist circumferences, that is, with greater distribution of fat in the body's extremities<sup>(6)</sup>.

Body composition was verified through a bioimpedance analysis device (model 310), which revealed the percentage of fat by applying four electrodes on the right side of the body in the following points: hand, wrist, foot and ankle. The subjects were lying in supine position, hands over a non-conductive surface (mattress), legs and arms apart at about 45°, at room temperature (around 20°C). The skin was cleaned with alcohol wipes. In accordance with the device's requests, the red wires were attached to the wrist and ankle, and the black ones, to hand and foot. In the meeting prior to checking the measures, the participants were requested to avoid moderate or vigorous exercises within 12 hours before the test and to not ingest diuretics.

Health parameters adopted were those established by the Operational Manual Canadian Standardized Test of Fitness (CSTF), also known as Fitness Canada. The ideal BMI should be between 20 and 27 kg/m<sup>2</sup>, the waist-hip ratio should be less than 0.79cm and fat percentage, below 30%<sup>(12)</sup>. All values are described in reference to the female gender.

Data was submitted to statistical analysis using the Statistical Package for Social Sciences (SPSS) 16.0 for Windows, both descriptive (mean and standard deviation)

and also inferential (Independent-Sample T and One-Sample T Test), if data presented normal distribution identified by Kolmogorov-Smirnov test, with significance level of  $p < 0.05$ .

The present study complies with the ethic and scientific recommendations of Resolution no.196/96 of the National Health Council/Ministry of Health<sup>(13)</sup> regarding research involving human beings, and received approval by the Ethics Committee in Research of University of Fortaleza, under Opinion no.284/2010.

## RESULTS

As seen in Table I, there was no statistical significance between the values of variable BMI in the case group and in the control group. When the results were confronted to the criterion referenced standards (standards of health), it was observed that, in average, both groups were in accordance with the health standards, which must present as ideal BMI a value  $> 20$  and  $\leq 27$ <sup>(12)</sup>.

The results for WHR, shown in Table II, revealed that there was no statistical significance among women in the case group and in the control group. However, statistical analysis demonstrated differences in each group compared with the health standards<sup>(12)</sup>.

Table III deals with the comparative analysis of the percentage of fat, which did not show statistical significance between the groups. However, when related to the health standards<sup>(12)</sup>, there was a significant difference in both groups.

Table I - Influence of time under physical exercise practice on the BMI, comparison between groups and health parameters. Fortaleza-CE, 2010.

	<b>n</b>	<b>Mean</b>	<b>Standard deviation</b>	<b>p<sup>a</sup></b>	<b>BMI &gt; 20<sup>b</sup></b>	<b>BMI ≤ 27<sup>b</sup></b>
Group 1 – Case	34	28.021	4.01	0.48	<0.05	0.147
Group 2 – Control	27	27.515	4.18		<0.05	0.528

<sup>a</sup>Test T for independent samples

<sup>b</sup>Test T for one sample, comparison with health parameters

\* $p < 0.05$

Table II - Influence of time under physical exercise practice on the WHR, comparison between groups and health parameters. Fortaleza-CE, 2010.

	<b>n</b>	<b>Mean</b>	<b>Standard deviation</b>	<b>p<sup>a</sup></b>	<b>WHR &lt; 0.79<sup>b</sup></b>
Group 1 – Case	34	0.89	0.06	1.1	<0.05
Group 2 – Control	27	0.87	0.08		<0.05

<sup>a</sup>Test T for independent samples

<sup>b</sup>Test T for one sample, comparison with health parameters

\* $p < 0.05$

Table III - Influence of time under physical exercise practice on the percentage of fat, comparison between groups and health parameters. Fortaleza-CE, 2010.

	<b>n</b>	<b>Mean</b>	<b>Standard deviation</b>	<b>p<sup>a</sup></b>	<b>RCQ&lt;0.79<sup>b</sup></b>
Group 1 – Case	34	36	4.6	0.56	<0.05
Group 2 – Control	27	35.3	6		0.05

<sup>a</sup>Test T for independent samples

<sup>b</sup>Test T for one sample, comparison with health parameters

\*p<0.05

## DISCUSSION

According to data from the American population, men reach maximum values for BMI between 45 and 49 years, with little reduction after that age. Women, in turn, reach their peak between 60 and 70 years, a more critical situation than men's<sup>(13)</sup>.

The practice of physical activity is one means to confront this situation. There are studies showing no significant difference between the BMI of women undergoing a program of physical activity, assessed using a pre-test and post-test<sup>(14,15)</sup>. However, another study has certified that women subjected to a circuit training and walking carried out three times a week, with weekly meetings for guidelines regarding diet and follow-up by a multidisciplinary team, showed satisfactory results regarding reductions in BMI during two months of intervention<sup>(16)</sup>.

In the present study, the reason for the absence of significant difference between women in the case group and in the control group is probably linked to the maintenance of this variable, since the reduction of body mass is most evident in the first weeks of physical activity, in which volume and intensity would be important factors to reverse the situation<sup>(15)</sup>. Despite this result, both groups are included in health standards, clarifying that the stabilization of the anthropometric variables and the preservation of lean body mass are of prime importance for this population, because the gain of body mass and lean mass loss occurs along the years<sup>(17)</sup>.

It is known that the body composition includes elements that indicate the health status of an individual, especially when there is a significant increase in fat mass over the years, and risk factors for diabetes, hypertension, heart disease, and some forms of cancer might be present<sup>(15)</sup>.

In the current investigation, the exercise program did not significantly alter the levels of body fat present in women in the case group compared with those in the control group, which corroborates another study<sup>(15)</sup>. It is noteworthy that the standard deviation of the first was inferior to that of the second group, demonstrating that there was less

heterogeneity in the results. However, both groups were found to surpass the referenced health standards. The reason for this result among active women is the weekly frequency established by the exercise program since, for the achievement of significant results related to fat mass loss, at least three days of exercise per week are needed<sup>(6,18)</sup>.

Another strategy to obtain positive results in reducing the percentage levels of fat and fat mass is the elaboration of a program of circuit training, with three-day weekly attendance. The elevation of the basal metabolism is the result of a physical work with weights and aerobic exercise, directly influencing the increase in daily caloric expenditure<sup>(19)</sup>.

Regarding the results on the variable WHR, there was no difference with statistical significance between the groups, revalidating study released in the literature (20). This variable predicts the risk of cardiovascular disease when the ratio is > 0.79cm, being common for women to present a body shape pattern said gynecoid, that is, with greater accumulation of fat in the hip and legs. This distribution tends to remain in the subcutaneous region until the age of 45. From that on, the internal and intramuscular body fat gets significantly intensified<sup>(13)</sup>.

Given this, the accumulation of body fat in the abdominal region has a large genetic influence, in addition to the following factors: education, gender, age, smoking, physical activity and menopause<sup>(21)</sup>.

But other factors can influence the results regarding changes in body composition, being of utmost importance that this program encompasses multi and interdisciplinary strategies, taking into account other areas of the health field<sup>(22)</sup>.

## CONCLUSION

In this study, women in the Case Group showed no satisfactory results when compared to those in the control group and health standards referenced in the anthropometric variables. The absence of significant difference between

the groups is probably linked to the maintenance of body weight and lean body mass, of great importance for the preservation of healthy aging. We suggest changes in the frequency and volume of the exercise program proposed by the project in order to provide women in the case group significant changes in their body composition.

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