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eduem@uem.br

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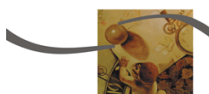
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## Multidisciplinary program for obesity treatment: Summary of results with adolescents

Luzia Jaeger Hintze<sup>1,2\*</sup>, Glauco Barnez Pignatta Cattai<sup>1,3</sup> and Nelson Nardo Junior<sup>1,4</sup>

<sup>1</sup>Núcleo de Estudos Multiprofissional da Obesidade, Universidade Estadual de Maringá, Av. Colombo, 5790, 87020-900, Maringá, Paraná, Brazil.

<sup>2</sup>Universidade Estadual de Londrina, Londrina, Paraná, Brazil. <sup>3</sup>Universidade Estadual de Maringá, Maringá, Paraná, Brazil. <sup>4</sup>Departamento de Educação Física, Universidade Estadual de Maringá, Maringá, Paraná, Brazil. \*Author for correspondence. E-mail: [lujhintze@hotmail.com](mailto:lujhintze@hotmail.com)

**ABSTRACT.** This study aimed to evaluate the effects of a multidisciplinary intervention program on the factors: stage of behavior change (SBC), physical self-description (PSD), blood pressure (BP) and physical fitness in obese adolescents. The study was characterized as quasi-experimental type, with 33 adolescents who were evaluated before and after 16 weeks of intervention. The anthropometric and fitness variables, BP were assessed, and we also applied the Stage of Change instrument and PSDQ (Physical Self-Description Questionnaire), in order to measure the SBC and the PSD, respectively. The statistical analysis involved measures of central tendency and dispersion, and the comparison between the initial and final periods was performed by Student's t-test. The comparison between the periods before and after intervention presented significant differences ( $p < 0.05$ ) for almost all variables, except for the hip circumference, waist to hip ratio and pull-ups in the adapted bar. The program promoted effective changes in the fat consumption, and habitual physical activity and PSD of habitual physical activity, body fat and appearance. The results are quite promising and evidence the need to expand programs like this, in order to lead to the behavioral change. In this way, the physical education professional has a decisive role on this process.

**Keywords:** adolescents, obesity, treatment, multidisciplinary program.

## Programa multiprofissional de tratamento da obesidade: síntese de resultados com adolescentes

**RESUMO.** O objetivo do estudo foi Avaliar os efeitos de um programa de intervenção multiprofissional sobre: estágio de mudança de comportamento (EMC), autodescrição física (ADF), pressão arterial (PA) e aptidão física em adolescentes obesos. O Estudo foi classificado como quase experimental realizado com 33 adolescentes que foram avaliados antes e após 16 semanas de intervenção. Foram avaliadas variáveis antropométricas, de aptidão física, PA e aplicados os instrumentos SOC (*Stage of Change*) e PSDQ (*Physical Self-Description Questionnaire*), a fim de mensurar EMC e ADF, respectivamente. A análise estatística envolveu medidas de tendência central e dispersão e a comparação entre os períodos inicial e final foi realizada pelo teste t de Student. A comparação entre os momentos pré e pós-intervenção apresentou diferenças significativas ( $p < 0,05$ ) para quase todas as variáveis, com exceção da circunferência do quadril, relação cintura quadril e teste de barra adaptada. Com o estudo, foi possível considerar que o programa mostrou interferir no EMC de consumo de gorduras na dieta e atividade física habitual e na ADF de atividade física habitual, gordura corporal e aparência. Os resultados são bastante promissores e apontam para a necessidade de ampliação na abrangência de programas de intervenção com enfoque na mudança do comportamento, tendo o profissional de educação física um papel decisivo nesse processo.

**Palavras-chave:** adolescentes, obesidade, tratamento, programa multiprofissional.

### Introduction

The obesity represents nowadays one of the main health problems in the world. That is because it is normally associated with several comorbidities and one increased mortality both in developed as in developing countries (MUST, 1996). In the actuality, it is estimated that more than 1 billion of adults all around the world are in overweight and at least 300 milion are already obese (OPAS, 2003; WHO 2002).

This phenomenon is also been observed among children and adolescents. One study conducted by Wang et al. (2002), comparing data get in the 1970 decade with the data from 1990 the authors showed one increase from 4,1 to 13,9% in the proportion of obesity among youth, that means, in a little more than 20 years, the prevalence has increased three times. Results like that shows to the authorities the great danger that obesity represents, once the literature states that since it is set in the young age,

the obesity tends to persist to the adulthood (WHITAKER et al., 1997).

Despite of the genetic predisposition factors to the overweight-obesity, the nutritional and physical activity habits seems to determine in a more sensitivity way the body composition (BOUCHARD, 2000; DELMAS et al., 2007; WALLER et al., 2008). Considering this, programs like the multidisciplinary program for obesity treatment, which focus in the changes of behavioral and in the support for the creation of a new pattern of life style are important strategies to slow down the impact of obesity and improve the quality of life of obese teenagers. In that matter, the mean of the present work was to assess the effects of the multidisciplinary program on the following aspects: readiness to change, physical self-description and fitness in adolescents obese.

## Material and methods

According to Thomas and Nelson (2002), the study is characterized as a quasi-experimental research. It was developed with 33 adolescents, with age range between 10 and 17 years old who took part in the Multidisciplinary Program for Obesity Treatment (MPOT), offered by the State University of Maringá. That program is based in the behavioral change and is constituted by professionals from the Kinesiology (Physical Education), Nutrition and Psychology areas.

The MPOT used the local media as a way to reach the target public for its intervention. The adolescents who showed interest in take part in the MPOT were oriented to came to a meeting where more detailed information was presented and the inclusion criteria was explained. After that, all adolescents who presented the conditions to be included in the MPOT signed along their parents the informed consent to participated in the research.

The inclusion criteria were: a) be classified as overweight or obese according to the Cole et al. (2000) BMI cutoff for the sex and age; b) No limitations to the physical activity or exercises practice; c) compatible schedule to attend to the MPOT activities three times for week; d) the acceptance of the conditions expressed in the informed consent form by the adolescents and their parents.

As exclusion criteria were included the following conditions: a) absence not justified in more than three consecutive sessions of physical activity, b) abandon of the program, c) not attendance to the tests and assessments in the phase pre and post intervention.

The duration of the program was 16 weeks, with physical activities three times for week where resistance training and stretching were included. At the beginning of the program, at the main phase of exercise program, the aerobic exercises was predominant. In the nutrition activities the classes focus on specific topics about the quantitative and qualitative characteristics of the health diet, highlighting the more common causes of impairment in the nutritional habits. The psychology intervention was at weekly bases and work with themes which include the reasons for change habits, factors that improve and others that can impair the changes at the long time and so on.

The data collection and all the interventions were conducted in the Department of Physical Education in the State University of Maringá. To the cardiorespiratory assessment it was employed the "suttle run 20 m" test, validated for use in Brazil by Duarte and Duarte (2001). The test was applied in groups of 5 to 8 people who should run, together in a pre-determined pace controlled by a beep emitted by a sound device for each 20 m during the entire test. The interval among the beeps emitted by the program were smaller at each minute in order to promote higher speed during the test. When the participants could not more maintain the speed necessary to be at the demarked point at the exact moment of each beep, or in other words, when they became delayed the test should be suspended for that participant. The duration of the test is depend on the ability of each participant, the initial speed is 8,5 km h<sup>-1</sup> with increments of 0,5 km h<sup>-1</sup> at each new stage. The equation described by Guedes and Guedes (2006) was applied to estimated the VO<sub>2</sub> max.:  $31.035 + (\text{velocity of stage} \times 3.238) - (\text{age} \times 3.248) + (\text{age} \times \text{velocity of stage} \times 0.1536)$ .

The measurements of strength were made by the adapted pull up test following the description of Guedes and Guedes (2006). For the test, the subject should be lying down with the back in the floor and during the test should be with the body perfectly straight while pull up the trunk having as base only the heels. At each movement the subject should pass the chin by a line determining the fully movement. The test continue until the subject could not more do the correct movement.

In the evaluation of flexibility and muscle endurance it was employed the sit-and-reach and the cull ups tests where it was used a scale in centimeter to measure the length that could be reached in a trunk bend movement while the higher number of repetitions during one minute was observed for the cull ups test as described by Thrichler (2003).

The blood pressure measurements was performed by the same professional and using the same device in different days always after an interval of 10 minutes rest time in conformity with the ACSM (2005) patterns. It was considered the first audible sound (Phase 1 of Korotkoff sounds) to the systolic blood pressure (SBP) and the measure correspondent to the audible alteration in the pattern sound (phase 4 of Korotkoff sounds) as an indicative of diastolic blood pressure (DBP).

Measurements of weight, height and circumference were performed following the standards set by WHO (1995). The assessed should be barefoot, with as few clothing as possible in an upright position and the arms at your sides with palms facing the thighs. The heels should be touching and weight equally distributed on both feet. The height measurement was taken in the inspiration of the individual at a level platform. We used a scale model BB100P from Black and Decker, with 0.1 kg of accuracy and precision stadiometer 0.1 cm. With these measures, we calculated the body mass index, obtained by the ratio between body weight (in kilograms) and height (in meters) squared, respecting the cutoff values proposed by Cole et al. (2000) for age and sex of individuals. It was adopted as a measure of waist circumference, the smallest perimeter found between the ribs and iliac crest. Measures of abdominal circumference and hip had as a anatomical reference the umbilical scar and the largest portion of the buttocks, respectively. All circumference measurements were taken directly to the skin except for the hip measurement, with non-extensible tape measure 0.1 cm precision.

The assessment of eating habits and physical activity was made by the instrument developed by Sutton et al. (2003), translated into Portuguese by Cattai et al. (2010). The questionnaire, called SOC (Stage of Change), has four areas relating to eating habits concerning the food portions, the amount of fat in the diet, consumption of fruits and vegetables and the amount of physical activity practiced by individuals. The answers vary for each statement on a Likert scale, where the average score obtained for each area indicates the stage at which the individual as follows: 1 to 1.4 (pre-contemplation), 1.5 to 2.4 (contemplation), 2.5 to 3.4 (preparation); 3.5 to 4.4 (action), 4.5 to 5 (maintenance). The assessment of physical self-description was made by the Physical Self-Description Questionnaire (PSDQ) proposed by Marsh (1996). The questionnaire comprises 70 questions, which are divided into 11 scales, which are related to self-related health status, motor coordination, the habitual physical activity to body

fat, fitness / motor performance, the physical concept, the appearance, strength, flexibility, aerobic fitness and self-esteem.

The Shapiro-Wilk test was used to verify the normality of the data. The nonparametric Mann Whitney and Wilcoxon it was applied in comparison between genders and between times, respectively. The Student t test for dependent samples was applied to compare the moments of the variables whose normality criteria was observed. For categorical variables, we used the chi-square test for trend. For presenting the data were used indicators of position (central tendency and dispersion). The level of significance was preset at  $p < 0.05$ . Statistical procedures were performed using the statistical package SPSS version 17.0. The study was approved by the Ethics Committee in Research of UEM. The term of consent was signed by parents or guardians of all subjects, after having received detailed information about the research.

## Results and discussion

Of the 33 teens entering the program, 22 (66.7%) were girls and 11 boys (33.3%). However, during the 16 weeks of intervention, there was a dropout rate of 42.4%. Thus, 19 adolescents completed the treatment, and the average attendance rate of these participants was 84.22%. The program's dropout rate is lower than those reported in studies of the international literature (BARJA et al., 2005; BRAET et al., 1997; MORANA et al., 2003).

Evasion and compliance have emerged as key challenges of multidisciplinary intervention programs aimed at the treatment of obesity, because of require permanent changes in the contexts of individuals, families and social (BRAET et al., 1997). The lower tax evasion and good adhesion presented in this study may be explained by the fact that physical activities are guided and monitored by professionals and academics which provide physical education experiences motivating and compatible with the conditions of adolescents. So thus these subjects have shown signs of satisfaction for participating in the Multidisciplinary Program for Treatment of Obesity.

Of the 19 adolescents who completed 16 weeks of treatment, 8 were boys and 11 were girls. The characteristics of these groups are shown in Table 1. The variables body mass index and waist / hip ratio, which are the main indicators of obesity and body fat shows averages very similar in between the sexes, and values above the ideal for the population in question, which stresses the importance of treatment for the study subjects.

**Table 1.** Sample Characterization according to anthropometric variables for boys and girls who conclude the Multidisciplinary Program for Obesity Treatment.

Variables	Boys	Girls
Age (years)	12.91(±2.39)	13.25(±1.58)
Weight (kg)	91.51 (±17.75)	78.47(±27.27)
Height (m)	1.69(±0.11)	1.57(±0.10)**
BMI (kg m <sup>-2</sup> )	31.93(±3.19)	31.02(±6.91)
waist circumference (cm)	93.61(±10.09)	82(18.3)*
Abdominal circumference (cm)	102.11(±8.6)	99.85(±16.14)
Hip circumference (cm)	109.35(±9.07)	107.13(±16.87)
waist/hip ratio	0.86(±0.06)	0.81(±0.05)

\*Non parametrical date (median and interquartile amplitude); \*\*significant differences pre x pos intervention (p < 0.05).

For males and females whose values of WHR were greater than 0.83 and 0.71, as it was the case of adolescents in the study, it is characterize the excess of abdominal fat, which raises the risk of developing cardiovascular disease, hypertension, diabetes mellitus and other metabolic disorders (ACSM, 2005). The study of Janssen et al (2005) found a strong relationship between BMI and waist-hip ratio with metabolic syndrome in obese adolescents. Adolescents with BMI above the recommended range had higher levels of triglycerides, blood pressure, low HDL - cholesterol, which are determinants of this syndrome.

The Table 2 shows the mean values of anthropometric variables before and after the intervention of 16 weeks of the MPOT. It was noted that in almost all indicators, there were significant improvements (p < 0.05).

The anthropometric measurement which showed more positive responses to the program were the Body Mass Index (BMI) and waist circumference (WC), with a reduction of 3.79 and 2.20% respectively. Only measures of hip circumference and waist to hip ratio were not significantly different. Height was the only one to increased, also significantly, which is

understandable, because adolescents are at different stages of maturation, and some are in the period of growth spurt.

Table 3 shows the average values in tests of physical performance and systolic and diastolic blood pressures before and after the intervention. For these variables also the MPOT has promoted significant improvement in systolic and diastolic blood pressure, aerobic fitness, flexibility, abdominal strength and upper limb (pull ups), showing an improvement of 16.93 and 10.84, 6.83, 13.5, 14.07 and 49.64% respectively. The t Student test showed that the MPOT significantly influenced all components of physical fitness and blood pressure evaluated, except the strength in the arms.

The test carried out, even with the adaptation in its form of execution (the supine position in the bar), seems to represent a major challenge for overweight /obesity adolescents. In other words, even if the intervention of 16 weeks have affected positively the strength of the upper limbs the adolescents was not able to support their body weight and performer the test, this could indicate the necessity of new verification of the validity of the test for this population.

**Table 2.** Results before and after 16 weeks of intervention by the Multidisciplinary Program for Obesity Treatment in adolescents.

Anthropometry	Pre	Post	P
Weight (Kg)	86.96 (±24.01)	81.56 (± 23.09)□	0.014**
Height (m)	1.62 (±0.12)	1.63 (±0.11)	0.03**
BMI (Kg m <sup>-2</sup> )	31.40 (±5.54)	30.21 (±5.22)	0.005**
waist circumference (cm)	89.70 (±12.28)	87.73 (±11.19)□	0.043**
Abdominal circumference (cm)	100.81 (±13.22)□	99.02 (±12.14)□	0.028**
Hip circumference (cm)	108.06 (± 13.84)	106.88 (±12.84)□	0.161
waist/hip ratio	0.83 (±0.06)□	0.82 (±0.05)□	0.199

\*\*significant differences pre x pos (p < 0.05).

**Tabela 3.** Results of physical tests pre and post 16 weeks of MPOT.

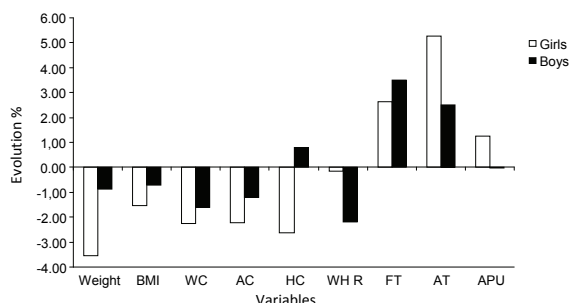
Physical Tests	Pré	Post	P
Flexibility (cm)	22.21 (± 7.63)□	25.21 (± 6.89)□	0.02**
Abdominal test (repetitions)	29.21 (± 8.32)	33.32 (± 5.31)	0.01**
Adapted pull ups (repetitions)	0 (2)□*	1(□□3)□*	0.063
VO <sub>2</sub> max. (mL kg <sup>-1</sup> min. <sup>-1</sup> )	39.8 (± 4.73)□	42.53 (± 5.64)□	0.00007**
Systolic blood pressure (mm hg)	135.26(± 15.14)	120 (20)*	0.000**
Diastolic blood pressure (mm hg)*	75.26(± 10.47)	70(15)*	0.007**

\*dados não paramétricos (mediana e amplitude interquartilica); \*\*diferenças significativas pré x pós (p < 0.05).

The value of  $VO_2$  max. obtained after the intervention was similar to the average found in the study of Vasques et al. (2007), with normal weight adolescents. In another study, from Florianópolis, Santa Catarina State, in which it was applied the test “20 m shuttle run” the results were in average of 44.3 mL  $kg^{-1}$  min.<sup>-1</sup> for boys and 42.7 mL  $kg^{-1}$  min.<sup>-1</sup> for girls. Thus, it is possible to consider the treatment of obesity, even with a short duration, could improve the aerobic fitness of teenagers, bringing it closer to that of non-obese subjects.

The increase in the blood pressure values represents a warning to health, mainly due to their relationship with cardiovascular disease. When it occurs in children and adolescents, the attention should be even greater once with advancing age, the problem tend to be worse (Guedes et al., 2006). The MPOT interfere with blood pressure levels of adolescents, showing up an efficient means of treatment and possible preventive agent for heart disease.

Figure 1 shows the comparison of the evolution of girls and boys in the MPOT. It could be seen that the girls showed more significant results than boys, except for waist-hip ratio (WHR) and flexibility test (FT). It appears that the weight among girls showed the most significant result, followed by the hip circumference (HC), waist and abdomen respectively.



**Figure 1.** Comparison of the evolution in the MPOT among boys and girls.

Among boys, the variables with the greatest progress were waist-hip ratio, waist circumference (WC) and abdominal circumference (AC). With regard to the components of fitness, there were significant improvements in the flexibility test (FT) and abdominal test (AT), while the strength of upper limbs evaluated by Adapted Pull Ups (APU) obtained the smaller increments.

The Table 4 shows the mean scores before and after intervention of 16 weeks MPOT. The scales which shows the highest scores before the intervention were related to health status, followed by strength, coordination and habitual physical activity. After the intervention, those scales continued to present the higher scores. However, the scale of physical activity has become the second greater score, with an increase of 76.72%.

The scales related to body fat, aerobic fitness and the physical concept that were the lowest score obtained before treatment. Continued to present the same trends with the lowers scores. However, showed an increase of 25.87, 15.78 and 26.29%, respectively. Other scales that have a significant percentage of change were the appearance, flexibility and fitness /motor performance, with 29.12, 18.19 and 17.49% of improvements, respectively.

The study showed that both participants in the program had a good perception in relation to sport. The same occurred in other aspects of sports performance and motor coordination, strength and flexibility. This trend, however, was not observed in self-perception of aerobic fitness. This perception, classified as regular in both groups can be explained due to lower cardiorespiratory conditions found in obese populations (GUEDES; GUEDES, 2003).

These findings differ from those commonly found in the literature that has pointed to a feeling of inferiority, dissatisfaction and emotional needs of obese adolescents (FERRIANI et al., 2005; RODRIGUES; BOOG, 2006). That perception is normally negative to the concept of self-image and physical appearance of these individuals (FERRIANI et al., 2005; OZMEN et al., 2007).

**Table 4.** Physical self-perception of adolescents undergoing 16 weeks of a Multidisciplinary Program for Obesity Treatment.

Scales of the Instrument	Pre	Classification	Post	Classification	Variation %
Health Status	5.28	Great	5.43	Great	3.24
Motor Coordination	3.61	Good	3.84	Good	10.91
Habitual Physical Activity	3.61	Good	4.83	Great	76.72
Body Fat	2.03	Regular	2.45	Regular	25.87
Fitness/Motor Performance	3.45	Good	3.66	Good	17.49
Physical Concept	2.7	Regular	3.07	Good	26.29
Appearance	3.23	Good	3.82	Good	29.12
Strength	4.05	Good	4.29	Good	10.63
Flexibility	2.98	Regular	3.35	Good	18.19
aerobic fitness	2.38	Regular	2.53	Regular	15.78

\* =  $p < 0,05$  (pre x pos) student test t.

One study (SHIN; SHIN, 2007) conducted with Chinese teenagers despite having used a methodology different from that performed in our study, found low levels of self-esteem in the researched subjects. The perception of competence in sports has also presented results unfavorable to this population. Although our study did not specifically evaluate this dimension, the results presented above demonstrate a good understanding of motor skills and fitness/motor performance, contradicting the findings of Franklin et al. (2006).

This discrepancy in findings suggests that the scales of self-perception of obese adolescents may represent conflicting results, which should indicate that more research is needed in this area. This again seems right once the adolescents involved in our study didn't show significant difference between most of the scales, which is contrary to expectation after the intervention program.

Table 5 presents the percentage of distribution in the Stages of Behavior Change (SBC) before and after 16 weeks of intervention and the results of the chi-square test for trend. The results revealed that the SBC most common among teenagers in all areas of the instrument at the time of pre-treatment it was the preparation stage.

**Table 5.** Distribution (%) and chi-square test for trend in the adolescent stage of behavior change before and after 16 weeks of intervention by the Multidisciplinary Program for Obesity Treatment.

Instrument Domains	Pre	Post	P
1. Size and amount of portions			
Pre-contemplation	0	0	0.39**
Contemplation	3 (15.8%)	0	
Preparation	8 (42.1%)	4 (21.1%)	
Action	6 (31.6%)	4 (21.1%)	
Maintenance	2 (10.5%)	13 (68.4%)	
2. Content of fat in the diet			
Pre-contemplation	0	0	0.446
Contemplation	3 (15.8%)	1 (5.3%)	
Preparation	6 (31.6%)	5 (26.3%)	
Action	7 (36.8%)	11 (57.9%)	
Maintenance	3 (15.8%)	2 (10.5%)	
3. Fruits and vegetables consumption			
Pre-contemplation	2 (10.5%)	0	0.184
Contemplation	0	3 (15.8%)	
Preparation	10 (52.6%)	4 (21.1%)	
Action	6 (31.6%)	9 (47.4%)	
Maintenance	1 (5.3%)	3 (15.8%)	
4. Habitual Physical Activity			
Pre-contemplation	0	0	0.89
Contemplation	5 (26.3%)	3 (15.8%)	
Preparation	11 (57.9%)	8 (42.1%)	
Action	3 (15.8%)	7 (36.8%)	
Maintenance	0	1 (5.3%)	

\*\*Significative differences pre x pos ( $p < 0.05$ ).

After 16 weeks of intervention, however, there was a decrease in the frequency of less advanced

stages (pre-contemplation, contemplation and preparation) and an increase in later stages (action and maintenance) in all areas of the instrument. The chi-square test for trend showed a significant difference in the area (size and number of servings).

Table 6 shows the mean and standard deviation of the scores in four domains of the questionnaire assessment of dietary habits and physical activity (SOC) and their P values obtained when comparing pre and post intervention. Statistically significant differences were found in domains 1 and 2, concerning the size and number of servings and amount of fat in the diet.

**Table 6.** Average score of the domains of the questionnaire pre and post intervention SOC Multidisciplinary Program for Obesity Treatment.

Instrument domains	Pre	Post	p
1. Size and amount of portions	30.32( $\pm 7.23$ )	34.95( $\pm 5.24$ )	0.002**
2. Content of fat in the diet	38.16( $\pm 9.81$ )	42.94( $\pm 7.49$ )	0.024**
3. Fruits and vegetables consumption	31(9)*	32.47( $\pm 7.75$ )	0.155
4. Habitual Physical Activity	25.74( $\pm 6.05$ )	28.05( $\pm 8.96$ )	0.225

\*Non parametric date (median and interquartil amplitude); \*\*Significative differences pre x post ( $p < 0.05$ ).

The benefits of regular physical activity are well described in the literature. There are improvements in fitness, heart and lung condition and muscle strength and flexibility. Also the regular physical activity act as a preventive agent for cardiovascular disease and some cancers, contribute to the regression of atherosclerosis and treatment of osteoporosis, asthma, diabetes control, prevention and control of elevated blood pressure as well as providing psychological well-being, improving the mood, self-esteem and reducing depression (BEAN, 1999; McARDLE et al., 1992; NIEMAN, 1999). Thus, the decrease in body fat is a variable with major focus, as it promotes greater energy and improves physical fitness. Although no significant differences in the pre and post intervention in relation to the dominance of the questionnaire, we find not only an improvement of more advanced teens to SBC, as well as an increase in domain score of 4 of the questionnaire. Based on that, the program multidisciplinary of treatment seems to have promoted positive changes in relation to the practice of physical activity. This results may explain the success of the program variables.

In relation to consumption of dietary fat, Lima et al. (2004), found that both obese and non-obese, have a higher intake than that recommended by the Dietary Allowance. Results like these reinforce the idea of nutritional intervention in these aspects especially in adolescents. In our study, the results demonstrate the difficulty in the consolidation of changes in nutritional habits, particularly with

regard to the amount of fat in the diet. Although this area has revealed a breakthrough in the SBC, the Chi-square test for trend showed no significant differences. There were, however, increases in average scores and statistically significant differences when comparing the pre and post intervention. This discrepancy in results highlights the need for more studies in this direction, since it was not so clear influence on this aspect of the program.

Considering the challenge that obesity represent to health we must state that the results presented by this study should be valued, that is because there is a need of studies presenting the strengths and the weakness of treatment programs like that. Thus, multidisciplinary programs, which involve changes in lifestyle, with psychological support, diet and physical activity to reduce body fat are needed regardless of pharmacological intervention to prevent and reduce the incidence of obesity and its comorbidities.

## Conclusion

The 16-week program was effective improving significantly almost all anthropometric variables, and variables related to physical fitness, abdominal muscle strength and flexibility also had highly positive responses to the program, as well as levels of systolic and diastolic blood pressure.

These results reinforce the idea of multidisciplinary program effectiveness based on changes in behavior, in that way representing as a means of treating obesity in adolescents. That could be seen as a current challenge for physical education teachers helping consolidate the multidisciplinary approach to treatment of obesity, focusing on behavior changes necessary to the success of the program.

Further studies involving a larger number of adolescents and follow-ups conducted longer and more controlled are necessary to clarify the issues that were not so evident in the present study, such as physical self-description and aspects related to the amount of fat in the diet.

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