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Original article

# Obese adolescents who gained/maintained or lost weight had similar body composition and cardiometabolic risk factors following a multidisciplinary intervention

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## Abstract

This study aimed to assess the impact of a multidisciplinary program of obesity treatment (MPOT) on adolescents who have maintained/gained weight or lost weight. Eighty-six adolescents aged 10–18 years were allocated in either the intervention group (IG; $n = 44$) or the control group (CG; $n = 42$). Each group was divided into two more groups: weight maintenance/gain and weight loss, as assessed after the intervention. The MPOT lasted 16 weeks and was conducted by a multidisciplinary team based on cognitive-behavioral therapy. We analyzed body composition and cardiometabolic parameters prior to and after the intervention. Adolescents from the IG who lost weight showed improvements in maximal oxygen uptake (23.54 ± 5.30 mL/kg/minute vs. 25.39 ± 5.63 mL/kg/minute), body fat percentage (49.29 ± 6.98% vs. 46.75 ± 8.56%), triglyceride levels (116.58 ± 46.50 mg/dL vs. 101.19 ± 43.08 mg/dL), diastolic blood pressure (75.81 ± 8.08 mmHg vs. 71.19 ± 6.34 mmHg), and the number of risk factors for metabolic syndrome (2.00 ± 1.06 vs. 1.58 ± 1.10). Adolescents from the IG who gained/maintained weight reported reduced body fat percentage (48.81 ± 5.04% vs. 46.60 ± 5.53%), systolic blood pressure (123.39 ± 14.58 mmHg vs. 115.83 ± 7.02 mmHg), diastolic blood pressure (74.83 ± 9.91 mmHg vs. 68.78 ± 5.95 mmHg), and number of risk factors for metabolic syndrome (from 1.67 ± 1.09 to 1.11 ± 0.68), and their lean mass (39.00 ± 7.20 kg vs. 41.85 ± 7.53 kg) and maximal oxygen uptake (23.74 ± 4.40 mL/kg/minute vs. 25.29 ± 5.17 mL/kg/minute) increased in a manner similar to those of adolescents who lost weight. Furthermore, we noted significant decreases in body mass index, body fat (kg), glycemia, and waist circumference in CG adolescents who lost weight, whereas those in the CG who maintained/gained weight had an increase in body mass index, hip circumference, body fat (kg), and lean mass. A 16-week MPOT promoted positive changes in body composition and cardiometabolic risk factors independently of weight changes.



*Keywords:* Adolescents; Intervention; Obesity; Weight gain; Weight loss

## Introduction

Excess weight in children and adolescents is a growing concern due to the elevated number of comorbidities [e.g., type 2 diabetes, hypertension, and metabolic syndrome (MS)],[1] which may develop at this time and may be present later in adulthood.[2] Thus, there is a need to develop

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intervention programs that encourage lifestyle changes in this population.[3]

Multidisciplinary interventions for obesity treatment in children and adolescents have presented improvements in anthropometric parameters, body composition, cardiorespiratory fitness, and cardiovascular risk factors such as MS and dyslipidemia.[4–7] Nevertheless, studies that did not show any improvement in body weight are common.[4,8,9] This may be in part explained by the increase in lean body mass coupled with the decrease in body fat mass observed following exercise interventions,[4,10] or possibly due to natural growth and development that occur in adolescents.[11] Therefore, it may be suggested that weight loss should not be the only characteristic to be assessed following lifestyle interventions, because many other beneficial changes may occur. For instance, Masquio et al[12] found that adolescents who had small reductions in body weight presented improvements in body mass index (BMI), fat mass, visceral fat, lean mass, and waist circumference (WC), whereas those who had small-to-moderate weight loss also presented reductions in insulin resistance and inflammatory markers following a 1-year multidisciplinary intervention. Wafa et al[8] and Hughes et al[9] noted weight gain in children aged 5–11 years following a 6-month lifestyle intervention. However, this weight gain was substantially less compared to the control group (CG), which received nutritional advice only[7] or no intervention.[8]

According to the Canadian Obesity Network,[13] the success in obesity treatment should be measured according to health benefits and well-being, instead of the amount of weight lost. However, to our knowledge, studies assessing the differential effects of a multidisciplinary program for obesity treatment (MPOT) in adolescents who gained or maintained weight after the intervention period, compared to those who lost weight, are scarce. Thus, the objective of the present study was to assess differences in body composition, glucose, insulin, lipid profile, and blood pressure in obese adolescents who gained/maintained or lost body weight following an MPOT. It was hypothesized that adolescents who took part in the MPOT would see improvements in body composition, and metabolic and hemodynamic parameters, irrespective of the amount of weight lost.

## Methods

### *Participants*

Adolescents and their families were recruited through media advertisements. Ninety-seven obese adolescents took part in this study. They were classified as obese according to the cutoff points laid out by Cole et al[14] and were invited to participate in the MPOT in 2011 and 2012 through media divulgation. Adolescents' age varied from 10 years to 18 years.

We used the following inclusion criterion: concordance of the adolescents and their parents/guardians in participating in the MPOT. The exclusion criteria were as follows: endocrine and metabolic diseases previously diagnosed and informed to the pediatrician, long-term alcohol consumption, use of glucocorticoids and psychotropics that could affect appetite regulation, and <70% compliance in all multidisciplinary interventions.

Adolescents who were not available to partake in the intervention schedule (i.e., they were not able to participate in all scheduled interventions, showed interest in the program after it had already started, or their schedule did not match with the schedule of the MPOT) were invited to be part of the CG, and evaluated prior to and after the 16-week period. It is important to note that none of these participants presented any exclusion criteria and were thus eligible to take part in this study. This is a pragmatic trial designed to evaluate the effectiveness of interventions in real-life practice conditions. Despite the disadvantage of not randomizing participants in each group, as explanatory trials do (e.g., randomized controlled trials), pragmatic trials produce results that can be generalized and applied in routine practice settings.[15,16]

Fifty of the 97 adolescents initially evaluated were allocated to the intervention group (IG) and 47 adolescents were assigned to the CG. However, six adolescents from the IG and five from the CG were excluded because they were unable to complete the intervention due to transportation issues, preference for other activities in the same period, or demotivation to continue in the MPOT, and/or they did not attend the last assessment session. Thus, 86 adolescents completed the protocol.

The MPOT lasted 16 weeks and was conducted twice a year. The main objective of the intervention team (i.e., physical educators, nutritionists, psychologists, and a pediatrician) was to aid in the establishment of eating and exercise behavior changes based on cognitive-behavioral therapy. The psychological and nutritional intervention was held weekly, including a 1-hour group meeting in each session. Physical educators gave one 1-hour lecture per week and helped adolescents in the IG take part in an exercise program three times per week, with each session lasting 1 hour. The pediatrician set up individual appointments with each family (parents and adolescents) to collect information that could help during treatment. The protocol of the MPOT has been described in more detail by Bianchini et al.[4] The present study was approved by the local Ethics Committee (protocol 463/2009) and is in accordance with the guidelines of the Declaration of Helsinki.

### *Evaluation*

During the week preceding the beginning of MPOT and the week following its completion, adolescents took part in a battery of assessments, which included body weight, stature, BMI, WC, and hip circumference (HC) measurements. Body weights of the participants, wearing light clothes and no shoes, were measured on a Welmy scale (Welmy, São Paulo, Brazil) to the nearest 0.05 kg. Height was measured with a wall stadiometer to the nearest 0.1 cm. BMI was calculated as the weight divided by height squared. WC and HC were measured with a WISO tape (WISO, Santa Catarina, Brazil) to the nearest 0.1 cm.