

## **Improvements in self-reported and parent-proxy perceptions of adolescents' health-related quality of life following a multidisciplinary obesity treatment program**

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### **Abstract:**

**Purpose:** To evaluate the effects of a Multidisciplinary Obesity Treatment Program (PMTO) on parent-proxy perceptions and self-reported health-related quality of life (HRQoL) in overweight and obese adolescents. **Methods:** Ninety-two overweight and obese adolescents aged 10–18 years were assigned to the PMTO. HRQoL was assessed with the Pediatric Quality of Life Inventory (PedsQLTM 4.0), administered to the adolescents and their parents/guardians at baseline and post-intervention. This intervention lasted 16 weeks and was based on cognitive behavioral therapy with the involvement of a psychologist, a nutritionist and exercise professionals. **Results:** Adolescents reported improved physical [pre: 78.13 (21.1) to post: 84.38 (18.8);  $p < 0.001$ ; effect size: 0.43], social [pre: 80.0 (30.0) to post: 85.0 (20.0);  $p = 0.033$ ; effect size: 0.10], psychosocial [pre: 75.0 (22.8) to post: 76.67 (19.6);  $p = 0.013$ ; effect size: 0.18], and total [pre: 75.0 (17.4) to post: 79.35 (16.8);  $p = 0.001$ ; effect size: 0.28] domain scores. As for parent-proxy perceptions, improvements for all domains, except school domain, were noted ( $p < 0.05$ ; effect sizes: from 0.26 to 0.34) post-intervention. At baseline, parents presented lower scores than the adolescents' HRQoL for all domains ( $p < 0.05$ ). However, following the intervention, parents only had lower scores than their children for the physical and total domains of the HRQoL scale. **Conclusions:** In addition to improving HRQoL in the adolescents, the PMTO improved parent-proxy perceptions of their children's HRQoL.

**Keywords:** Obesity | Adolescents | Parents | Quality of life | Intervention

### **Article:**

#### **Introduction**

Recent data from Brazilian youths show that 22.1% of boys and 24.3% of girls are classified as being overweight or obese [1]. Many youths may feel dissatisfied with changes in their body

weight at the start of adolescence. This dissatisfaction can lead them to feel anxious, depressed, and may even contribute to a decrease in their self-esteem [2, 3]. Therefore, the integration of psychosocial interventions, in addition to exercise and diet, in overweight and obese adolescents may lead to improvements in many domains of health-related quality of life (HRQoL) that may be impacted by weight change during adolescence, such as social, emotional and school-related domains [2,3,4].

Some studies have assessed the effectiveness of intervention-based programs for obesity treatment on psychosocial outcomes, such as emotional function, social interactions and school performance, in children and adolescents using HRQoL questionnaires [5,6,7,8,9,10,11,12]. A recent review has also discussed the benefits of pediatric obesity interventions on HRQoL [13]. These interventions reported different results based on the duration (8 weeks to 18 months), the type, and the focus of the intervention (parents and/or children and adolescents), as well as the age of the participants (range from 5 to 19 years). Many of these studies using multidisciplinary intervention teams implemented nutritional, psychological and exercise interventions for children and adolescents admitted to outpatient clinics [6,7,8,9,10, 12]. The latter often focused on individual appointments made by pediatric dietitians and/or psychologists, in which case the dietitians provided information about lifestyle changes for the children's parents [9] or for both parents and children [11]. Thus, the integration of psychologists in a multidisciplinary intervention team for overweight and obese adolescents, and their parents may be beneficial in the treatment of psychosocial parameters [10].

A well-known tool used to measure HRQoL in children and adolescents between 2 and 19 years, and their parent-proxy perceptions is the Pediatric Quality of Life Inventory™, PedsQL™ 4.0, developed by Varni et al. [14] and later validated in Portuguese by Klatchoian et al. [15]. Studies that have employed this tool have shown that parents reported lower scores on the HRQoL than that self-reported by their children [4, 16], and this may be even lower for overweight and obese adolescents [17]. On the other hand, a study by Kunkel et al. [18] observed greater parent-reported scores for their children's HRQoL.

This tool has also been previously employed to assess the changes in the parents' perception of their adolescents' HRQoL in obesity treatment studies, which involved the parents in the intervention [11, 19]. Hughes et al. [11] and Wafa et al. [19] examined the effects of a 26-week weekly appointment intervention with dietitians focused on applying different behavioral change techniques on pediatric obesity treatment and found significant increases in the parents' report of their children's HRQoL; however, no changes were noted in the children's self-reported HRQoL scores [11, 19].

To our knowledge, there is limited literature on the effects of a multidisciplinary treatment that involves Cognitive Behavioral Therapy (CBT) on the HRQoL of overweight and obese adolescents by examining both self-reported and parent-proxy reports of HRQoL. CBT is based on therapeutic techniques that are applied to assist with weight control. The focus of the therapy is on modifying dysfunctional behaviors in subjects' lifestyle and reinforcing motivation to be part of an intervention program [20]. More interventions are needed to consider this approach and its effects on both adolescents and their parents' perceptions of HRQoL, which is the primary aim of the present study. In addition, parents play a key role in the management of their

children's perception of their body weight and changes in body weight throughout adolescence [21].

The aim of the present study was to evaluate the effects of a Multidisciplinary Obesity Treatment Program (PMTO), based on CBT, on parent-proxy perception and self-reported HRQoL in overweight adolescents. It was hypothesized that the 16-week PMTO based on CBT would improve both parents' report and adolescents' self-report of HRQoL scores in all domains.

## **Methods**

### **Participants and procedure**

This study was approved by the local Ethics Committee (protocol 463/2009), registered at the Brazilian registry of clinical trials (RBR-95239p) and is in accordance with the guidelines put forth in the 1964 Declaration of Helsinki and its later amendments. All the adolescents and their parents/guardians gave their written consent before taking part in this study. Adolescents were recruited through media advertisements. This is a program offered for the community as a public health service to help adolescents who are struggling with excess body weight. The program is carried out by the local university and the university hospital where the "first come, first served" approach is applied since the multidisciplinary team can offer this service for  $\approx 20$ –30 adolescents per semester.

We used the following inclusion criteria: concordance and availability of the adolescents and their parents/guardians in participating in the PMTO, aged between 10 and 18 years, presence of overweight or obesity based on the Cole and Lobstein [22] cutoffs. The exclusion criteria were: use of glucocorticoids or psychotropics that could interfere with weight control, long-term alcohol consumption, and  $<70\%$  compliance in all multidisciplinary interventions.

From the two hundred and ten adolescents who inquired about the PMTO, 125 met the inclusion criteria and did not present any exclusion criteria. Thirty-three were further excluded because they were unable to complete the intervention/study period, because of transportation issues, preference for other activities during the study period, or loss of motivation to continue in the PMTO. Thus, 92 adolescents (49 girls, 53.3%) with parent-proxy perceptions of HRQoL were included in the present analyses.

The PMTO lasted 16 weeks. 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 interventions were held weekly, which included a 1-h group meeting. Physical educators gave weekly, 1-h lectures and encouraged adolescents to take part in an exercise program, scheduled for 1 h per session 3 times per week. The pediatrician set up individual appointments with each family (parents and adolescents) to collect information that could help throughout the intervention. At baseline and one month into the study period, the adolescents' parents took part in lectures with the professionals involved in the study to discuss and inform them about the importance of family in the process of changing eating and exercise behaviors and pediatric obesity management. Moreover, these sessions were used to present study results

of each participant to their parents/guardian. The PMTO protocol is described in more detail elsewhere [23].

## Evaluation

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

We also determined pubertal development according to Tanner stages [24]. A partial sample (57 adolescents) identified themselves as being in stages 2 and 3 (pubertal;  $N = 26$ ), or stages 4 and 5 (postpubertal;  $N = 31$ ). Pubertal development assessments began after 2011 and is the reason for having data on this outcome in only 57 of the 92 participants.

Body composition was assessed with multifrequency bioelectrical impedance InBody model 520 (InBody Body Composition Analyzers, Korea). Participants were evaluated during the afternoon, while wearing light clothes, no metal objects and following recommendations described by Heyward [25]. We computed relative and absolute body fat mass and absolute lean mass based on this assessment.

## Assessment of HRQoL

Adolescents' and parent-proxy perceptions of HRQoL were assessed using the PedsQL™ 4.0, proposed by Varni et al. [14] and later adapted and validated in Portuguese by Klatchoian et al. [15]. This inventory has six domains: physical (i.e., it is hard for me to run), emotional (i.e., I feel sad and depressed), social (i.e., other adolescents do not want to be my friends), school (i.e., I have difficulty in following my class in scholar activities), psychosocial, and total. The last two domains are calculated with the mean scores for emotional, social, and school domains (psychosocial), and physical, emotional, social, and school domains (total). The scoring varies from 0 (very low HRQoL) to 100 (very high HRQoL) points. To our knowledge, a cutoff point to clinically identify low HRQoL has yet to be established [14, 15].

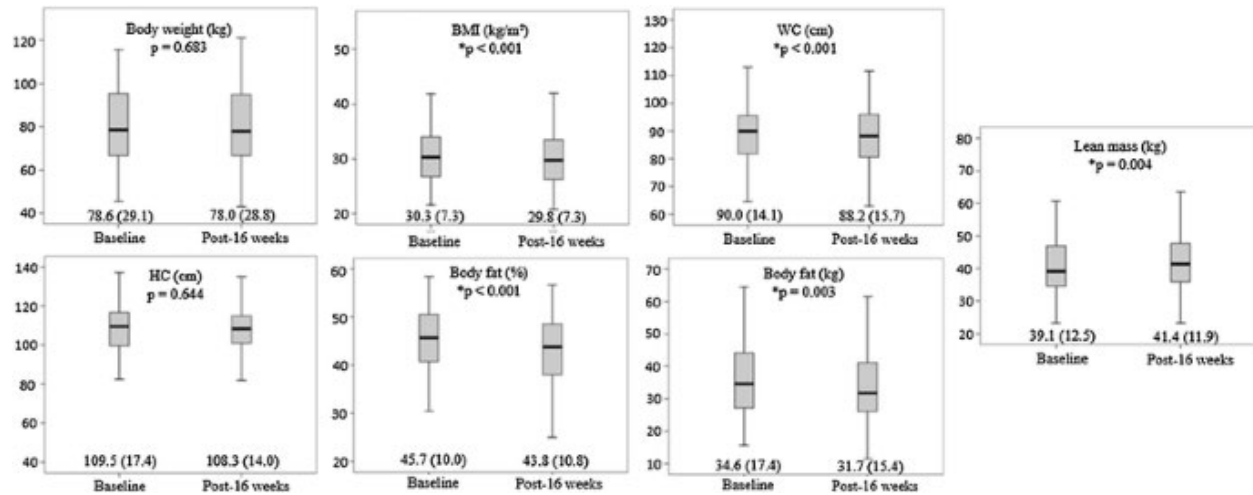
## Statistical analyses

We used the Shapiro–Wilk test to assess normality. Data were presented as means and standard deviations when normality was confirmed and medians and interquartile ranges when normality was violated. Mixed repeated-measures analysis of variance was used to compare changes over time (pre- and post-intervention) in the different groups (adolescents' self-reported and parent-proxy reports of HRQoL) and posthoc analysis with Bonferroni adjustments were used for multiple comparisons. Significance levels were set at  $p < 0.05$ . Cohen effect sizes [26] were used as a qualitative measure of the effects of the intervention on each group for each analysis

performed. These classifications include: trivial ( $\leq 0.2$ ), small (between 0.21 and 0.5), moderate (between 0.51 and 0.8) and large ( $> 0.8$ ).

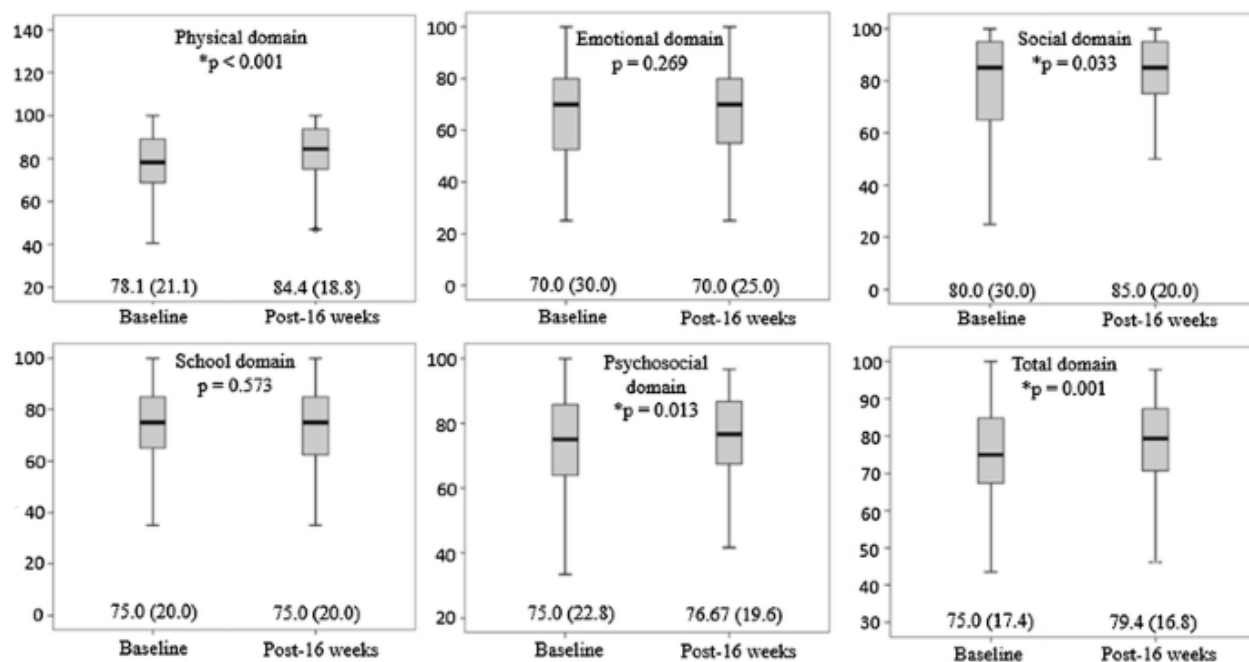
## Results

The mean age of the adolescents at the beginning of the intervention was  $12.84 \pm 1.79$  years. After the intervention, significant improvements in BMI (baseline median:  $p < 0.001$ ; effect size:  $-0.11$ ), WC ( $p < 0.001$ ; effect size:  $-0.16$ ), body fat (absolute and relative) ( $p$  0.003 and  $< 0.001$ , respectively; effect sizes:  $-0.20$  and  $-0.36$ , respectively) and lean mass ( $p$  0.004; effect size: 0.19) were observed (Fig. 1).

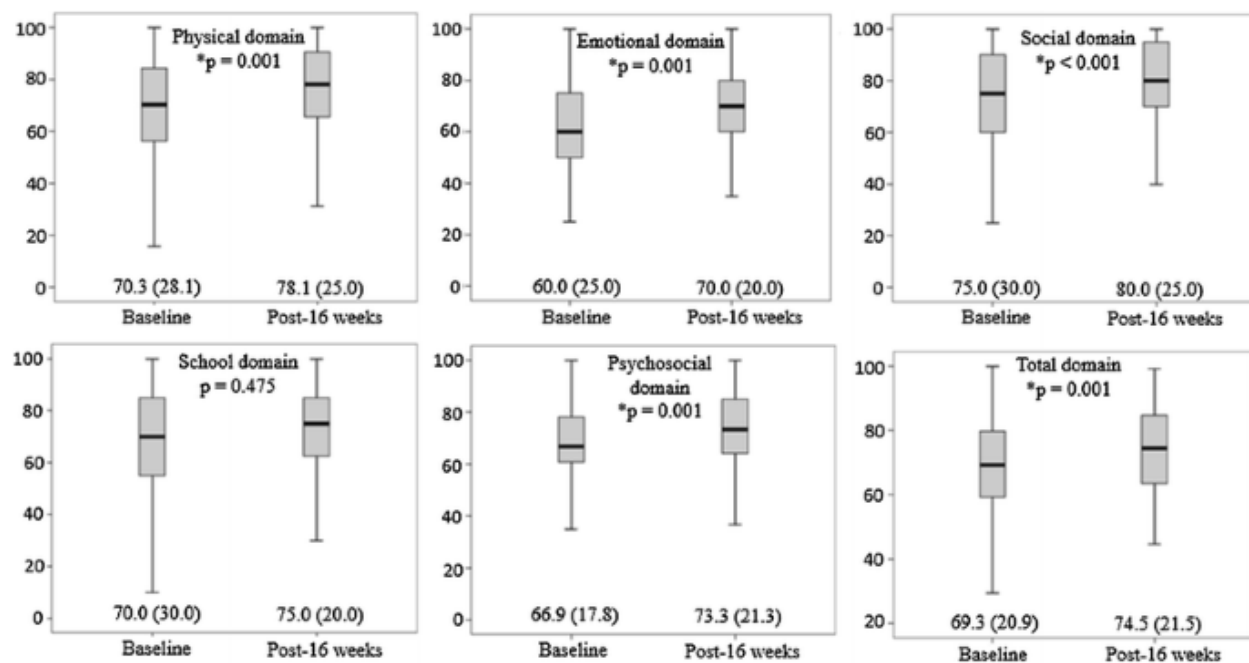


**Fig. 1.** Anthropometric variables and body composition before and after the intervention period ( $n = 92$ ). BMI body mass index, WC waist circumference, HC hip circumference. Boxplot representation of median (interquartile range). \*Significant within-group difference from baseline

Following the intervention, significant improvements in physical ( $p < 0.001$ ; effect size: 0.43), social ( $p$  0.033; effect size: 0.10), psychosocial ( $p$  0.013; effect size: 0.18) and total domains ( $p$  0.001; effect size: 0.28) were seen (Fig. 2). As for parent-proxy perceptions, increases in all HRQoL domains ( $p < 0.001$  for social domain; effect size: 0.26, and  $p = 0.001$  for the others; effect sizes of 0.31 for physical, 0.33 for emotional, 0.34 for psychosocial, and 0.33 for total domain), except for the school domain, were noted (Fig. 3).



**Fig. 2.** Adolescents' health-related quality of life before and after the intervention period ( $n = 92$ ). *Boxplot* representation of median (interquartile range). \*Significant within-group difference from baseline



**Fig. 3.** Parent-proxy perceptions of health-related quality of life before and after the intervention period ( $n = 92$ ). *Boxplot* representation of median (interquartile range). \*Significant within-group difference from baseline

The comparison between parent-proxy perceptions and adolescents' self-reported HRQoL revealed that parents presented lower scores than their children's scores in all domains at

baseline ( $p < 0.05$ ). Following the intervention, parents of the adolescents only presented lower scores in physical and total domains and no significant differences in the other domains.

## Discussion

The main finding of the present study is that a 16-week PMTO led to positive changes in overweight and obese adolescents' self-reported HRQoL, and improvements in their parents' perceptions of HRQoL.

Main increases were obtained for physical and social domains. In relation to social domain changes, the social involvement promoted by PMTO is one of the factors that could explain the improvements in HRQoL, given that the multidisciplinary team tries to create a positive and comfortable environment for the adolescents and their families [23]. The use of group interventions may facilitate the establishment of friendships between adolescents, especially for those of similar ages [27]. Nikolaidis [27] suggested that individuals with similar ages have more tendency to have similar lifestyle habits (e.g., exercise participation). In addition, the social support related to the use of group interventions have been previously associated with higher levels of motivation to change exercise and eating behaviors, and consequently lead to greater adherence rates to the interventions [28]. Improvements in self-esteem and the drive to maintain a healthier lifestyle can aid in the improvement of HRQoL [10, 29]. However, even with significant improvements in adolescents' HRQoL, their scores for all domains, except for physical domain, are still below mean values observed in normal weight adolescents [30, 31] thus reinforcing the need to maintain longer term multidisciplinary interventions in these individuals.

Regarding the noted increases in the physical domain, the integration of psychosocial interventions, in addition to exercise and diet, in overweight and obese adolescents may lead to improvements in many domains of HRQoL that may be reduced due to weight change during adolescence [2, 4, 18], including the physical domain [7]. Fullerton et al. [7] evaluated HRQoL scores before and after a 12-week multidisciplinary intervention with nutritional education, physical activity and behavioral changes in overweight and obese children, and noticed significant improvements in physical and total domains. The positive changes in physical domain of HRQoL seem to be associated with improvements in percentage body fat after a multidisciplinary intervention [32]. According to Morano et al. [5], weight loss combined with improvements in physical fitness could be positively associated with perceptions of physical HRQoL. Hofsteenge et al. [8] reported beneficial intervention effects on physical health and school functioning assessed in obese adolescents during an 18-month follow-up. Kolotkin et al. [33] also noted significant improvements in HRQoL following a multidisciplinary intervention in all domains evaluated, which included physical comfort, social life and family relations assessed with the Impact of Weight on Quality of Life (IWQOL-Kids) tool. The promotion of exercise participation associated with the PMTO may be the most important factor that contributes to the improvements observed in physical domain of HRQoL. Recently, Torres-Luque et al. [34] demonstrated that physical activity as part of extracurricular activities is the best representation of total physical activity performed during the week by children, given that many kids do not take part in sufficient physical activity during school hours.

Psychosocial and total domains were also improved in the present study. Other multidisciplinary interventions previously showed improvements in these general domains of quality of life [10, 12]. For instance, Wille et al. [12] showed positive changes in friends and total domains of HRQoL after a 1-year multidisciplinary intervention to treat obesity, which was assessed with the German generic quality of life instrument for children KINDL tool. Positive changes were also reported by Lofrano-Prado et al. [10] with the SF-36 questionnaire, where obese girls showed improvements in general health perception, and obese boys showed improvements in functional capacity, physical aspects, pain, vitality, emotional aspects and the mean score of all measured dimensions, following a 1-year PMTO.

In addition to improving the HRQoL of overweight adolescents, the PMTO also reduced differences between parent-proxy perceptions of their children's HRQoL compared to their children's own perception. As for parent-proxy perceptions of adolescents' HRQoL, Kunkel et al. [18] noted that parents presented higher scores than those reported by their overweight children. However, most studies suggest that parents present lower HRQoL scores than their children [4, 16, 17]. This lower score was also noted at the beginning of the PMTO for all HRQoL domains. Nonetheless, following the intervention, the emotional, social, school and psychosocial domains were not perceived as being lower when compared to their children's HRQoL scores. According to Katzmarzyk et al. [21], the involvement of parents in obesity treatment interventions is fundamental to the success of their children and adolescents in these programs. Family environment and parents' attitudes play a fundamental role in the establishment of nutritional and physical activity habits, which should be taken into consideration when imposing a diet, physical activity and/or lifestyle intervention [21, 35, 36]. According to Nikolaidis [27], the familiar environment is considered a determinant for exercise participation in children, although genetic factors might play a role as well [37]. In addition, Morano et al. [5] developed a 6-month multidisciplinary obesity program, combining school- and family-based components and reported significant changes in HRQoL. Therefore, there is evidence to suggest that multidisciplinary interventions targeting both children and their parents may lead to improvements in HRQoL.

The results of the present intervention were obtained based on the pragmatic trial point of view designed to evaluate the effectiveness of interventions in real-life conditions. These results can be generalized and applied to the routine care of adolescents with obesity who are looking for similar intervention programs, and may be used to evaluate and monitor similar health services in the community. Collectively, this may aid in the implementation of public policies related to the treatment of obesity in adolescents.

## **Conclusions**

In summary, the present study demonstrated that a 16-week PMTO promotes positive changes in anthropometric variables and the HRQoL (i.e., physical, social, psychosocial, and total domains) of adolescents. PMTO also improved the parent-proxy scores for the HRQoL of adolescents in the physical, social, emotional, psychosocial, and total domains. In addition to improvements in the HRQoL of overweight adolescents, this PMTO also reduced the differences parent-proxy perceptions vs their children's own perception of HRQoL. Future studies including the assessment of other variables (e.g., psychological and social parameters) that could help in



further understanding the changes promoted by PMTO on HRQoL in overweight and obese adolescents are needed.

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## Ethics declarations

### Conflict of interest

The authors declare that they have no conflict of interest.

### Ethical standard

This study was approved by the local Ethics Committee (protocol 463/2009). All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

### Informed consent

Informed consent was obtained from all individual participants included in the study.

#### Abbreviations

**BMI:** Body mass index

**ES:** Effect size

**HRQoL:** Health-related quality of life

**PMTO:** Multidisciplinary obesity treatment program

**WC:** Waist circumference

**HC:** Hip circumference

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