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Can 12 weeks improve the standard feeding of obese adolescents?

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ABSTRACT

Introduction: Being a complex stage of individual development, adolescence provides the experience of challenging situations as the young person develops autonomy, independence, and own behavioral habits while progressing to adulthood. Thus, obesity in this period configures an essential and growing public health problem and progressively demands greater diligence in clarifying the particularities that allow its triggering and perpetuation to obtain adequate understanding that enables the optimization of health promotion strategies that provide quality of life to these adolescents.

Objective: This study aimed to analyze whether 12 weeks of multi-professional interventions improved the dietary patterns of obese adolescents.

Materials and Methods: This is a pre-experimental and interventional study carried out in an academic institution in the accommodations pertinent to the Interdisciplinary Laboratory of Intervention in Health Promotion. Forty-three adolescents (male = 20 and female = 23) who were overweight were evaluated in the pre- and post-intervention multi-professional moments. The 24-hour food recall (24hR) was applied to collect information on dietary patterns; subsequently, the results were subdivided according to the level of food processing. The 12-week multi-professional program included nutritional interventions (1x/week), psychological interventions (1x/week) and physical exercises (2x/week). Data were expressed as mean and standard deviation. A paired test was applied to compare the pre- and post-intervention moments, assuming a significance level of 5%.

Results: With the present research, it was possible to determine the potential progress of improvements in dietary patterns of obese adolescents, submitted to intervention over 12 weeks, indicating an increase in grams and kcals in the consumption of fresh foods and a reduction of kcals of processed and ultra-processed foods.

Conclusions: Based on the results, it was found that when assessing the level of food processing, it was possible to verify a change in the eating habits of adolescents with obesity.

KEYWORDS

Eating habits; Food and Nutrition Education; Feeding Behavior; Overweight.

INTRODUCTION

According to the World Health Organization (WHO)[1], adolescence is a crucial period of human development between 10 and 19 years, with different biological, cognitive, emotional, and transitions from childhood to adulthood. This condition is a complex period, marked by autonomy and independence in daily activities, with the adoption of new behaviors and experiences[2]. As a reflection, the environment in which it is inserted underlies the adolescent's health customs[3].

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Established behaviors are shaped at a young age and maintained over time, motivated by family, community, society, colleagues, school, and even social media advertisements[4]. With changes in the nutritional and epidemiological profile of the population in recent years, it is the changes in eating patterns and reduction of physical activity levels in which young people are exposed to obesogenic behaviors and environments, reflecting excessive weight gain and body fat[4,5].

The obesogenic environment refers to environmental and social exposure that promotes weight gain and hinders the maintenance of a healthy lifestyle[4]. Obesity is a complex chronic non-communicable disease (NCD) of multifactorial etiology resulting from the positive energy balance. Its complexity is associated with the development of diseases such as type 2 diabetes mellitus (TDM2), hypercholesterolemia, hypertension, the development of metabolic and cardiovascular syndrome, and morbidity and mortality in adulthood[6].

Thus, lifestyle care becomes essential to avoid health consequences and problems in adulthood. The lack of incentive to practice physical exercises and the consumption of foods with higher levels of processing is correlated to excess of body fat and nutritional deficiencies that provide health problems in the young phase[7,8,9]. Thus, consuming processed foods is worrying due to the tendency to contain sodium, fats, and sugar in high amounts and additives, that is, low in fiber, vitamins, and minerals[10,11,12].

The multi-professional actions are necessary to reverse this context[12]. Food and nutritional education involve permanent, transdisciplinary, intersectoral, and multi-professional action, promoting short- and long-term changes[13,14]. Early implementation of behavioral modifications, with the adoption of healthy eating habits and regular exercise, becomes essential to restore the health of adolescents with obesity and stop the progression of parameters related to metabolic syndrome and cardiometabolic risk[15].

Even so, due to the complexity of these changes, implementing effective strategies for behavior change and adopting healthy habits in the treatment of overweight represents a significant challenge[16,17]. Identifying effective methods with a broad and detailed approach is essential to promote positive changes in health-related behaviors, such as improving food quality. However, this task has been increasingly tricky among adolescents and requires scientific research to identify the best method of treatment today and the most effective when the treatment is in the adolescence phase, especially in the food context. Therefore, this study aimed to investigate whether 12 weeks of multi-professional intervention can improve the eating behaviors of adolescents with obesity.

METHODS

This study presents a pre-experimental and interventional design[18]. Data were collected at Cesumar University, on the premises of the Interdisciplinary Laboratory of Intervention in Health Promotion (LIIPS), over 12 weeks of multi-professional interventions. The center's Research Ethics Committee approved the study by opinion nº 4.913.453/2021. The procedures followed the standards required in Resolution 466/2012 of the National Health Council on research involving human beings.

Forty-three adolescents (male = 20 and female = 23) living in a municipality in southern Brazil were recruited. As inclusion criteria, the following adolescents were recruited: (1) adolescents from 12 to 17 years; (2) overweight or obese; (3) consent form signed by the responsible/responsible adolescent; (4) availability to participate in a multi-disciplinary intervention three times a week for 12 weeks; and (5) participate in the initial evaluations of the project. As exclusion criteria, adolescents: (1) did not meet any of the instruments requested; (2) presented orthopedic, cardiovascular, and cognitive deficits that prevented the practice of physical exercises; (3) were on some restrictive diet (low carb, low fat, or low calorie) or nutritional guidance during the 12 weeks of the study; (4) were using a psychotropic drug or appetite regulator; and (5) accidents that made participation in practical interventions impossible. For further details of the study, figure 1 shows the study flowchart.

The height was measured using a stadiometer of the brand Sanny, Standard, following the standardization proposed by Lohman, Roche, and Martorell[19]. Body mass (kg) was measured using a mechanical balance Welmy®, with a capacity of 250 kg and an accuracy of 100g. With height and body mass, body mass index (BMI) was calculated by dividing weight by height squared (BMI = body mass/(H^2)). The nutritional status of adolescents was classified according to the cut-off points established by the World Health Organization (WHO)[20], according to the percentiles: overweight was between the 85th percentile and <95, and those with obesity were 95th percentile. According to the WHO reference data, the BMI z-index was calculated using the WHO computer application[20].

Usual food consumption was assessed using a 24-hour food recall (24hR). Participants filled out the 24hR at the beginning and end of the interventions in detail for two non-consecutive working days and one day on the weekend. The average ((day 1 + day 2 + day 3)/3) was used to establish the grams and kilocalories (kcals) of foods classified according to food processing[9,12]. Participants were asked to detail each food item, such as brand names or restaurants, and to label specific items (low fat, 1% milk). 24hR information was calculated using Avanutri software (version 2004®, Avanutri evaluation equipment Ltda., Três Rios, Rio de Janeiro, Brazil). Tables added foods unavailable in the program using the Brazilian Food Composition Table (TACO)[21], as Malta, Papini, and Current[22] suggested.

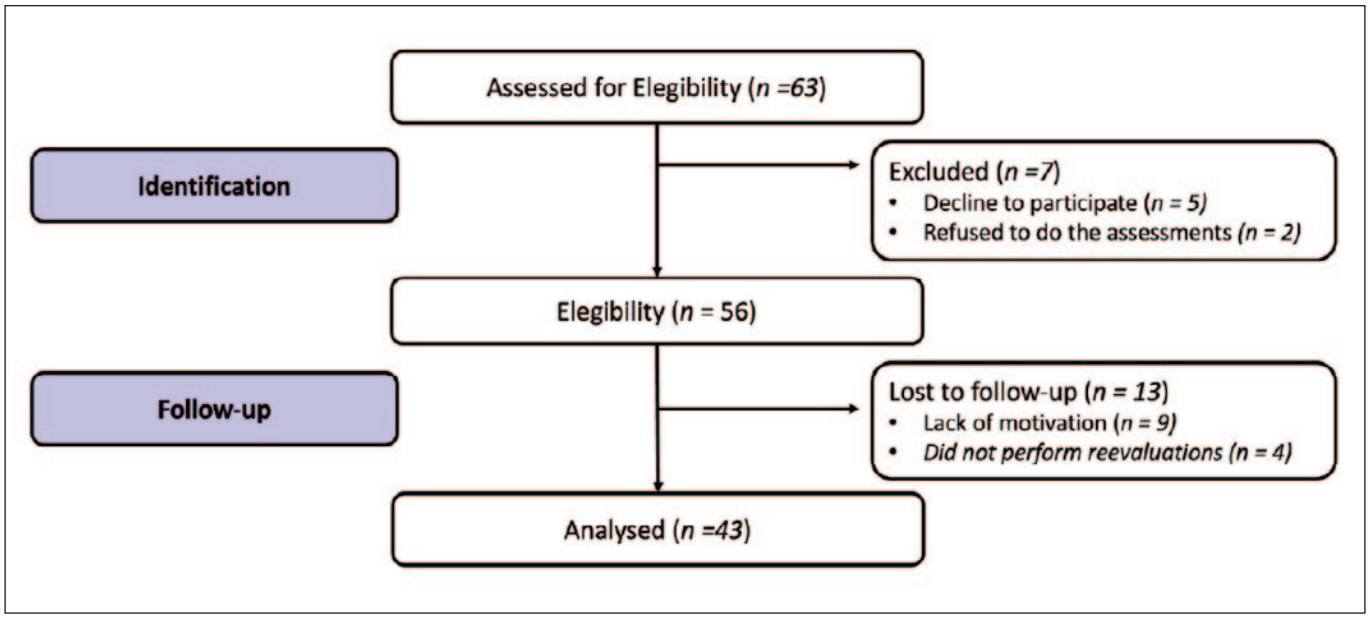

Figure 1. Study flowchart

With the results found in 24hR, the amount in grams and kcals of each level of food processing was analyzed: Fresh products, minimally processed, processed, or ultra-processed foods. Fresh produce was obtained directly from plants, which did not change after leaving nature (such as fruits and salads). The minimally processed were subjected to minimal processes such as cleaning, removal of unwanted parts, packaging, drying, fermentation, and other processes that do not add salt, sugar, or oils to the original food (such as fruit salad, orange juice). Processed foods were produced from fresh foods, but salt, sugar, oils, and fats were added during preparation (such as jams, cheese, and bread). Ultra-processed foods undergo industrial processes to be ready for consumption (such as stuffed biscuits, sweets, snacks, and beverages). The results were tabulated in an Excel spreadsheet, and subsequently, the pre- and post-intervention consumption was analyzed using the average of three days, according to the information described in topic 24hR.

The intervention occurred over 12 weeks, for three days a week. The meetings lasted an hour and a half, along with the participation of the nutrition team once a week (30 minutes of interventions each), psychology once a week (30 minutes of interventions each), and physical education three times a week (for 1 hour each). The interventions were previously designed and discussed among health professionals to determine a schedule and planning between areas.

After confirming the normality of the data using the Kolmogorov-Smirnov test, the data were presented as mean and standard deviation. The paired t-test was used to compare the pre and post-intervention responses, assuming a $p< 0.05$. Absolute delta (post less pre-intervention was calculated). In addition, Cohen's via d effect size was calculated with the following classification: small: d = 0.2. medium: d = 0.5. large: d = 0.8. All statistical analyses were performed using the Statistical package (Version 29.0, Stasoft, United States of America).

RESULTS

A total of 43 adolescents (23 women and 20 men) living in a municipality in southern Brazil were evaluated. There were no significant changes in body weight and BMI ($p>0.05$), but for age and height measurements, there was an increase from pre to post-intervention ($p<0.05$). The general characteristics of the evaluated group are described in Table 1.

When comparing each level of processing described in Table 2, it is noteworthy that consumption of kcals in fresh foods was higher in the post-test than in the pre-test ($p = 0.006$; $d = 0.69$; moderate effect). Consequently, higher values were found after the interventions when evaluating the consumption in grams of fresh food ($p <0.001$; $d = 0.69$; moderate effect).

When evaluated by group (female and male), the female sex showed a significant increase in the consumption of fresh foods in kcals at the time post-intervention ($p = 0.009$; $d = 0.46$, moderate effect) and grams ($p = 0.004$; $d = 0.88$, large effect). Similarly, males also showed a significant increase in grams ($p = 0.04$; $d = 0.80$, large effect), but for consumption in kcals, no significant results were found. No significant differences were observed for the consumption of minimally processed foods ($p>0.05$); however, the values were higher when compared to the final evaluation, even if small.

Table 1. Characteristics of the general sample and by sex

Variables		Pre-intervention	Post-intervention	Absolute delta	Cohen's *d*
Age (years)	G*	13.72 ± 2.46	13.98 ± 2.53	0.26 ± 0.44	0.10 - small
	F*	13.57 ± 2.45	13.83 ± 2.55	0.26 ± 0.45	0.11 - small
	M*	13.90 ± 2.53	14.15 ± 2.56	0.25 ± 0.44	0.10 - small
Body mass (kg)	G	80.31 ± 25.72	80.41 ± 24.25	0.10 ± 2.62	0.001 - small
	F	78.38 ± 26.55	78.46 ± 24.85	0.08 ± 2.69	0.001 - small
	M	82.54 ± 25.23	82.66 ± 23.99	0.12 ± 2.60	0.001 - small
Height (m^2)	G*	1.63 ± 0.12	1.64 ± 0.11	0.01 ± 0.01	0.06 - small
	F*	1.60 ± 0.07	1.60 ± 0.07	0.01 ± 0.01	0.06 - small
	M*	1.67 ± 0.15	1.68 ± 0.14	0.01 ± 0.02	0.08 - small
Body Mass Index (kg/m^2)	G	29.85 ± 7.97	29.66 ± 7.46	-0.19 ± 1.04	-0.02 - small
	F	30.40 ± 9.10	30.31 ± 8.47	-0.08 ± 1.02	-0.01 - small
	M	29.22 ± 6.61	28.92 ± 6.25	-0.31 ± 1.07	-0.05 - small

Data were expressed by mean and (±) standard deviation; * = $p < 0.05$; G = General (female + male); F = Female; M = Male; absolute delta refers to post minus pre-values.

DISCUSSION

This study aimed to investigate whether 12 weeks of multi-professional intervention can improve the eating behaviors of adolescents with obesity. The main results showed significant changes in increased consumption of fresh foods (kcals and grams), reduction of processed foods (kcals), and ultra-processed foods (kcals). However, no significant differences were observed between the consumption of minimally processed foods and the amount in grams of processed and ultra-processed foods.

Changing dietary patterns is complex and time-consuming. When related to weight loss, treatment requires the joint action of several health professionals, such as nutritionists, psychologists, and exercise physiologists, who must adopt personalized strategies and adapt to the specific needs of everyone[23]. The study developed by Branco[16] with 12 weeks of intervention demonstrates that integrating different areas of knowledge is fundamental to making the health recovery process more effective and promoting healthy habits in the long term, especially in this age group.

Encouraging and promoting educational health guidelines can help the population adopt a diet based on fresh foods, with the consumption of fruits and vegetables, in addition to reducing ultra-processed products and ready-to-eat meals[24,25]. Processed foods are rich in refined carbohydrates, saturated fatty acids, and trans fats and low in nutrients and fiber, associated with metabolic syndrome development and a marked risk of NCD when consumed daily[24-26]. Thus, recent evidence reinforces the need to reduce the consumption of ultra-processed foods as an effective strategy for combating adolescent obesity[27,28]. Cardel et al.[29] point out that the decrease in these foods and the incentive to consume fruits and vegetables is significant for promoting healthy eating habits in this population. However, it is known that the food industry has significant power in marketing sugary foods, which are rich in salt and fats, especially those intended for adolescents[1]. Thus, it is up to professionals to look closely at the difficulties implemented today by society.

The study's results allow us to identify a possible beginning of a change in the participants' eating patterns. This finding indicates that the multi-professional approach adopted was adequate for the parameters analyzed. As well as similar studies, with interventions of 12 weeks, have also shown positive results in increasing the consumption of fresh food[9,12,30]. Despite the positive results, a more extended observation period could allow more effective and sustainable changes in food consumption. Adopting healthy eating habits is a gradual process that takes time to consolidate.

Promoting a healthy environment consequently infers better health conditions and a lower risk of developing cardiovascular diseases and may influence the body context. Steele et al.[24] suggest that increased consumption of fresh and min-

Table 2. Responses of the level of food processing before and after intervention of the adolescents participating in this study

Food Processing		Kcals		Absolute delta	Cohen's *d*	Grams		Absolute delta	Cohen's *d*
		Pre-intervention	Post-intervention			Pre-Intervention	Post-Intervention		
Natural (fresh)	G	77.61 ± 144.79	156.61 ± 184.32*	89.45 ± 184.68	0.55 - moderate	148.55 ± 192.15	309.05 ± 285.86*	160.50 ± 286.43	0.84 – large
	F	93.07 ± 166.50	170.35 ± 157.76*	96.83 ± 136.14	0.46 - moderate	181.89 ± 206.21	362.65 ± 305.98*	180.76 ± 294.20	0.88 – large
	M	59.83 ± 116.71	140.80 ± 213.99	80.97 ± 231.94	0.69 - moderate	110.20 ± 171.72	247.40 ± 254.47*	137.20 ± 282.97	0.80 – large
Minimally processed	G	921.77 ± 634.72	952.78 ± 446.79	31.01 ± 677.47	0.05 – small	680.06 ± 448.22	827.58 ± 488.38	147.53 ± 576.04	0.33 – moderate
	F	749.67 ± 372.00	749.94 ± 350.57	0.27 ± 451.73	0.001 – small	576.89 ± 311.33	613.48 ± 264.65	36.59 ± 365.80	0.12 – small
	M	1119.69 ± 808.22	1186.05 ± 438.05	66.36 ± 880.80	0.08 – small	798.70 ± 551.52	1073.80 ± 571.70	275.10 ± 739.28	0.50 – moderate
Processed	G	571.18 ± 684.03	361.51 ± 324.87	-209.66 ± 656.04	-0.31 – small	299.61 ± 332.68	220.72 ± 257.73	-78.89 ± 423.46	-0.24 – small
	F	526.09 ± 461.23	341.46 ± 387.96*	-184.64 ± 306.35	-0.40 – small	310.60 ± 312.05	182.13 ± 205.91	-128.47 ± 345.22	-0.41 – small
	M	623.02 ± 884.70	384.58 ± 240.78	-238.44± 917.10	-0.27 – small	286.98 ± 362.75	265.10 ± 306.37	-21.88 ± 502.00	-0.06 – small
Ultra-processed	G	726.86 ± 717.66	383.93 ± 537.95	-342.92 ± 854.74	-0.48 – small	441.54 ± 592.49	203.20 ± 355.34	-238.34 ± 641.08	-0.40 – small
	F	641.80 ± 681.49	237.38 ± 253.36*	-404.43 ± 720.90	-0.59 – small	424.03 ± 684.08	131.98 ± 194.24	-292.05 ± 711.81	-0.43 – small
	M	824.67 ± 762.85	552.48 ± 713.77	-272.19 ± 1001.70	-0.36 – small	461.68 ± 483.05	285.10 ± 471.41	-176.58 ± 560.63	-0.37 – small

Data were expressed by mean and (±) standard deviation; * = $p < 0.05$; G = General (female + male); F = Female; M = Male; Kcals = kilocalories; absolute delta refers to post minus pre-values.

imally processed foods may help lose weight since these foods tend to be healthier and have lower energy density. Although the study did not evaluate body composition or observe significant changes in body weight and BMI of adolescents, other studies with similar interventions have shown positive results. For example, Oliveira et al.[30] observed that a 12-week program focused on increasing fresh food consumption and reducing ultra-processed foods resulted in improved body composition, with decreased fat mass and muscle mass gain. These findings indicate that adopting a diet based on less processed foods may benefit health and body composition, even if the effects are not immediately observable. Therefore, strategies that encourage the consumption of fresh and minimally processed foods can be promising in helping the process of weight loss and improving adolescent's overall health.

Another point to be mentioned is that the study addresses that although there are no significant differences in the consumption of processed and ultra-processed foods between the general group and the male before and after the intervention, the female group showed significant reductions in kcal consumption of these foods. However, when evaluated in grams, no significant reductions were found. This difference can be attributed to cultural and historical contexts in which men and women tend to have different behaviors about health and food[30]. Point out that men and women seek health care differently, which can influence their food choices.

Thus, from the differences in behavior and socio-cultural contexts observed between men and women, health professionals who care for overweight adolescents should recognize this diversity and adapt their interventions in a person-

alized way. Only in this way will it be possible to provide an environment conducive to sustainably changing habits. Professionals and public policies may increase the effectiveness of interventions aimed at preventing and treating overweight in adolescence, contributing to the improvement of the health and well-being of this population. Public policies play a crucial role in guiding and fostering integrated strategies involving multi-disciplinary teams, schools, families, communities, and the media, providing broad support in adopting a healthy lifestyle considering the particularities of each group[16]. This difference in behavior is a crucial factor to be considered in developing effective strategies for sustainably adopting healthy eating habits.

Nevertheless, three limitations can be highlighted in this study: (i) not analyzing the body composition of the participants, making it impossible to identify the effectiveness of dietary changes; (ii) controlling the diet after one month of this study to verify whether the change was persistent; (iii) the lack of analyzing the family environment to identify the context that the adolescent was inserted. Even so, it is expected that this study may be an incentive for new multi-professional interventions aimed at promoting health in adolescents, thus contributing to the choice of healthier foods regardless of the environment in which they are inserted to promote the reduction of obesity. It emphasizes the need to implement health education in Basic Health Units so that every adolescent, regardless of financial condition, can access nutritional information. This action can promote new environmental contexts and involve parents in behavioral intervention programs promoting the improvement of healthy habits in the family, which would reflect on the obesogenic environment and reflect on cases of increasing obesity.

CONCLUSION

Based on the change in dietary pattern, we can see that multi-professional interventions can have benefits after 12 weeks of interventions, with a significant increase in adolescents' choice of fresh and minimally processed foods. Thus, we can say that it is of paramount importance to create multi-professional programs aimed at improving the eating patterns of adolescents to promote a healthier lifestyle that can contribute to reducing overweight and obesity and preventing NCDs, which can have significant impacts on adult life since obesity is not only an individual responsibility but also social, being necessary interaction between the individual microenvironments (schools, neighborhoods, workplaces) and macroenvironments composed of (health system, government, food industry, and society) so that multisectoral actions can contribute to reducing the obesity epidemic.

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