

Interdisciplinary lifestyle therapy improves binge eating symptoms and body image dissatisfaction in Brazilian obese adults

Terapia interdisciplinar de mudança do estilo de vida melhora sintomas de compulsão alimentar e insatisfação com a imagem corporal em adultos obesos brasileiros

Joana Pereira de Carvalho-Ferreira,¹ Marcos Alberto Taddeo Cipullo,² Danielle Arisa Caranti,³ Deborah Cristina Landi Masquio,¹ Stephan Garcia Andrade-Silva,¹ Luciana Pellegrini Pisani,³ Ana Raimunda Dâmaso⁴

Abstract

Introduction: Obesity is related to numerous negative consequences for physical and mental health. It is often associated with the presence of binge eating disorder, body image dissatisfaction, and general psychopathology.

Objective: To assess the effects of an interdisciplinary lifestyle therapy on binge eating symptoms, depression, anxiety, body dissatisfaction, and quality of life in obese adults.

Methods: A total of 49 obese adults (body mass index = 37.35 ± 5.82 kg/m²; age = 44.14 ± 10.00 years) participated in a weight-loss program for 6 months. Symptoms suggestive of binge eating, body dissatisfaction, depression, anxiety, and quality of life were measured using self-reported questionnaires. Food intake was assessed using a 3-day dietary record. Data were analyzed using analysis of variance (ANOVA).

Results: ANOVA results showed a reduction in binge eating symptoms and in body dissatisfaction results. Depression and anxiety symptoms also decreased, and an increase was observed in quality of life scores. After therapy, a significant improvement was observed in dietary patterns, as well as significant weight loss. A positive correlation was found between variation of anxiety symptoms and lipid intake. Binge eating symptoms were associated with anxiety symptoms and body image dissatisfaction, and body image dissatisfaction correlated positively with anxiety symptoms in males only. In females, a positive correlation was observed between depression and binge eating symptoms.

Conclusion: The interdisciplinary therapy was effective in promoting positive physical and psychological changes and in improving the quality of life of obese adults.

Clinical Trial Registration Number: NCT01358773

Keywords: Binge-eating disorder, body image, depression, anxiety, obesity, interdisciplinarity.

Resumo

Introdução: A obesidade se relaciona com inúmeras consequências negativas para a saúde física e mental. Está frequentemente associada com transtorno da compulsão alimentar periódica, insatisfação com a imagem corporal e psicopatologia geral.

Objetivo: Avaliar os efeitos de uma terapia interdisciplinar de mudança do estilo de vida sobre sintomas de compulsão alimentar, depressão, ansiedade, insatisfação com a imagem corporal e qualidade de vida em adultos obesos.

Métodos: Um total de 49 adultos obesos (índice de massa corporal = 37.35 ± 5.82 kg/m²; idade = 44.14 ± 10.00 anos) participaram de um programa de redução de peso por 6 meses. Sintomas de compulsão alimentar, insatisfação com a imagem corporal, depressão, ansiedade e qualidade de vida foram avaliados por meio de questionários autoaplicáveis. O consumo alimentar foi avaliado utilizando-se um registro alimentar de 3 dias. Os dados foram analisados utilizando análise de variância (ANOVA).

Resultados: Os resultados da ANOVA mostraram uma redução nos sintomas de compulsão alimentar e na insatisfação com a imagem corporal. Os sintomas de depressão e ansiedade também diminuíram, e foi observado um aumento nos escores de qualidade de vida. Após a terapia, foi verificada melhora significativa no perfil nutricional, assim como significativa redução de peso. Foi observada uma correlação positiva entre a variação dos sintomas de ansiedade e o consumo de lipídios. Sintomas de compulsão alimentar apresentaram associação com sintomas de ansiedade e insatisfação com a imagem corporal, e a insatisfação com a imagem corporal se correlacionou positivamente com os sintomas de ansiedade nos homens. Nas mulheres, foi observada uma correlação positiva entre sintomas de depressão e de compulsão alimentar.

Conclusão: A terapia interdisciplinar foi eficaz na promoção de mudanças físicas e psicológicas e proporcionou uma melhor qualidade de vida em adultos obesos.

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Descritores: Transtorno da compulsão alimentar, imagem corporal, depressão, ansiedade, obesidade, interdisciplinaridade.

¹ Graduate Program in Interdisciplinary Health Sciences and Obesity Study Group, Universidade Federal de São Paulo (UNIFESP), Santos, SP, Brazil. ² Department of Health, Education, and Society and Obesity Study Group, UNIFESP. ³ Graduate Program in Interdisciplinary Health Sciences, Department of Biosciences, and Obesity Study Group, UNIFESP. ⁴ Graduate Programs in Interdisciplinary Health Sciences, Graduate Program in Nutrition, Department of Biosciences, and Obesity Study Group, UNIFESP. Data contained in this paper were partially presented in poster format at the 14th Brazilian Congress of Obesity and Metabolic Syndrome, held in São Paulo, SP, Brazil, between May 25 and 28, 2011.

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Introduction

Obesity is a chronic, multifactorial disease that has been increasing towards epidemic proportions. It affects millions of people worldwide and is currently considered a major public health problem. In Brazil, it is estimated that 50% of the adult population and 21.5% of adolescents are either overweight or obese.¹ Previous studies have shown a significant association between obesity and other pathologies such as cardiovascular disease, non-alcoholic fatty liver disease (NAFLD), metabolic syndrome, some cancers, type 2 diabetes mellitus, among others. All these conditions have impacts on the individual's quality of life and life expectancy.²⁻⁶

In addition to physiological pathologies, manifestations of psychological disorders associated with obesity reinforce its multifactorial etiology. Despite the controversy concerning the cause-effect relationship between mental health and obesity, obese individuals often feel judged in a negative way. Previous investigations have suggested that stigmatizing experiences are associated with depression, general psychological symptoms, and body image dissatisfaction.⁷⁻¹⁰ Self-appreciation and body image satisfaction are important factors for psychological health, and studies have highlighted that people satisfied with their body image are more likely to adopt positive health behaviors.¹¹

Eating disorders such as binge eating are also an important factor associated with obesity. In fact, eating disorders can contribute to the development and maintenance of obesity, as these individuals face greater difficulties losing weight. Binge eating disorder is characterized by presence of binge eating episodes without compensatory behaviors and intense feelings of shame and guilt.^{12,13} It is often associated with psychopathologies such as depression, anxiety, impulse-control, and substance use disorders.¹⁴⁻¹⁷

Furthermore, previous investigations indicate a negative correlation between severity of obesity and quality of life. Compared with normal-weight individuals, obese ones presented significantly lower quality of life scores. In addition, obesity is knowingly associated with severe physical, social, and economic adverse consequences. In this scenario, it is important to note that moderate obesity and overweight are also negatively associated with quality of life.¹⁸⁻²⁰ Previous studies have shown a higher prevalence of psychological symptoms such as depression and anxiety according to severity of obesity, characteristics that are inversely related to quality of life.²¹⁻²³

Even though many studies have investigated the relationship between obesity and psychological symptoms, eating behaviors, and quality of life, few studies have described the effects of a lifestyle shift on obese adults. Thus,

the objectives of the present study were: 1) to evaluate the effects of an interdisciplinary lifestyle therapy program on binge eating, depression, and anxiety symptoms, as well as on body image dissatisfaction, in obese adults; and 2) to investigate quality of life, food intake, and changes in the anthropometric profile of participants.

Methods

Population

Overweight and obese adults were recruited to participate in an interdisciplinary lifestyle therapy program at the Graduate Program in Interdisciplinary Health Sciences of Universidade Federal de São Paulo (UNIFESP), in Santos, SP, Brazil. After screening, 49 obese adults, 12 males and 37 females, were included in this study and attended an interdisciplinary lifestyle therapy program for 6 months. Inclusion criteria were age between 20 and 60 years, body mass index (BMI) > 27 kg/m², and being insufficiently active.²⁴ Non-inclusion criteria were limitations that precluded physical activity, history of alcohol or drug abuse, and less than 75% of attendance to the sessions.

All subjects signed an informed consent form and agreed to participate on a voluntary basis. This study was formally approved by the Research Ethics Committee (0135/04) of UNIFESP.

Study design

At first, obese adults were submitted to different evaluations, covering anthropometric measures, binge eating, depression, and anxiety symptoms, body image dissatisfaction, and quality of life. Subsequently, the interdisciplinary therapy program was started, lasting for 6 months. All evaluations were repeated after therapy. Evaluation procedures and the therapy protocol are described below.

Anthropometric measurements

Anthropometric measurements were assessed at baseline and after therapy. Patients were evaluated standing, wearing light clothing and no shoes. Body mass was measured on a Balmak® digital platform scale, model BK 300 (Bárbara D'Oeste, SP, Brazil), with a 300-kg capacity, rounded to the nearest 0.1 kg. Stature was measured using a wall-mounted stadiometer (Sanny®, São Bernardo do Campo, SP, Brazil) with an accuracy of 0.01 cm. BMI was calculated as weight (kg) divided by height (m) squared.

Questionnaires

The following self-report questionnaires were applied at baseline and after the interdisciplinary lifestyle therapy program, and were used as parameters for the assessment of treatment outcome. It is important to emphasize that the instruments were not applied with the purpose of establishing a diagnosis, but rather to identify the symptoms and severity of disorders.

Binge Eating Scale (BES). This scale has been translated into Portuguese and validated for the Brazilian population. It comprises 16 self-administered items for the assessment of binge eating severity in obese individuals. Each item presents three or four differently weighted statements, with a final score varying from 0-46. Based on BES scores, patients can be classified according the following levels of severity: normal (≤ 17), moderate bingers (18-26), and severe bingers (≥ 27).²⁵

Body Shape Questionnaire (BSQ). This is a 34-item self-administered scale developed to measure body dissatisfaction in the 4 past weeks. The respondent rates each item using a Likert scale from 1 (never) to 6 (always). The final score indicates the respondent's level of concern and distress about body shape. Subjects are classified according to standards of the original study: no concern (≤ 110), mild (111-138), moderate (139-167), and severe (≥ 168). The BSQ has been translated into Portuguese and validated for the Brazilian population.²⁶

Beck Depression Inventory (BDI). This is a 21-item self-reported questionnaire used to identify symptoms of depression in the general population. It has been translated into Portuguese and validated for the Brazilian population.²⁷ Each item comprises four statements typically associated with depressive

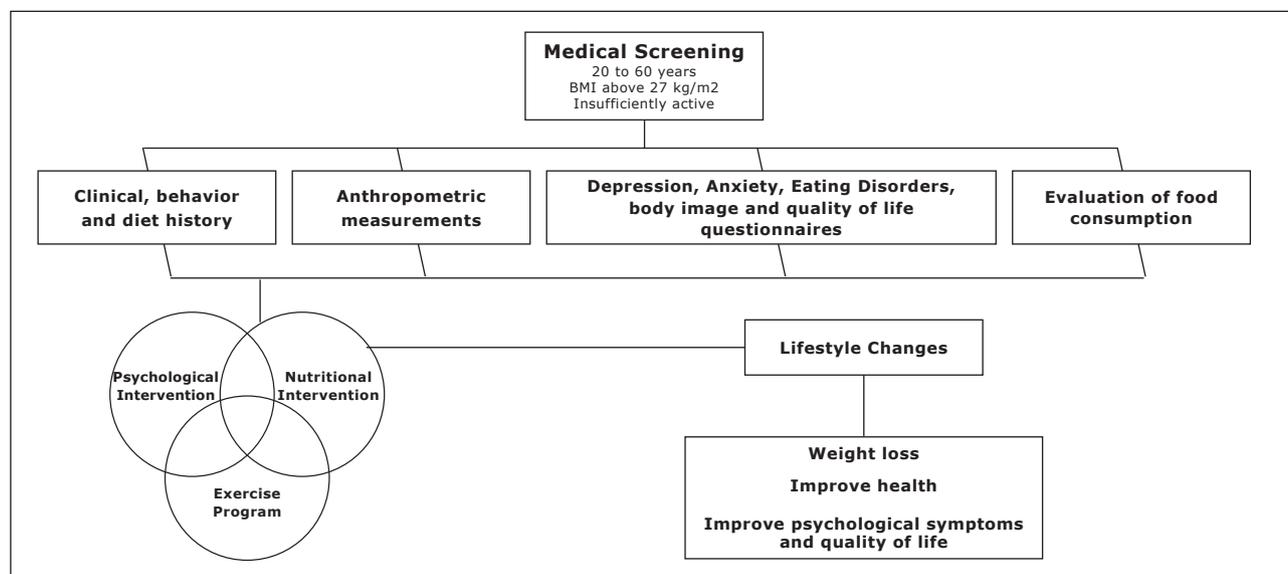
symptomatology. The severity of depression is measured using the following ranks: no concern (0-11), mild (12-19), moderate (20-35), and severe (36-63).

Beck Anxiety Inventory (BAI). This is a 21-item self-reported questionnaire used to identify symptoms of anxiety. It has been translated into Portuguese and validated for the Brazilian population.²⁷ Each item presents a common symptom of anxiety, and respondents are asked to rate each item regarding the intensity of symptoms experienced over the past week. Subjects are classified into the following categories: no concern (0-10), mild (11-19), moderate (20-30), and severe (31-63).

World Health Organization-Quality of Life – BREF (WHOQOL-BREF). This is an abbreviated form of the WHOQOL-100, both developed by the World Health Organization. A version translated into Portuguese and validated for the Brazilian population by the Brazilian WHOQOL group was used.²⁸ The WHOQOL-BREF includes 26 questions and is based on a four-domain structure: physical health, psychological symptoms, social relationships, and environment. The scores obtained in each domain suggest the individual's perception of quality of life in each domain. Scores are scaled in a positive direction.

Therapy protocol

Weekly meetings were held by the research group in order to discuss major difficulties faced by study participants and try to implement techniques to overcome or minimize them. Some interventions were planned and carried out by professionals from different areas, enabling integration across disciplines. The study protocol is illustrated in Figure 1.



BMI = body mass index.

Figure 1 – Study protocol diagram.

Medical therapy

Medical activities included anamnesis (initial medical history) and physical examination.

Psychological therapy

Obese adults were invited to attend weekly psychological group sessions to discuss common psychological problems associated with obesity. Depression, anxiety, body image dissatisfaction, eating disorders, such as binge eating, bulimia, and anorexia nervosa, the relationship between food and feelings, stress, family problems, among other topics. The signals, symptoms, consequences for health, and the relation of this topics with the causes and maintenance of obesity were also discussed. Interventions were focused on developing coping strategies, relaxation techniques, body awareness, self-knowledge and behavioral changes. Sessions were planned ahead by the research team but were subject to changes according to patients' demands. Individual psychotherapy was offered only when nutritional or behavioral problems were suspected.

Nutritional therapy

At baseline and after therapy, subjects were asked to fill a 3-day dietary record.²⁹ Portions were measured using familiar/everyday volumes and sizes. Individuals were instructed by a nutritionist on how to record the intake of food.

Once a week, individuals received nutritional guidance in groups that discussed important issues involved in changing lifestyle habits. Among other topics, information was provided on the food pyramid, weight-loss and fad diets, food labels, fat-free and low-calorie food, dietary substitutes, good nutritional choices, and functional foods. Practical experimental cooking classes were conducted to improve the participants' understanding of portion sizes, healthy recipes, etc. All subjects attended an individual nutritional session and were always encouraged to reduce their food intake and follow a balanced diet.^{30,31}

Exercise program

Study participants reported an insufficiently active lifestyle. As part of the physical therapy sessions, held one to three times per week, obese adults were encouraged to perform an exercise program; these exercises were monitored by a physiologist. Spontaneous physical exercises were also encouraged, e.g., walking, climbing stairs, dancing, always as a way of changing their lifestyle.³²

Statistical analysis

Distributional assumptions were verified using Kolmogorov-Smirnov's test. Based on data distribution, analyses were performed using parametric methods, and significance was set at $p < 0.05$. Comparisons between measures taken at baseline and after the weight-loss intervention were made using analysis of variance for repeated measures (ANOVA). The marginal homogeneity test was used to evaluate changes in the prevalence of subjects classified into each severity category of binge eating symptoms. Associations between the variables were calculated using Pearson's correlation coefficient.

Results

At first, 96 obese adults were enrolled in the program. However, only 49 completed 6 months of therapy with > 75% of attendance treatment sessions. The main reasons of dropping out of the study were lack of time or incompatibility of schedules and health problems.

Effects on psychological symptoms

According to Table 1, there was a significant improvement in binge eating symptoms and dissatisfaction with body image after the program. A decrease in depression and anxiety symptoms was also observed. No gender differences were found at baseline or over time (Table 1).

Severity of binge eating disorder symptoms revealed a decrease in the frequency of moderate and severe symptoms and an increase in the frequency of normal status (Figure 2; $p = 0.001$).

The results obtained with the WHOQOL-BREF scale showed that patients perceived a significant improvement in their quality of life. The scores of each domain were significantly different before and after therapy, showing a positive trend (Table 1). No significant gender differences were observed at baseline and over time.

Effects on food intake

Significant differences were observed in food intake values before and after therapy. Total energy intake, lipid, saturated fat, carbohydrate, and protein intake decreased significantly, as shown in Table 2.

Table 1 – General characteristics, anthropometric variables, scores obtained for binge eating, depression, and anxiety symptoms, body image dissatisfaction, and quality of life, at baseline and after therapy

	All		Men		Women	
	Baseline	After therapy	Baseline	After therapy	Baseline	After therapy
Age, years	44.14 (10.00)		43.00 (7.82)		44.51 (10.68)	
Height, m	1.64 (0.08)		1.75 (0.05)		1.60 (0.04)*	
Body mass, kg	101.65 (22.70)	99.50 (23.04) [†]	124.83 (25.56)	122.36 (26.37) [†]	93.47 (14.87)*	91.88 (15.97) [§]
BMI, kg/m ²	37.35 (5.82)	36.36 (5.90) [†]	40.32 (6.84)	39.50 (7.13) [†]	36.30 (5.12)*	35.21 (5.03) [§]
AC, cm	113.69 (15.50)	111.97 (15.17) [†]	129.00 (16.96)	124.54 (17.72) [†]	108.72 (11.35)*	107.78 (11.75) [§]
TC, cm	115.48 (13.60)	112.66 (13.85) [†]	126.87 (16.38)	124.90 (16.15) [†]	111.78 (10.36)*	108.47 (10.20) [§]
NC, cm	38.84 (5.22)	38.97 (5.11)	45.21 (4.66)	45.47 (4.47)	36.78 (3.45)*	36.80 (3.09)
HC, cm	120.16 (11.86)	120.34 (11.30)	123.34 (13.76)	122.58 (13.97)	119.12 (11.19)	119.60 (10.50)
WHR	0.95 (0.09)	0.93 (0.08)	1.05 (0.06)	1.01 (0.07)	0.92 (0.08)*	0.90 (0.06)
BES	16.40 (7.50)	8.73 (5.74) [†]	17.92 (7.76)	10.08 (4.58) [†]	15.81 (7.45)	8.22 (6.10) [§]
BSQ	118.65 (28.38)	100.54 (25.47) [†]	110.60 (36.50)	91.40 (28.00) [†]	121.09 (25.62)	103.48 (24.36) [§]
BDI	15.42 (7.54)	7.98 (5.23) [†]	19.20 (6.96)	9.70 (3.65) [†]	14.27 (7.42)	7.44 (5.57) [§]
BAI	14.93 (9.80)	8.79 (7.19) [†]	16.00 (8.67)	9.00 (5.55) [†]	14.58 (10.25)	8.71 (7.77) [§]
WHOQOL-BREF						
Physical	12.69 (2.77)	14.29 (2.20) [†]	11.12 (2.16)	13.14 (1.93) [†]	13.21 (2.78)	14.68 (2.18) [§]
Psychological	12.98 (2.48)	14.62 (2.00) [†]	13.15 (1.55)	14.97 (1.13) [†]	12.92 (2.75)	14.52 (2.20) [§]
Social relationship	13.41 (3.76)	14.84 (3.09) [†]	11.52 (2.75)	13.89 (2.75) [†]	14.09 (3.87)	15.18 (3.17) [§]
Environment	13.72 (2.13)	14.17 (1.89) [†]	13.68 (1.42)	14.21 (0.75) [†]	13.73 (2.36)	14.15 (2.15) [§]

Values expressed as mean (standard deviation).

AC = abdominal circumference; BAI = Beck Anxiety Inventory; BDI = Beck Depression Inventory; BES = Binge Eating Scale; BMI = body mass index; BSQ = Body Shape Questionnaire; HC = hip circumference; NC = neck circumference; TC = thoracic circumference; WHOQOL-BREF = World Health Organization-Quality of Life - BREF; WHR = waist-to-hip ratio.

* Gender differences at baseline, $p < 0.05$.

[†] Comparison between baseline and after therapy in the total sample, $p < 0.05$.

[‡] Comparison between baseline and after therapy in males, $p < 0.05$.

[§] Comparison between baseline and after therapy in females, $p < 0.05$.

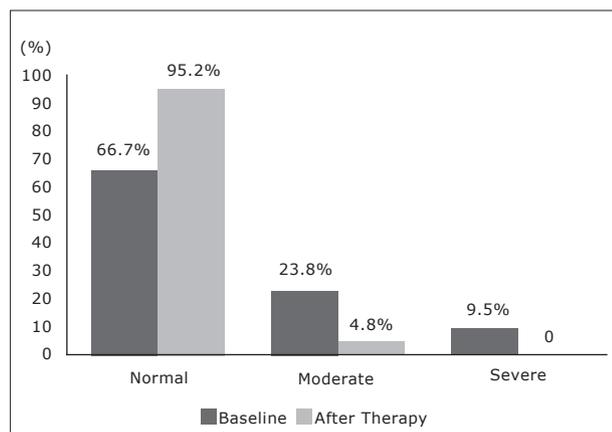


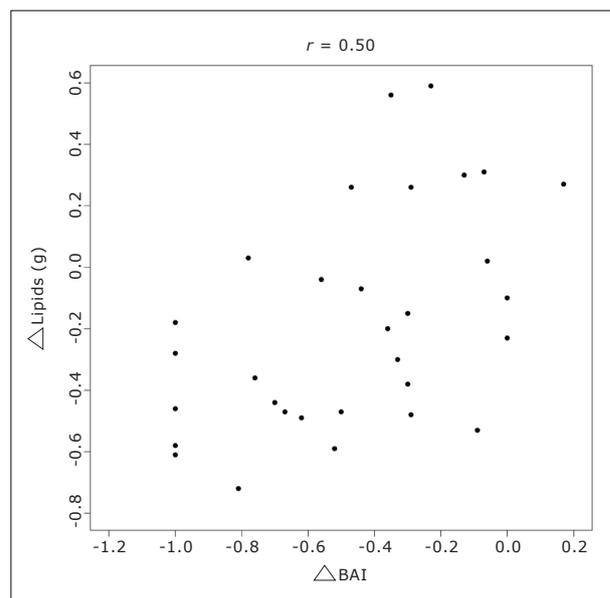
Figure 2 – Prevalence of binge eating disorder symptoms according to severity at baseline and after therapy

Table 2 – Values of food intake measured at baseline and after therapy

	Baseline	After therapy
Energy intake (Kcal)	2195.93 (829.26)	1603.60 (522.23)*
Protein (g)	95.54 (37.31)	69.76 (23.43)*
Lipid (g)	94.12 (92.30)	53.38 (26.55)*
Saturated fat (g)	24.89 (13.63)	14.76 (9.97)*
Carbohydrate (g)	272.43 (105.43)	209.58 (64.37)*

Values expressed as mean (standard deviation).

* Comparison between baseline and after therapy, $p < 0.05$.



BAI = Beck Anxiety Inventory.

Figure 3 – Positive correlation between changes in anxiety symptoms and changes in lipid intake (g)

Effects on anthropometric variables

Descriptive characteristics of all patients and of men vs. women are shown in Table 1. At baseline, men showed higher body mass, BMI, abdominal/thoracic/neck circumference, and waist-to-hip ratio results, when compared with women. Hip circumference was statistically similar in men and women at baseline. However, results over time were not different within each group (gender vs. time). Following the interdisciplinary lifestyle therapy program, the entire group showed an improvement in body mass, BMI, abdominal circumference, and thoracic circumference.

Correlations

A positive correlation was found between changes in anxiety symptoms and lipid intake (g) (Figure 3). Binge eating symptoms were associated with anxiety symptoms and body image dissatisfaction, and the latter correlated positively with anxiety symptoms in males only. Meanwhile, in females, a positive correlation was observed between depression and binge eating symptoms (Figure 4).

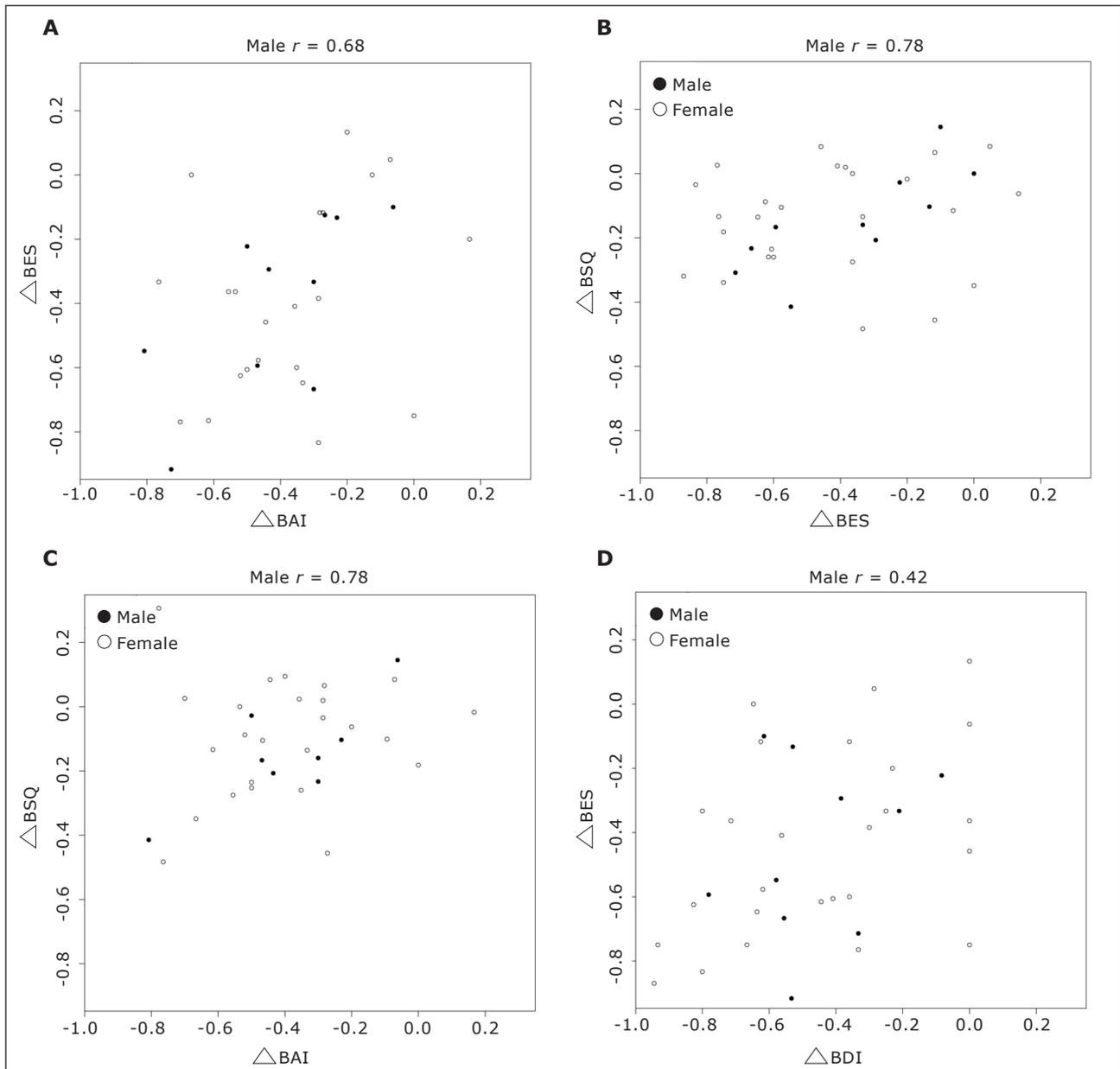


Figure 4 – Positive correlations: A) between changes in binge eating symptoms and anxiety symptoms in men; B) between changes in binge eating symptoms and body image dissatisfaction in men; C) between changes in body image dissatisfaction and anxiety symptoms in men; and D) between changes in binge eating symptoms and depression symptoms in women.

Discussion

The highlight of the present study was to show that an interdisciplinary therapy program with obese adults promoted an improvement in physical and psychological symptoms, reducing the prevalence and severity of binge eating symptoms, as well as dissatisfaction with body image. Depression and anxiety were also ameliorated after therapy. Finally, a positive correlation between changes in anxiety symptoms and lipid intake was observed. Altogether, these results may have contributed to an improved quality of life among participants.

Correlations between binge eating and anxiety symptoms and body image dissatisfaction and between the body image dissatisfaction and anxiety symptoms was found only in males. Females, in turn, showed a positive correlation between depression and binge eating symptoms.

Binge eating disorder has recently been included in the Diagnostic and Statistical Manual of Mental Disorders, 4th edition, Text Revision (DSM-IV-TR) as an eating disorder and is more frequently observed among obese individuals than in the general population. Our data are consistent with the literature in showing approximately 30% of binge eating among obese individuals who seek treatment, contrary to 3-5% in the general population.³³⁻³⁵ Previous studies have shown that binge eating disorder is strongly associated with high BMI, and therefore it has been associated with severity of obesity.^{14,36}

It is important to note that the present study evaluated binge eating symptoms but did not intend to establish a diagnosis of binge eating disorder. Notwithstanding, identifying the manifestation of these symptoms is also important, as individuals reporting symptoms and episodes of binge eating are at increased risk factor for developing the disorder.³⁴ The manifestation of binge eating presents two important factors. The first one concerns objective aspects, such as the amount of food ingested in a certain period of time; the second is related to subjective aspects, which include feelings of guilt, grief, and loss of control regarding the eating behavior.^{12,37} Considering the relevance of these two aspects, we can suggest that binge eating causes both physical and mental health impairments; as a result, any approach to these patients should cover all aspects involved. In this sense, the need for offering interdisciplinary therapy programs to this population, potentially covering all factors involved in obesity and binge eating disorders, is emphasized.

In agreement with previous studies, our project aimed to improve binge eating symptoms and weight loss, among other treatment goals. According to the profile of comorbidities presented by patients, treatment

should also focus on psychopathological aspects.^{38,39} Different methods of treatment have been studied, suggesting that both weight loss and improvement of psychological symptoms have a fundamental role in improving binge eating.^{37,39-41} Protocols in which psychotherapy was associated with nutritional therapy and physical exercise therapy have been shown to be more effective for weight loss, as well as to contribute to improving the psychopathology.⁴²

The interdisciplinary approach of the clinical program here described may attend the specific needs of this population. Our Interdisciplinary lifestyle therapy program was effective in promoting significant weight loss and BMI reduction. Importantly, mean BMI of men decreased after therapy from class III to class II, which is an important treatment outcome.

A gradual decrease in adiposity through lifestyle changes is essential to reduce the risk of developing chronic diseases such as NAFLD and metabolic syndrome. Moreover, it is known that gradual weight loss protects the individual from adverse effects of abrupt reductions in body mass, such as liver toxicity.^{43,44} Decreases in waist circumference also help reduce the risk of NAFLD, insulin resistance, and cardiovascular disease.^{6,31}

In addition to physical improvement, the decrease in waist circumference has an important association with mental health. Zhao et al.⁴⁵ evaluated 2,439 obese adults and showed that waist circumference and visceral obesity were significantly related with presence of major depression and moderate/severe depression symptoms. These data reinforce the relevance of waist circumference reduction in our protocol.

Furthermore, our findings also attested to the beneficial effects of therapy in decreasing the mean scores and prevalence of binge eating symptoms. In this sense, we can hypothesize that a relationship exists between weight loss and a better profile of eating behavior and food intake. Indeed, previous studies have demonstrated an alteration in some hormones involved in neuroendocrine regulation of energy balance (e.g., leptin and ghrelin) after lifestyle therapy for weight loss in obese adults. These hormones have an important role in regulating food intake and energy expenditure, contributing to reduce symptoms and the prevalence of eating disorders, according to recent studies.⁴⁶⁻⁴⁹

It has been confirmed that binge eating symptoms are related to objective and subjective factors. With regard to objective factors (the amount of food ingested), a decrease was observed in total energy intake in this study (Table 2). Noteworthy in our results is the decline of saturated fatty acid intake. The intake of this kind of fat is known to be associated with an increased inflammation state in obesity and with insulin resistance.

As a result, a high intake of saturated fat is strongly related with NAFLD and cardiovascular disease.³¹

A remarkable finding of this study was the interaction observed between objective and subjective factors related to binge eating: we observed that variations in anxiety symptoms are related to variations in lipid intake. In fact, this correlation corroborates other published data indicating that anxiety is related to food intake.⁵⁰ Therefore, it can be hypothesized that outcomes in each issue affect the other, which reinforces the relevance of interdisciplinary interventions for obese adults to enhance expected results. Toral & Slater⁵¹ had already highlighted this need and recommended that the assessment of food intake should include several factors, including psychological, social and cultural aspects, which are often neglected.

We also evaluated comorbidities frequently associated with obesity and binge eating disorder. Following interdisciplinary therapy, an improvement was observed in psychopathological issues, such as depression and anxiety symptoms. These data are relevant considering the impact of depressive disorders on the success of weight-loss treatment. Pagoto et al.⁵² showed that subjects with major depressive disorder and binge eating disorder were less able to lose weight than patients who had neither disorder. Therefore, weight-loss treatment should always include interventions to minimize psychological symptoms, so as to ensure achievement of good results.

Actually, it has been shown that young people with obesity present higher psychological problems than individuals with light obesity or overweight, and there seems to be a relationship between depression/anxiety and eating disorders. Fandiño et al.⁵³ concluded that presence of binge eating disorder was a potential risk factor for severe psychopathology, since obese people with binge eating disorder presented worse results when compared with obese controls.

In the present investigation, positive correlations were found for binge eating symptoms according to gender. Changes in binge eating symptoms were positively correlated with changes in anxiety scores in males and with depression symptoms in females. Furthermore, emotional states and situations are known to be related with overeating in overweight and obese people.^{54,55} These data confirm earlier assumptions that binge eating is related to psychopathology and suggest that these variables probably influence each other mutually.

Depression is a condition strongly related to many factors, such as sociodemographic characteristics, age, gender, among others; the association between obesity and depression usually affects more women than men.^{56,57}

Another crucial issue in obesity and mental health treatment is related to body dissatisfaction, as it has been shown to have as a strong impact on perpetuation of obesity as anxiety traits and depressive symptoms.⁵⁸ In our study, the decrease observed in body dissatisfaction scores stands out. Individuals can become more satisfied with their bodies, despite having not yet reached an ideal body mass. In addition to being important for mental health, such improvement is certainly a motivation factor for treatment maintenance, important for the time necessary to make people become healthier. Mond et al.⁵⁹ highlight that body image and shape concerns are important mediators of the association between obesity and an impaired psychosocial functioning, emphasizing that problems with body image acceptance may be relevant for binge eating disorder.

It is important to note that the subjects of this study were insufficiently active at baseline, but started to regularly perform physical exercise after participating in the interdisciplinary therapy program. Notwithstanding, maintaining habits acquired in obesity treatment programs is a challenge faced by these individuals. Some studies have shown that body image satisfaction is related with maintenance of regular physical activity and weight loss, contributing to lifestyle changes.^{60,61} Therefore, our results highlight the need of addressing body image issues in overweight treatment protocols, so as to improve both outcomes and their maintenance.

The positive correlations found between changes in body image dissatisfaction and changes in binge eating and anxiety symptoms in males can be considered a highlight of this study. According to the American Psychiatric Association,¹² individuals with binge eating disorder show higher prevalence rates of general and eating psychopathologies (i.e., related to body image disturbance). This information supports the results mentioned above, helping clarify the strong correlation found between binge eating symptoms and body image dissatisfaction.

Because binge eating is related to anxiety, the positive correlation found between improved anxiety and body image dissatisfaction results may be explained by the variation observed in binge eating symptoms.⁶² However, future investigations are needed to clarify these hypotheses. It is important to note that these correlations were only found in men, whereas we had expected to observe them also in women. Carraça et al.⁶³ showed that, during a female weight-control program, improvement of body image components played a key role in enhancing eating self-regulation. Nevertheless, since the variation observed in the male data of the present study was small, it is understandable that correlations would be statistically stronger in this group.

In agreement to Lofrano-Prado et al.,⁶⁴ this study shows a positive consequence of lifestyle interdisciplinary therapy on quality of life. Significant results were found in every domain evaluated, which reflects the improvements observed in physical, psychological, and social health. In the literature, weight loss is related to improvement of health-related quality of life. Some studies highlight that changes are mainly related to physical function and pain, but most studies also describe strong changes in mental health domains of quality of life,⁶⁵⁻⁶⁷ as also observed in the present study.

There is evidence that the levels of physical activity currently recommended are related with the perception of “health days” by individuals.⁶⁸ Interestingly, Ernerson et al.⁶⁹ showed that poor quality of life and depressive symptoms can result from obesity, provoking poor or non-healthy behaviors, such as inadequate food intake and sedentary lifestyle, even without much weight gain. These data help better explain the fundamental role of lifestyle changes in improving quality of life and depression symptoms.

Conclusion

The interdisciplinary therapy program here described helped improve both the physical psychological aspects evaluated (binge eating, depression, and anxiety symptoms, and body image dissatisfaction), which are essential to the control of obesity and binge eating disorder. Our results evidenced an intrinsic vicious cycle between severity of obesity and states of affective disorders and eating behaviors, reinforcing the important role of interdisciplinarity as a possibility to improve clinical practice. Further investigations are needed to evaluate the maintenance of these improvements after therapy.

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Correspondence

Joana Pereira de Carvalho Ferreira
Av. D. Ana Costa, 95, Vila Mathias
11060-001 - Santos, SP - Brazil
Tel.: +55-13-3221-8058
Fax: +55-13-3878-3711
E-mail: carvalhoferreira.jp@gmail.com