Med Discoveries
An open access journal of science and medicine

Article Type: Research Article
Volume 2, Issue 10
Received: Sep 11, 2023
Accepted: Oct 05, 2023
Published Online: Oct 12, 2023

A Comparative Study of Cognitive Behavioral Therapy and Mindfulness-Based Cognitive Therapy for Weight Reduction and Activity Increase in Obese Individuals with Coronary Artery Disease

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Abstract

Objective: Obesity is a metabolic disorder and is often the cause of health problems such as cardiovascular diseases. The purpose of this preliminary study was to compare the efficacy of Cognitive Behavioral Therapy (CBT) with Mindfulness-Based Cognitive Therapy (MBCT) on activity and weight in obese people who have Coronary Artery Disease (CAD).

Methods: The design of this semi-experimental research was a pre/post-test with a control group. The statistical population was composed of obese patients who simultaneously dealt with CAD and were referred to the BLIND Hospital in BLIND. 45 patients were selected using a convenience sampling method and were randomly assigned into three groups. The first group received CBT; The second one received MBCT; And the third group acted as a control group. Data was gathered using the Baecke Habitual Physical Activity Questionnaire (BHPAQ) and by calculating the patient's Body Mass Index (BMI) in the pre-test, post-test, and follow-up. Data were analyzed using the mixed analysis of variance method.

Results: Results indicated a significant effect within-subject factors in BMI and activity in leisure time, but in between-subject factors groups have significant differences only in activity in leisure time, so the CBT and MBCT groups received higher scores in this variable.

Conclusions: The results of this study show that CBT and MBCT can lead to weight reduction and an increase in physical activity in obese people suffering from cardiovascular disease by changing both their lifestyle and their thought processes.

Practical implications: Applying CBT and MBCT in medical protocols can improve health conditions in obese patients with cardiovascular problems.

Keywords: Obesity; Coronary artery disease (CAD); Heart diseases; Cognitive behavioral therapy (CBT); Mindfulness-based cognitive therapy (MBCT).

Citation: Dehghani-Arani F, Lotfi Kangarshahi A. A Comparative Study of Cognitive Behavioral Therapy and Mindfulness-Based Cognitive Therapy for Weight Reduction and Activity Increase in Obese Individuals with Coronary Artery Disease. Med Discoveries. 2023; 2(10): 1080.

Introduction

Obesity has become a global health concern, with a significant increase in its prevalence in recent years. According to the World Health Organization, more than 1.9 billion adults were overweight, and over 600 million were obese worldwide in 2014 [1]. This indicates a sharp increase in the prevalence of obesity, which is a major risk factor for various chronic diseases, including cardiovascular diseases, diabetes, and some types of cancer. The definition of overweight states that the person's BMI is between 25 and 29.9, with obesity consisting of a BMI≥ 30 obesity is a condition wherein there is an overconcentration of stored fats in the body [2].

Physical activity and proper nutrition are effective in reducing weight and therefore decreasing this overconcentration of stored fats; however, research has shown that nutrition or physical activity alone often does not have much effect on obesity. Importantly, non-pharmacological treatments such as enhancing exercise are effective both, in reducing mortality and treating depressive symptoms [3]. Further, if weight loss does occur, maintenance of it is difficult as obesity has varying physical, psychological, and social aspects. Remaining committed to a diet and maintaining an appropriate weight is one of the great difficulties faced by obese people [4]. Psychological factors have clear importance concerning obesity. There are studies show obesity increases the incidence of anxiety and Major Depressive Disorder (MDD) as a function of metabolic dysfunction [5,6].

Regulation of food consumption is affected by environmental factors, and findings show that cultural, familial, and dynamic factors are involved in causing obesity. While most researchers have proposed certain family histories, personality constructs, and unconscious conflicts as causes of obesity (Show et al., 2005), different psychological disorders and life hardships may underlie their obesity as well [7]. These patients may have resorted to binge eating as a coping mechanism due to emotional disturbances and other conditions surrounding them [8].

Additionally, research has shown that being overweight may lead to psychological problems and bodily diseases, including insulin resistance and type 2 diabetes, high blood pressure and hypertension, dyslipidemia, cardiovascular disease, stroke, sleep apnea, gallbladder disease, osteoarthritis, and cancer [9]. Cardiovascular diseases stemming from being overweight and obesity have become one of the principal causes of death, especially in BLINDian men [1].

Considering that obesity is a multi-faceted issue including physical, psychological, and social backgrounds, several methods have been suggested for reducing it and increasing physical activity. Some of the most well-known methods are surgical treatments, pharmacotherapy, and psychological treatments [10]. Surgical treatments involve many risks and shortcomings, so many practitioners avoid this method [11]. Medication may also involve risks, as constant use may cause adverse effects on the body [12]. Regulation of food intake and the salience of mood, incentives, and may be an appropriate target for novel therapeutic agents. According to several studies, some antidepressant compounds may be effective, well-tolerated, and safe for reducing depressive symptoms and severe suicidal ideation in obese or treatment-resistant depression patients [13,14].

In recent years, developments in the treatment of psychological disorders have resulted in new methods of weight reduction being proposed by clinical psychologists [15]. Evidence gathered by research demonstrates that CBT can teach cognitive and behavioral strategies for achieving and maintaining positive changes in one's way of life. Studies have shown that CBT is an appropriate and effective treatment for reducing weight [16-19].

Cognitive Behavioral Therapy (CBT) is a psychotherapy that focuses on the relationship between thoughts, feelings, and behaviors. Its cultural impact includes adaptations for diverse populations, such as the use of CBT in the treatment of depression among Asian Americans and PTSD among refugees. CBT can be applied in various settings and used to treat various mental health conditions. Local adaptations of CBT can address cultural factors and language barriers. Supporting research has shown the effectiveness of CBT in treating conditions such as anxiety disorders, depression, PTSD, and eating disorders [20-22].

This therapy which is built upon a cognitive-therapy-based diet, examines inefficient thoughts, as well as examining different aspects of physiological (hunger and thirst drives, voracities caused by hormones and other biological activities), environmental (seeing or smelling food, watching cooking programs or food commercials), cognitive (thinking about food) having a positive memory of an extraordinary food eaten in the past or negative memory of hunger), emotional (tension, anxiety, sadness, boredom and other negative or positive emotion such as happiness or excitement), and social (being offered food or being among people who are eating) mechanisms as activators of these inefficient thoughts [23]. CBT focuses on problem-solving skills, self-monitoring, stimulus control, conditioning control, and cognitive restructuring to address inefficient thoughts related to eating and diet. The therapy helps individuals identify and challenge negative or irrational thoughts and develop healthier coping strategies [24,25,15]. MBCT, or Mindfulness-Based Cognitive Therapy, is a psychotherapy approach that combines mindfulness meditation practices with cognitive-behavioral therapy techniques to help individuals who have experienced depression or other mood disorders [26]. MBCT has been researched extensively and is effective in reducing symptoms of depression and anxiety in individuals from diverse cultural backgrounds (e.g., Hispanic/Latino, African American, and Asian American) [27,28]. It has been applied successfully in various settings, including hospitals, clinics, and community centers, in both urban and rural areas [29,30].

In addition, recent studies have suggested a negative association between mindfulness practice and obesity, indicating that mindfulness may promote weight loss and healthier eating habits [31-35]. One of the fundamental concepts of mindfulness-based interventions that have been extensively used to treat obesity and eating habits in recent times is the purposeful redirection of the senses that have a negative association with obesity [36,37]. In general, some psychological and behavioral mechanisms can affect glucose regulation and therefore affect obesity and other cardiovascular diseases by the redirected concentration of the senses. These possible mechanisms include consumption voracity (e.g. for delicious food and sedentary activities), stress response (especially related to diabetes risk factors, such as the effects of stress on the consumption of food), feelings of control (e.g. personal perception of efficiency in reaching goals related to the prevention of diabetes, such as following a diet or exercising) and awareness of present experiences (e.g. the awareness of the body's reactions following the consumption of certain kinds or amounts of food and engaging in physical activity) [38-40].

Since treating obesity using drugs or surgery carries many risks and side effects, the application of psychological interventions in reducing weight is especially important. Regarding the regulation of eating, people tend to prefer instant to delayed gratification, and resistance to the temptation of eating is often too difficult for them; as a result, commitment to a diet faces several problems [41,42]. Consequently, assessing the effectiveness of behavioral and cognitive interventions is a research necessity in this field.

There is limited research comparing the effectiveness of CBT and MBCT specifically for weight loss and obesity in Coronary Artery Disease. However, studies have shown that both CBT and MBCT can be effective in addressing the psychological factors that contribute to these conditions. A systematic review and meta-analysis by Linardon and colleagues (2017) examined the effectiveness of CBT for weight loss in adults. The review found that CBT was effective in producing modest weight loss in both the short and long term and that it was more effective than other psychological interventions. Another systematic review and meta-analysis by [43] examined the effectiveness of mindfulness-based interventions, including MBCT, for weight loss in adults. The review found that mindfulness-based interventions were effective in producing modest weight loss in the short term, but that the effects were not sustained in the long term.

Overall, while there is limited research comparing the effectiveness of CBT and MBCT specifically for weight loss and obesity in Coronary Artery Disease, both approaches are effective in addressing the psychological factors that contribute to these conditions. Further research is needed to determine which approach is more effective for this specific population.

Interestingly, while both Cognitive Behavioral Therapy (CBT) and Mindfulness-Based Cognitive Therapy (MBCT) are effective in reducing symptoms of depression and anxiety in diverse populations, there is no research yet comparing their effectiveness specifically in individuals with obesity and CAD. This gap in the literature motivated this preliminary study, which aimed to compare the two approaches and determine which is more effective for this population. Such studies are essential to guide therapists and physicians in selecting the most appropriate and effective interventions for their patients. By considering the unique needs and challenges of individuals with obesity and CAD, this research can help improve treatment outcomes and quality of life for this population.

Methods

The method employed in this study was a quasi-experimental design with a pre-test-post-test with a control group. The study population consisted of obese individuals with co-occurring CAD who were receiving treatment at BLIND Hospital's obesity clinic. The selection of participants was challenging due to the limited availability of obese individuals with CAD and resource constraints. Hence, convenience sampling was used to select a sample of 45 participants, who were subsequently randomized into three groups: CBT, MBCT, and a control group. The first two groups received CBT and MBCT, respectively, while the control group did not receive any intervention.

At the start of the study, each group had 15 members. At the conclusion, 5 participants from the first group and 6 participants from the second group were excluded for being absent for more than 2 therapy sessions. In the control group, the information of 3 people was not analyzed due to the patient's lack of cooperation in the pre-test or follow-up phases. Consequently, the final sample included 31 people. Inclusion criteria included filling out a consent form, CAD diagnosis by a specialist has lasted for at least one year, having no other physiological disorders, having no chronic psychological disorders, and having an obesity diagnosis (BMI≥30). The minimum age of study participants was 30, and the maximum age was 60. Basic literacy and exclusion criteria consisted of not participating in more than two therapy sessions and a specialist physician's opinion that continued treatment was harmful to the person.

To conduct the study, necessary arrangements were made with the obesity clinic of BLIND Hospital. After visiting the hospital, a list of patients dealing with comorbid obesity and CAD was prepared. Some patients were selected from the obesity clinic, while others were chosen from the hospital's catheterization lab, Emergency Room (ER), and Intensive Care Unit (ICU). Among these patients, those who met the inclusion criteria were chosen for the initial sample. The patients were called after reviewing their health records and receiving a confirmation from the hospital's cardiologist. In the first session, after explaining the outline of this study, a BHPAQ was filled out for every patient as their pre-test, and they were then randomly allocated to three groups. Then, one group was randomly set as the CBT experimental group, another group as the MBCT experimental group, and the third as the control group (without treatment).

The CBT and MBCT interventions were delivered by licensed psychologists with experience in treating individuals with comorbid obesity and CAD, and who had received specialized training in delivering CBT and MBCT interventions. The two experimental groups received respective psychological interventions in eight sessions while the control group was placed on the waiting list without any treatment. It is worth noting that because of the patient's medical conditions, the first four sessions of these interventions were held in person while the rest were held online. By utilizing different locations while conducting the study, contact between the different group members was limited. This prevented any information exchange.

After the sessions, all members of the three groups were individually invited to the post-test phase. In this phase, BHPAQ was administered to everyone. Research data was gathered using questionnaires, medical records, and interviews and was analyzed by descriptive (mean and standard deviation) and inferential (mixed-design analysis of variance) statistics methods using SPSS V.22 statistical analysis software.

Body Mass Index (BMI)

BMI is calculated by dividing weight (in kilograms) by the square of height (in meters). Weight was measured by a digital scale with a sensitivity of 100 grams, and height was measured with an inelastic tape measure with an accuracy of 0.5 centimeters.

Table 1: Body Mass Index (BMI) categories.

BMI	Category
18.5<	Lose weight
18.6-24.9	Normal weight
25-29.9	Overweight
30-34.5	Obesity-grade 1
35-39.9	Obesity-grade 2
40≥	Obesity-grade 3

Baecke Habitual Physical Activity Questionnaire (BHPAQ)

It was utilized to determine physical activity levels. This tool is a standard international questionnaire used for assessing the level of physical activity and has been acquired and translated by the BLIND and BLIND University of Medical Sciences. It has been used in various studies in BLIND. The questionnaire is composed of 16 questions that assess the amount of physical activity using the Likert scale and includes three parts, in which the first part has eight questions, with each question having five options numbered 1 to 5, describing different body conditions while working. The sum of the scores is then divided by eight. The second part, from questions 9 to 12, regarded people who engaged in primary and secondary sports, and the sum of their scores was divided by four. The third part is related to physical activity during leisure time; it includes questions 13 to 16 and the sum of their score is divided by 4. After these steps, all mean scores are summed up and determine the total physical activity of the participant, with the highest score for physical activity being 15 [44]. Utilizing Cronbach's alpha, it was determined that the reliability of this questionnaire was 0.73 (Cronbach's alpha =0.73). Sanayi et al. (2010) estimated Cronbach's alpha to be 0.78 and mean construct reliability (composite reliability) to be 0.63. In Safikhani, Sultanhosseini, and Yarmohammdian's study (2008), the coefficients of reliability and validity were 0.56 and 0.89, respectively. In the present study, Cronbach's alpha of the questionnaire was 0.69.

Mindfulness-Based Behavioral Therapy (MBCT)

Invented the MBCT method in the Medical Center of the University of Massachusetts (UMass) [45]. Kabat-Zinn defines mindfulness as follows: "Attention directed towards goal in the present". He taught participants calmness through the presence of the mind. To facilitate the usage of this method, he refined it to fit patients with chronic physical diseases. He aimed to equip patients with stress-coping methods so they could be released from mental reactions that worsen stressors and interfere with effective problem-solving. This mindfulness- and psychological training-based method is focused on reducing stress as one of the causes of obesity and creating awareness of eating and physical activity. Practical forms of this method include sitting, checking one's body, eating with awareness, and being aware of feelings, all of which are taught by an experienced mindfulness coach. The first goal of this therapy in the present study was to provide the experience of an "always quiet place" which would allow people to use mindfulness in day-to-day life and respond to daily events instead of reacting to them. The size of the class was between 8 to 30 people. The program comprised 8 sessions, and the duration of each session was between 1 to 2 hours based on the size and structure of the class. The sessions' schedule was created based on Kabat-Zinn's therapeutic schedule and was aimed at reducing stress and interventions based on eating behavior and physical activity. This training included principal and ancillary practices. Additionally, class practices were undertaken for increasing mindful awareness, artistic expressions, and verbal communication. At-home practices for reinforcing and deepening learned material were encouraged as well. Participants received a notebook, including pamphlets and at-home self-monitoring papers as well.

CBT program for obesity

Designed a six-week program based on teaching problem-solving skills, self-monitoring, stimulus control, conditioning control, and cognitive restructuring [46]. Beck's diet solution revolves around the principles of Cognitive Therapy (CT). CBT's key factor is its emphasis on teaching people to recognize and strongly respond to inefficient thoughts which hamper diet attempts. It also aims to help people to change their thoughts so that they can change their actions. This treatment covers the recognition of destructive thoughts regarding automatic and indeliberate eating and helps control these thoughts by increasing focus and assessing biological, environmental, mental, emotional, and social stimuli as starters. The CBT program for obesity is an 8-session program designed by based on [4,47]. This program is executed in weekly group sessions that last 2 hours each. Participants in the program learn important skills that prepare them for receiving and following a diet. Each session starts with a meeting agenda and ends with providing feedback and an assignment. Harmful thoughts are also discussed and assessed during every session.

Demographic information of the patients is provided in the table, the changes in their scores in each of the psychological disturbance and alexithymia scales are shown using tables and graphs, and their variations are examined.

Results

Reviewing the demographic indices of participants, the mean age of the CBT group was 46.6 (SD=7.57), the mean age of the mindfulness group was 44.55 (SD=7.53), and the mean age of the control group was 45.25 (SD=8.00).

Table 2 shows the marital status and education of the participants. There was no significant difference between groups in age or other demographic indices $F_{(2 \text{ and } 15)}$ =0.21, P>0.81.

Table 2: Frequency of the marital and education status.

Group	Marital status		Education status		
	Married	Single	Diploma	Bachelor	Master
CBT group	9	2	8	3	**0**
MCBT group	9	0	5	3	**1**
Control group	10	2	7	5	**0**

The mean and the standard deviation of each group's BMI in pre-test, post-test, and follow-up can be seen in Table 3.

Table 3: Frequency of the marital and education status.

stage	Group	SD	M
Pre-test	CBT group	2.26	34.32
	MCBT group	3.62	35.38
	Control group	5.50	34.66
Post-test	CBT group	2.84	32
	MCBT group	3.91	32.58
	Control group	4.96	34.45
Follow-up	CBT group	2.62	31.25
	MCBT group	3.82	32.23
	Control group	4.68	34.26

The mean and the standard deviation of the CBT, MCBT, and control group's physical activity in the pre-test, post-test, and follow-up are presented in Tables 4,5, and 6, subdivided into the three subscales of leisure time, work, and exercise.

Physical activity during leisure time:

Table 4: Groups' mean and standard deviation of physical activity in leisure time.

Pre-test	CBT group	1.66	9.9
	MCBT group	2.14	9.11
	Control group	1.66	8.66
Post-test	CBT group	1.72	13.9
	MCBT group	1.82	14.11
	Control group	1.7	9
Follow-up	CBT group	1.54	12.8
	MCBT group	1.87	13.55
	Control group	2.09	9.25

Physical activity in work situations:

Table 5: Groups' mean and standard deviation of physical activity in work situation.

Stage	Group	SD	M
Pre-test	CBT group	3.37	21.06
	MCBT group	3.39	21
	Control group	3.29	21.16
Post-test	CBT group	2.98	24.7
	MCBT group	4.82	26
	Control group	3.6	21.58
Follow-up	CBT group	3.69	24.1
	MCBT group	4.55	25.55
	Control group	3.09	21.83

Physical activity during exercise:

Table 6: Groups' mean and standard deviation of physical activity in exercise.

stage	Group	SD	M
Pre-test	CBT group	5.37	8
	MCBT group	5.45	9.33
	Control group	8.38	9.5
Post-test	CBT group	3.32	11.4
	MCBT group	5.07	10.11
	Control group	9.03	9.75
Follow-up	CBT group	3.77	10.3
	MCBT group	4.63	9.55
	Control group	7.79	9.66

As can be seen in both BMI and physical activity variables in all three situations, the control group's means have remained constant in the pre-test, post-test, and follow-up, while the experimental groups' means have decreased.

Repeated measure analysis of variance was employed to analyze data using inferential statistics and analysis of the study's suppositions. Before performing said analysis, however, both requirements for the repeated measure analysis of variance (Mauchly's sphericity test and the similarity of different group variances) were checked and confirmed. The results of the mixed analysis of variance are presented in Table 7 and display within-group variations.

Table 7: Groups' mean and standard deviation of physical activity in exercise.

BMI	Time	72.95	1.32	55.02	36.16	0.001	0.55
	time*group effect	28.53	2.65	10.76	6.68	0.001	0.32
	error	59.78	37.12	1.61	---	---	---
PhA in leisure time	time	172	2	86	76.01	0.001	0.73
	time*group effect	73.54	4	18.38	16.25	0.001	0.53
	error	63.35	56	1.13	---	---	---
PhA in work situation	time	150.33	1.57	95.75	18.03	0.001	0.39
	time*group effect	64.68	3.14	20.59	3.88	0.007	0.21
	error	233.35	43.96	5.3	---	---	---
PhA in exercise	time	36.8	1.55	21.78	3.38	0.04	0.1
	time*group effect	31.71	3.1	10.22	1.58	0.2	0.1
	error	279.85	43.44	6.44	---	---	---

As Table 7 shows, on the BMI index, the primary effect of time ($p<0.01$, $F=34.16$), as well as the interaction between time and group ($p<0.01$, $F=6.68$), are significant, meaning that the process of recovery is different in the control group than in the other two groups, and the two therapeutic groups received lower scores in BMI index in post-test and follow-up phases.

In physical activity during leisure time, the primary effect of time ($p<0.01$, $F=76.01$) and interaction between time and group ($p<0.01$, $F=16.25$) were significant as well. Additionally, regarding physical activity in work situations, the primary effect of time ($p<0.01$, $F=18.03$) and interaction between time and group ($p<0.01$, $F=3.88$) were significant. It can be concluded that the course of change in the control group is different from the other two groups and that the therapeutic groups achieved significantly higher scores in leisure time and work situation physical activity in the post-test and follow-up phases. In the component of physical activity during exercise, data analysis revealed that the primary effect of time ($p<0.05$, $F=3.38$) is significant, but the interaction between time and group ($p<0.20$, $F=1.58$) was not. Consequently, the course of change in exercising activities isn't different between the control and other groups.

Table 8 shows the analysis of variance results performed for assessing inter-group variations.

Table 8: Results of the mixed analysis of variance for assessing the between-group variations.

Variable	Source of variation	SS	df	MS	F	p	h2
BMI	Main group effect	50.09	2	25.04	0.53	0.59	0.03
	error	1312.18	28	46.86	---	---	---
PhA in leisure time	Main group effect	233.94	2	116.97	15.38	0.001	0.52
	error	212.95	28	7.6	---	---	---
PhA in work situation	Main group effect	121.96	2	60.98	1.93	0.12	0.16
	error	884.51	28	31.59	---	---	---
PhA in exercise	Main group effect	1.27	2	0.637	0.006	0.99	0.001
	error	113.06	28	3165.67	---	---	---

According to the results displayed in Table 8, it can be suggested that there was no significant difference between groups in terms of BMI, physical activity in work situations, and physical activity during exercise, but the difference in physical activity during leisure time (p=0.01, F=15.38) was significant.

Discussion

The present study aimed to investigate the effectiveness of Cognitive Behavioral Therapy (CBT) and Mindfulness-Based Cognitive Therapy (MBCT) in promoting weight reduction and increasing physical activity in individuals suffering from cardiovascular disease and obesity. The results of our study demonstrated significant within-subject effects of BMI and leisure time activity, indicating that both interventions led to improvements in these variables. Interestingly, between-subject analyses only revealed significant differences in leisure time activity, with higher scores reported in both the CBT and MBCT groups. Our findings suggest that both CBT and MBCT can lead to lifestyle changes and altered thought processes that may result in weight reduction and increased physical activity among obese individuals with cardiovascular disease. These results are consistent with previous research demonstrating the efficacy of MBCT in promoting healthy lifestyle changes in a variety of populations like [12,21,20,48,41,22].

Mindfulness training can be an effective strategy for weight management among obese individuals. The practice of mindfulness helps in increasing self-control, self-regulation, and self-monitoring of behavior, leading to a step-by-step recovery. Obese individuals often experience negative emotions like anxiety, depression, and mood swings, which can negatively impact their weight control. Mindfulness intervention helps in changing negative thoughts and emotions and replaces them with positive ones. The practice also helps in developing attitudes, attention, and purpose simultaneously, leading to a new perspective on experiences [48]. This change enables individuals to recognize and replace harmful habitual patterns with healthy ones, leading to complete awareness of inefficient and flawed mental processes. Mindfulness also helps in preventing negative evaluative processes about body image and weight and increasing awareness of the moment. Mindfulness training can help regulate and manage negative emotions and improve body image and attitude toward weight loss.

In addition to the effectiveness of MBCT in decreasing the BMI of obese patients with CAD, the findings of this study confirmed that CBT can also influence weight reduction in these patients. These findings are in line with results obtained by [24,25,15,16,19,4]. Research by [19], has shown that CBT has been recognized as an appropriate treatment method for weight reduction. To explain the effectiveness of this therapy in the current study, [16] have stated that obesity occurs due to maladaptive daily patterns, including cognitive distortion and defective behavioral cycles so that the incorrect eating pattern permeates the person, home, and social environment. Therefore, CBT uses behavioral therapy techniques to adjust behaviors by altering circumstances and consequences and designs cognitive methods to recognize, evaluate, and finally restructure inefficient thoughts and beliefs. Additionally, CBT uses strategies to extend the learned skills and behaviors in therapy to daily life so they can apply them accordingly [17].

As shown, the psychological state of obese people involves processing the maladaptive information that limits their ability to lose weight. For example, the cognitive factor of dichotomous thinking is one of the strongest predictors of weight gain or weight regain. Obese people with a dichotomous thinking style, compared with people with a flexible thinking style, consider partial weight loss as a sign of overall failure, insufficient, and unsatisfactory [49]. Cognitive-behavioral therapy seeks to correct this thinking style and control the weight gain process by replacing dichotomous thinking with a more adaptive, flexible thinking style, considering slight weight loss as an improvement.

The study found that mindfulness-based and CBT interventions increased physical activity in the experimental groups during post-test and follow-up stages, with significant differences observed between the experimental and control groups. These findings align with previous research by [25,50,51].

People with low self-esteem and intense feelings of loneliness and shyness often suffer from negative self-evaluations, leading to reduced physical activity due to limited social relationships and high isolation. Mindfulness-based interventions play a constructive role in social adjustment, allowing individuals to control negative thoughts in interpersonal relationships and increase physical activity. This is achieved by promoting attention control, which helps clear the mind of judgments that lead to feelings of loneliness and enables individuals to pay close attention to the present and extend it to their daily activities. Cognitive-behavioral interventions correct misconceptions in thinking and emotion, leading to a positive attitude toward body mass index and increasing physical activity. Mindfulness therapy reduces automatic depressive processes and promotes adaptive behaviors, such as increasing physical activity. Overall, the mindfulness approach strengthens awareness, improves thoughts, perceptions, emotions, and behavioral patterns, and increases social adjustment in social, emotional, and familial contexts.

The implications of these findings are significant for the treatment and prevention of obesity-related health problems, such as cardiovascular disease. Given the prevalence of obesity in modern society, interventions that target both behavioral and cognitive factors hold great promise for improving public health outcomes. Future research may further explore the mechanisms by which CBT and MBCT lead to lifestyle changes and weight reduction, as well as investigate the long-term efficacy of these interventions. Overall, the present study adds to a growing body of literature demonstrating the potential benefits of psychological interventions in the treatment of obesity and related health conditions.

Conclusion

This preliminary study found that both Cognitive Behavioral Therapy (CBT) and Mindfulness-Based Cognitive Therapy (MBCT) were effective in promoting weight reduction and increasing leisure time activity among obese individuals suffering from cardiovascular disease. The results suggest that these interventions may lead to lifestyle changes and altered thought processes that can improve the health conditions of this population. Specifically, the practice of mindfulness can help with weight management by increasing self-control, self-regulation, and self-monitoring of behavior, as well as changing negative thoughts and emotions. On the other hand, CBT can influence weight reduction by altering cognitive distortions and defective behavioral cycles, and by restructuring inefficient thoughts and beliefs. These findings have practical implications for medical protocols aimed at improving the health conditions of obese

patients with cardiovascular disease.

These findings have important implications for healthcare and policy, as incorporating CBT and MBCT into medical protocols can improve health conditions in obese patients with cardiovascular problems. The practice of mindfulness helps in increasing self-control, self-regulation, and self-monitoring of behavior, leading to a step-by-step recovery. CBT addresses maladaptive daily patterns, including cognitive distortion and defective behavioral cycles, and uses strategies to extend the learned skills and behaviors in therapy to daily life.

Future research could investigate the long-term effects of these interventions on weight and activity levels and explore the mechanisms underlying their effectiveness in promoting lifestyle changes. Overall, our study provides valuable insights into the potential benefits of CBT and MBCT for obese individuals with cardiovascular disease and contributes to the growing body of research on the role of psychology in promoting health and well-being. We encourage policymakers and healthcare professionals to consider incorporating CBT and MBCT into their practices to improve the health outcomes of their patients.

Practical implications

This study had several limitations that must be taken into account when interpreting the results. First, the relatively small sample size may have reduced the statistical power of the study and may limit the generalizability of the findings. Moreover, the follow-up period of one month may not be long enough to evaluate the long-term sustainability of the intervention effects. Additionally, the last four sessions of the intervention were held online, which may have affected the comparability of treatment sessions with each other.

Given these limitations, we suggest that future studies should consider using larger sample sizes and longer follow-up periods to confirm the results and assess the long-term effectiveness of the interventions. Furthermore, researchers should consider evaluating the effect of the interventions on cognitive and emotional symptoms related to obesity and heart disease, in addition to the physical outcomes measured in this study.

In addition, the study only evaluated patients with CAD, and it would be important to test the effectiveness of treatment and intervention approaches in patients with other subgroups of heart problems in future studies. We also suggest that future studies should consider measuring the value of combining lifestyle, pharmacological, or surgical approaches to the treatment of obesity.

Overall, this study provides preliminary evidence for the effectiveness of CBT and MBCT in improving BMI and physical activity in obese individuals with co-occurring CAD. However, the limitations and caveats outlined above must be taken into consideration when interpreting the results and planning future research.

Disclosure statement: The authors declare no conflict of interest.

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