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Effectiveness of Dialectical Behavior Therapy on Emotion Regulation, Food Cravings, and Body Mass Index Among Obese Female Students

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Background: Obesity is a medical condition in which excess fat tissues have been accumulated in a person's body. Excessive accumulation of adipose tissue can cause a decline in health indicators, including reduced life expectancy or decreased quality of life.

Objective: This study aimed to evaluate the effectiveness of dialectical behavior therapy on emotion regulation, food cravings, and body mass index (BMI) of obese female students.

Methods: This quasi-experimental study was conducted based on a pretest-posttest control group design and follow-up. The statistical population of this study included all female obese students studying in the first year of high school in Sari, Mazandaran Province, Iran, in the academic year of 2019-20 referring to endocrinology and obesity centers. The samples (n=24) were selected by the convenience sampling method and considering the inclusion and exclusion. They were then randomly assigned into two groups, namely experimental and control. The tools that were used to gather the necessary data included the Food Cravings Questionnaire and Difficulties in Emotion Regulation Scale. The collected data were analyzed in SPSS software (version 22) using repeated-measures analysis of variance.

Results: The results showed that dialectical behavior therapy had an effect on the components of emotion regulation, BMI, and food craving. This result was significant up to the follow-up stage ($P<0.01$).

Conclusion: It can be concluded that dialectical behavior therapy reduced negative emotions in obese people, and according to one of the main factors of craving (i.e., negative emotions), effective emotion regulation could reduce craving. As a result, it led to weight loss in obese female students.

Keywords: Body mass index, Craving, Dialectical behavior therapy, Emotional regulation, Obesity

Background

Obesity is a medical condition marked by the accumulation of too much adipose tissue in a person's body. The excessive accumulation of adipose tissue can cause the loss of health indicators, including a decrease in the average life expectancy or reduction of the quality of life (1). It has been revealed that obesity is on the rise among adolescents. Adolescence is associated with rapid changes in behavioral patterns. These changes put adolescents at the risk of developing high-risk health behaviors, such as inactivity and inappropriate nutritional habits, which will remain in effect for years to come, even for the rest of their lives.

The most common method for estimating obesity is the use of body mass index (BMI). This index is calculated by dividing the person's weight in kilograms by the dual power of his height in meters (2). According to the definition, a person is considered obese when the IBM exceeds 30 kg (3). It should be noted that adolescents' IBM greater than or equal to the 95th percentile is considered obese (4). Based on the report of the World Health Organization, the prevalence of obesity and overweight was about 36.5% during 2011-2014 (5). In Iran, 28.6%, 10.8%, and 3.4% of people were overweight, were obese, had morbid obesity, respectively (6).

A variety of reasons have been presented for the cause of obesity. However, the most crucial factor affecting obesity and overweight is the body's desire to store energy in the form of fat, which is inherited evolutionarily from today's human beings. Obesity increases the risk of various diseases, especially heart disease, type II diabetes, bone osteoarthritis, and asthma (7). Obesity and overweight are the most common metabolic disorders in humans. They are considered serious diseases in recent decades, which are among the causes of mortality that can be prevented (8). Overweight, obesity, and overeating can be investigated and explained in different genetic, physiological, metabolic, behavioral, and psychological dimensions (9-11). Body mass index indicates the amount of deficiency or weight gain and is obtained by dividing the person's weight in kilograms by the square of the height in meters (12-14).

One of the other factors that affect obesity and excessive eating is craving. This variable refers to the

intense enthusiasm and commitment to consuming a drugs and alcohol, which is the core of addiction disorders. The term craving is used in the spectrum of addiction and obesity and plays a significant role in the pathology of obesity and overweight (15). Craving is a factor that is neglected in most medications and bariatric surgery, which can be effective in the relapse of obesity and increased body mass (15). Craving is one of the most important precursors predicting overeating and calorie intake in eating disorders (16-17).

One of the other variables associated with eating disorders and obesity is emotion regulation. The general concept of emotion regulation implies entering the information calling for excitement (18). In other words, emotion regulation refers to understanding emotions, adjusting experiences, and expressing emotions (19). Adaptive emotional adjustment is related to adaptability and positive social interactions (20). Increasing the frequency of positive emotional experiences causes effective meditation with stressful situations and even increases the necessary activities in response to social situations (21). The review of the literature and psychological studies have shown that emotion setting is an essential factor in determining health and having successful social interaction performance (22). In a study, Swildi et al. found that people with an eating disorder had significant levels of emotional intensity, less acceptance of emotional responses, lack of emotional awareness and clarity, problems of emotion regulation, and greater use of dysfunctional emotion regulation strategies, compared to ordinary people (23).

Various strategies, such as diets, are presented for the treatment of obesity and overweight. Drug therapy can also be used along with these diets and physical activities. However, drug therapy is highly discussed in obesity, as there have been doubts about the effectiveness and safety of the medications. Moreover, it has been observed that with the continuation of medication use, the process of weight loss slows down (24). Nevertheless, with the discontinuation of the medication use, most patients return to their previous weight; therefore, it is required to implement psychological interventions in such patients (25).

It can be stated that successful treatments in obesity should pursue long-term goals that impact people's cravings in cognitive, emotional, and behavioral domains (26). Dialectical behavior therapy is one of the treatments that has been considered regarding its effectiveness in reducing eating disorder problems in adolescents. Dialectical behavior therapy is a new approach introduced by Linehan that is based on emotion regulation in treating eating disorders and has been the most comprehensive and experimental therapeutic approach in emotion regulation so far (16). Experts have recognized the conceptualization of dialectical behavior therapy from self-harm as a behavior that provides a means of regulating negative emotions in extreme overeating or cleansing and evacuation behaviors as emotion regulating behaviors, especially negative ones in patients with an eating disorder (27). Dialectical behavior therapy is specifically designed to teach adaptive emotion regulation skills and target behaviors resulting from emotional irregularities (28).

Considering that emotions and feelings are closely related to obesity and its related behaviors, especially overeating since dialectical behavior therapy focuses on emotion regulation, it seems that this therapeutic approach can effectively treat obesity. In this regard, cognitive behavior therapy effectively reduced anxiety sensitivity and changed body image in female students with bulimia nervosa (29). Rahmani et al. found that dialectical behavior therapy was associated with a significant reduction in overeating problems in obese people and was influential in improving these individuals' emotion regulation. The results of the mentioned study also showed that this intervention was related to a significant decrease in BMI in the experimental group (29). Based on the findings of a study conducted by Omara et al., dialectical behavior therapy could improve intermittent mood disorders and anxiety in women with an eating disorder. This study showed that people receiving dialectical behavior therapy showed less anxiety behavior and mood and emotional problems after attending training sessions than those in the control group (30).

Objectives

Considering the importance of education and therapeutic interventions in the presentation or progression of obesity problems, the results of this study can help develop programs and strategies to reduce obesity problems and related physical factors. To the best of our knowledge, no study has been dedicated to investigate the effectiveness of dialectical behavior therapy on emotion regulation, food craving, and BMI in female students with obesity. Therefore, this study aimed to evaluate the effectiveness of dialectical behavior therapy on emotion regulation, food craving, and BMI in female students with obesity.

Methods

This quasi-experimental study was conducted based on a pretest-posttest control group design and follow-up. The statistical population of this research consisted of all female high school students in Sari city, Mazandaran Province, Iran, in 2019-20. After obtaining the necessary permissions from the State office of education in Sari, three high schools were randomly selected from all female high schools in Sari. The samples were selected by convenience sampling method based on inclusion and exclusion criteria and randomly assigned to two groups, including the experimental and control groups (n=12 each). The final sample size was determined at 24 cases estimated by G*Power software (version 3.1; no need for formula and by specifying the type of statistical tests) based on the test power of 0.80, the effect size of 0.40, and the error level of $\alpha = 0.05$. The inclusion criteria were having the IBM for adolescents greater than or equal to 95^{th} percentile, not using psychiatric medications and addictive substances, referring for the

first time to receive the treatment of obesity, lacking a field of obesity, and giving an informed consent form. On the other hand, the patients who had a physical illness (e.g., endocrine disorders), were unwilling to continue cooperation, and were absent from intervention sessions for two consecutive sessions were excluded from the study.

Furthermore, the students applying for the project were randomly assigned to the experimental and control groups and the questionnaires were administered as a pre-test. Afterward, dialectical behavior therapy was implemented in the experimental group, whereas the control group did not receive any psychological intervention. At the end of the interventions, the research questionnaires were completed again as post-test by the experimental and control groups. Furthermore, the questionnaire was completed by the sample groups two months later for follow-up. Dialectical behavior therapy was performed based on protocols introduced by Telch, Agras, and Linehan (27). It should be noted that this research was approved in the Islamic Azad University, Sari Branch, Sari, Iran, with ethics ID (IR.IAU.SARI.REC.1398.208). Moreover, in the information of this study, IRCT20200405046962N1 is available in Iran Clinical Trial System.

Food Cravings Questionnaire: This 39-item questionnaire, designed by Cepeda-Benito et al. (2000), evaluates craving for food in 9 scales (31). The responses are rated on a six-point Likert scale (1=always, 2=most of the time, 3=usually, 4=occasionally, 5=rarely, 6=never). Each person's scores are obtained from the sum of the individual's responses, and the higher scores indicate higher craving for obesity. Cepeda-Benito et al. confirmed the structure and content validity of this tool and reported Cronbach's alpha reliability as 0.82 (31). In Iran, the structure and content validity of this instrument was confirmed by Alipour et al. and evaluated its reliability by Cronbach's alpha method (α=0.81) (32).

history of receiving psychological interventions in the

The Difficulties in Emotion Regulation Scale: This 36-item scale is developed by Gratz and Roemer (2004) (33). This scale has six subscales include rejection of emotional responses, difficulty in performing targeted behavior, difficulty in impulse control, lack of emotional awareness and lack of emotional clarity. The items are scored on a five-point Likert scale (from 1=very rarely to 5=approximately always), and a higher score indicates weaker emotion regulation. The structure and content validity of this instrument was confirmed and its reliability was evaluated through Cronbach's alpha coefficient method (α=0.78) (33). In Iran, Kermani Mamazandi et al. confirmed the structure and content validity of this tool and calculated its reliability using Cronbach's alpha coefficient method (α=0.75) (34). In the present study, its Cronbach's alpha coefficient reliability was obtained at 0.71.

Body Mass Index: By dividing weight in kilograms by the square height in meters, the weight was measured using a digital scale with a sensitivity of 100 grams, and the height was measured using an unsaturated band meter with a precision of 0.5 cm. In this study, BMI for adolescents greater than or equal to the 95th percentile was obtained by the therapist.

At the descriptive level, numerous distribution tables, percentages related to demographic characteristics, and descriptive statistics were used to investigate the research variables in the samples. At the inferential level, according to the level of data measurement and statistical assumptions (i.e., normality, homogeneity of variances, homogeneity of covariance variance matrix, and croissant assumption), repeated measure analysis of variance were used. Tukey's follow-up tests were used by SPSS software (version 22).

Results

The mean age scores of students in the experimental and control groups were estimated at 14.09±1.09 and 13.43±1.43, respectively.

Table 1: Descriptive results of research variables in two groups of subjects in the pre-test, post-test, and follow-up stages

Group	Variable	Pre-test		Post-test		Follow-up	
		Intervention	Control	Intervention	Control	Intervention	Control
	Emotional regulation	128.49 (6.77)	128.43 (9.45)	103.03 (7.45)	127.93 (6.29)	102.85 (7.35)	127.85 (6.49)
Food craving		121.91 (14.24)	121.54 (21.23)	94.41 (15.97)	121.25 (15.54)	94.05 (15.58)	120.39 (15.74)
Body mass index		31.60 (29.60)	31.73 (1.54)	29.60 (1.69)	31.69 (1.38)	29.60 (1.28)	31.05 (1.18)

According to Table 1, there was a difference in all variables in pre-test and post-test, and this difference remained stable in the follow-up phase. At first, the assumption of the normal distribution of statistical society was investigated by skewness and kurtosis tests showing that the status of variables was not stretched and skewed. Considering that the Shapiro-Wilks test was not significant at the level of 0.05, and the statistics were not significant with a confidence coefficient of 0.95, the normality of statistical distribution could be accepted.

Table 2: Results of repeated measure analysis of variance with within-subject factors

	Variables	Sources of Change	SS	Df	MS	F	P	Eta
Emotional regulation		Time	754.40	1	754.40	26.22	0.001	0.96
		Time*Group	693.78	1	693.78	21.99	0.001	0.91
		Error	129.96	27	4.81			
Food craving		Time	750.00	1	750.00	20.96	0.001	0.97
		Time*Group	582.28	1	582.28	15.24	0.001	0.85
		Error	233.02	33	7.06			
Body mass index		Time	542.85	1	542.85	16.20	0.001	0.94
		Time*Group	420.39	1	420.39	10.33	0.001	0.88
		Error	85.78	33	2.59			

The results of Table 2 showed that concerning the intragroup factor, the amounts of F calculated for the effect of stages (i.e., pre-test, post-test, and follow-up).

The results of Table 3 showed that there was a significant difference between the scores of emotion regulation, craving, and BMI components in comparing pre-test and post-test with follow-up. However, the were significant at the level of 0.05. The results of Tukey's follow-up test were calculated to investigate the difference between the means in the treatment stages. difference between post-test and follow-up was not significant due to the stability of treatment.

Table 3: Summary of Tukey's follow-up test results to determine the difference between pre-test, post-test, and follow-up stages in the experimental group

Stages		Mean Difference	Standard error	Sig.
	Follow-up	0.420	0.36	0.77
Emotional regulation	Post-test	7.96	0.86	0.001
	Follow-up	7.75	0.79	0.001
	Follow-up	0.28	0.21	0.34
Food craving	Post-test	14.96	2.24	0.001
	Follow-up	13.36	3.57	0.001
	Follow-up	0.52	0.41	0.85
Body mass index	Post-test	0.85	0.052	0.001
	Follow-up	0.71	0.046	0.001

Discussion

This study aimed to determine the effectiveness of dialectical behavior therapy on BMI, food craving, and emotion regulation in adolescent girls with obesity. Based on the findings of this study, dialectical behavior therapy was associated with significant effects on emotion regulation in female students with obesity, which is in line with the results of studies performed by De Souza et al. (35), Wisniewski and Ben-Porath (36), and Wallace et al. (37). In this regard, Safer et al. (38) investigated the effectiveness of dialectical behavior therapy in binge eating disorder among students and reported that this intervention was associated with significant effect in reducing the symptoms of binge eating disorder among students and also was significantly effective in emotion regulation and depression symptoms of these subjects (39). Based on the other findings of the mentioned study, dialectical behavior therapy was effective on food craving in students with obesity. It was also found that dialectical behavior therapy had an impact on BMI in obese students.

In explaining this finding, it can be said that dialectical behavior therapy is designed to teach emotion regulation skills and provides acceptable content to target behaviors that are the result of bad emotional regulation and play a role in obesity (40). A person who can manage developed emotions, free from any internal and external compulsion, can experience or prevent emotions (41). Dialectical behavior therapy is designed to teach emotion regulation skills and provide acceptable content to target behaviors resulting from bad emotional regulation (42). Dialectical behavior therapy reduces anxiety and stress by implementing techniques related to the component of mindfulness. Furthermore, it decreases anxiety and stress by changing cognitive patterns and improving the thinking style, identifying cognitive errors, increasing the ability to control thoughts and emotions, and improving the way people deal with their

thoughts and negative emotions, which in turn improves emotional regulation (43).

Teaching fully logical cognitive-behavioral techniques, such as identifying cognitive errors and replacing them with efficient thoughts and examining thinking patterns, would merely lead to an analytical insight into the reasons for their turmoil. This insight brings various benefits to the individual and does not prevent the efficiency of these analytical techniques in practice. Another advantage of mindfulness is that this method is easily usable and readily available by the individual without a therapist's presence after complete learning and is even highly effective in preventing the recurrence of uncontrollable negative emotions. Consequently, people who suffer from uncontrollable negative emotions and those with a variety of anxiety and mood disorders can control and regulate their thoughts, anxieties, and emotions by learning this method and applying it and improve their emotional regulation ability (44).

According to the findings of this study, dialectical behavior therapy improves the monitoring of internal events by changing the methods of coping with dysfunctional emotions and negative thoughts, improving the way emotions and thoughts are controlled, educating the individual about how to control his behaviors, improving coping strategies, reducing the suffering caused by experiencing negative emotions, improving the psychological status, and increasing adaptability.

One of the limitations of the present study was related to its population that was limited to female first-grade students; therefore, the generalization of its results to other cases should be performed with caution. Another limitation was related to the large number of items in the questionnaire that led to the prolongation of the implementation time, which affected the accuracy of the participants' responses. Considering the effectiveness of dialectical behavior therapy, such a program can be used in educational content and treatment centers, including endocrinology and obesity centers for adolescents with obesity, and adopted to take a positive step to promote physical and mental health and improve the ability of obese people. It is suggested that different intervention methods be applied by different specialists to increase the validity of this treatment method and its generalization capability.

Conclusion

It can be concluded that dialectical behavior therapy reduced negative emotions in obese individuals. According to one of the main factors of craving (i.e., negative emotions), efficient emotion regulation could reduce craving and reduce weight in obese female students.

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Conflicts of interest

The authors stated that there is no conflict of interest in this article.

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