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Investigating the Effect of two Methods of Dialectic Behavioral therapies and Metacognitive therapy on the Body Mass Index and Emotional Eating Behavior in Patients with type 2 Diabetes

Shima Sheikh[1], Saied Malihi Alzackerini[2*], Fatemeh Mohammadi Shirmahaleh[2], Fatemeh Zam[3], Ahmad Baseri[4]

[1] PhD Student in Health Psychology, Department of Health Psychology, Karaj Branch, Islamic Azad University, Karaj, Iran.
[2] PhD in Health Psychology, Department of Health Psychology, Karaj Branch, Islamic Azad University, Karaj, Iran.
[3] PhD in General Psychology, Department of Psychology, Karaj Branch, Islamic Azad University, Karaj, Iran.
[4] Assistant Professor, PhD in General Psychology, Department of Psychology, Faculty of Social and Cultural Sciences, Imam Hossein University, Tehran, Iran.

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Abstract

Background: *Diabetes is one of the chronic multifactorial metabolic diseases that in addition to affecting the clinical condition of the individual, incurs many costs to different communities around the world and also in Iran. This study aimed to investigate the effect of dialectical behavior therapy and metacognitive psychotherapy on the body mass index and emotional eating behavior in patients with type 2 diabetes.*

Methods: *This study was an applied and controlled clinical trial one with a pre-test and post-test design with a control group and random assignment and quarterly follow-up. The participants were selected from among patients referring to Mashhad diabetes research center. The patients were randomly divided into two experimental (n=40) and control group (n=20). The experimental groups received weekly sessions for 2 months (8 sessions), while the control group did not receive any intervention. To collect the data, in addition to the demographic questionnaire, the standard Dutch eating behavior questionnaire was used to collect data. Data were analyzed and examined by SPSS 21 and statistical tests. Significant level was set at 0.05.*

Results: *Based on the study, it was found that there was a significant difference between the mean of intervention and control groups (Pvalue<0.05). In other words, dialectical behavior therapy and metacognitive psychotherapy significantly reduced the body mass index and emotional eating behavior in patients with type 2 diabetes.*

Conclusions: *According to the results, it seems that dialectical behavior therapy and metacognitive psychotherapy can be used as effective psychological interventions to reduce body mass index and emotional eating behavior in patients, which requires further investigation.*

Keywords: Diabetes, Dialectic behavioral therapies, Metacognitive therapy.
***Corresponding to:** S Malihi Alzackerini, **Email:** zuckerini99@yahoo.com
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Introduction

According to the definition of "world health organization", diabetes is a multifactorial metabolic disease that results from impaired insulin secretion, or insulin function, or both, and is characterized by chronic hyperglycemia.[1] Type 2 diabetes is a chronic and complex disease that requires constant medical care and is highly related to lifestyle, and its complications significantly affect the quality of life of patients.[1] In September 2014, the international diabetes federation announced that 387 million people worldwide had diabetes, resulting in 4.9 million deaths per year and one death per second. In 1998, however, the number of people with diabetes was projected to reach 286 million by 2030.[2] This indicates that the disease is spreading faster than expected.[3] Most people with diabetes live in low- and middle-income countries, according to the report, the highest prevalence of the disease is in the age group of 40-59 years, in the Middle East and North Africa.[4] In Iran, the number of people with diabetes is 6% of the population.[5] So that in 1989, more than 4 million people in Iran had diabetes.[6] Given the high prevalence and progress of the disease and its debilitating complications and the effect that the disease has on the quality of life, it is necessary to study the factors related to disease control and improving the quality of life of patients.[7] In general, more than 90% of people with type 2 diabetes are obese or overweight. Obesity and overweight is one of the major public health problems of the present century, with the rate of obesity doubling worldwide since 1980, according to the world health organization. From a public health perspective, the expansion of effective interventions in the treatment of obesity is an important issue.[8] Also, among the many studies that have been done in recent years on the etiology, course, prognosis, and treatment of diabetes, psychological factors have received special attention. Psychological factors are one of the most important and influential factors in controlling blood sugar. Cognitive-behavioral and emotional factors play a role in the development, regulation, and control of diabetes.[9] In other words, these patients face two main problems of self-care issues such as dieting and dieting, and emotional issues. More than 20-40% of diabetics experience emotional problems ranging from anxiety-related illnesses (such as fear of developing symptoms) to more general symptoms of anxiety, anxiety, and depression. These emotional disorders are not only unpleasant for the individual, but research has shown that they reduce the quality of life, poor self-care behaviors, negative evaluation of insulin therapy, decreased blood sugar control, and in severe cases, cardiovascular disorders and even death.[10] One of the issues of self-care is eating behavior, which is a complex phenomenon that includes the extent and frequency of

periods of eating and choosing daily foods and determines the amount of energy received by the individual and is the result of environmental, physiological, and psychological factors. Many people claim to eat more when they are anxious or upset, and there is evidence that stress can cause them to eat more. According to the theory of emotional arousal, overeating occurs by emotional arousal to reduce the level of arousal. Different types of eating behaviors have been identified, including uncontrolled eating, emotional eating, and restraint in eating, each with its etiology (derived from theories, e.g., external theory, psychotic theory, and self-control theory).[11] Many obese patients have emotional disturbances and have learned to use an excessive appetite for food as a means of coping with psychological problems due to access to the overeating mechanism in their environment. Some patients show serious symptoms of some mental disorders when they return to normal weight because they have lost access to a coping mechanism.[12] Because psychotherapy services in medical diseases can reduce the need to use costly medical services and increase the mental health of patients, it is important to apply considerations based on effective psychotherapy approaches, so many psychological interventions are used simultaneously with medical interventions to control this disease.[13,14] Among psychological therapies, cognitive-behavioral therapy has the most empirical support in the treatment of this disorder.[15] Over the past four decades, cognitive-behavioral therapy has faced many shortcomings due to increasing psychological problems and the inadequacy of classical theoretical models in explaining pathology and providing appropriate and effective interventions and over these four decades, the cognitive-behavioral approach has shifted toward providing complex theoretical and therapeutic models and with the advent of the third wave of cognitive-behavioral therapy such as dialectical behavior therapy, commitment-based therapy and acceptance, metacognitive therapy, awareness-based therapy, behavioral activation therapy has found a special formulation.[16] In other words, third-wave therapies seek to provide effective protocols by combining methods such as meditation techniques and observer thinking with traditional cognitive-behavioral therapy. Therefore, studying the effectiveness of this range of treatments is of particular importance.[16]

Among the third wave therapies, metacognitive therapy, dialectical behavior therapy compared to other therapeutic approaches in this field, in the field of treatment of emotional problems are among the proposed therapies. Although these treatments are similar in some basic processes, each has its pattern and mechanism of treatment. Each of these therapeutic approaches claims to be effective in reducing emotional symptoms.[16] Since none of the therapeutic approaches have been based on the emotion regulation model so far, and given that they play a key role in eating disorders, an alternative treatment that has achieved widespread implementation and positive results for patients with eating disorders is dialectical behavior therapy.[17]

Metacognitive psychotherapy is a type of cognitive-behavioral therapy that emphasizes the relationship between ways of thinking, monitoring, and reviewing cognitive information processing with clinical symptoms and disorders that the purpose of metacognitive psychotherapy sessions is to raise patients' awareness and encourage them to critically reflect on misconceptions.[18] Dialectical behavior therapy is a new approach based on emotion regulation, which has been the most comprehensive and experimental therapeutic approach in emotion regulation for people with a borderline personality disorder so far. Dialectical behavior therapy is a cognitive-behavioral approach based on the principle of change and introduces four components including mindfulness, distress tolerance, emotional regulation, and interpersonal efficiency in group therapy. In this treatment, mindfulness and distress tolerance as components of emotional acceptance and regulation and interpersonal efficiency as effective components of change in dialectical behavior therapy.[17] The main belief of both therapeutic approaches used in the research is that emotions are the result of the person's assessment of the situation, and people acquire this ability to be in each situation instead of thinking about the negative aspects such as that I am always a failure and or what a great tragedy, to think about how he can deal more effectively in this situation. Changes in dysfunctional beliefs or perceptions and interpretations of a situation play an important role in changing emotions, controlling eating behavior, and self-care. Due to the high prevalence rate of this disease in different communities, including in our country, the psychological and physical problems of these patients and the important place of psychological therapies in improving treatment, conduct research on the impact of effective psychological therapies on the mental and physical health of these patients, it is necessary to put. Therefore, this study aimed to determine the effect of two methods of dialectical behavior therapy and metacognitive psychotherapy on body mass index and emotional eating behavior of diabetic patients in Mashhad research center in 2019.

Materials and Methods

This study was an applied and controlled clinical trial one with a pre-test and post-test design with a control group and random assignment and quarterly follow-up. The statistical population of the present study includes 60 patients with type 2 diabetes who were selected from among the patients referred to the diabetes research center located in Mashhad in the period from January to March 2019 after examination, interview, and diagnosis by a specialist. Participation in the research was done based on completing a written consent form. Inclusion criteria was having the type 2 diabetes between the ages of 40 and 65 in both men and women which was approved by a specialist, as well as having a body mass index (BMI) above 30 and having a diet. The ethics code of study was IR.IAU.K.REC 1397.77 and clinical trial code was IRCT20200229046642N1. Ethical issues confirmed by the declaration of the world medical association of Helsinki such as informed consent, the confidentiality of information obtained from them, and voluntary withdrawal from the study were also considered in this study. All participants were randomly assigned to three groups of dialectical behavior therapy, metacognitive psychotherapy and

the control group, who were followed up after a period of three months. Then, the following tools were used for data collection.

1- The Dutch behavior questionnaire: this tool developed by Van Strien, Frijters, Bergers, and Defares (1986), consists of 33 items and three subscales that are used to determine eating style (external, emotional, or restricted). 1- Restricted eating, which measures the restriction of eating behavior and consists of 10 substances, 2- Emotional eating, which measures eating in response to emotional distress and has 13 items in this questionnaire, and 3- External eating, which measures eating in response to external signs of food and constitutes 10 items of this questionnaire. The materials of this questionnaire have a five-point Likert response scale (never=1 to most of the time=5). This questionnaire has retest reliability, internal consistency (Cronbach's alpha coefficients between 0.82 to 0.95), and appropriate factor validity.[19] The questionnaire was first translated into Persian by Salehi Fedredi and then a Persian version was translated into English by an English translator (reverse translation) and provided to the questionnaire manufacturer.[20] Alipour, Abdokhodaei and Mohammadi (2016)[21] Cronbach's alpha coefficient of emotional eating, external eating and restricted eating scores were 0.87, 0.76, and 0.91, respectively. The reliability coefficient of the total score of this questionnaire using Cronbach's alpha method was 0.87 and for the subscales of emotional eating, external eating and restricted eating were 0.87, 0.91, and 0.83, respectively.

2- Body mass index: This index is calculated by dividing weight by height squared in meters.

Group sessions of dialectical behavior therapy and metacognitive psychotherapy were held for 8 sessions, 1 session per week for both experimental groups (no intervention was performed for the control group). The metacognitive therapy protocol was based on the Hamburg university protocol and the dialectical therapy protocol was based on the Linhan group therapy protocol (tables 1 and 2).

In data analysis in the descriptive part, central tendency and dispersion indices such as frequency, percentage, mean and standard deviation were used to describe demographic characteristics and research variables. To test the research hypotheses, SPSS-21 statistical software and statistical method of analysis of variance with repeated measurements were used.

Results

In this study, the number of participants in the study was 60 people who were randomly divided into three groups of dialectical behavior therapy, metacognitive psychotherapy and control group, of which 39 were female and 21 were male. The mean age of the participants was 55.3±6.5 years and they followed the normal distribution shown in table 1.

Table 2 shows the frequency of gender and socio-economic groups in the studied populations. Based on the results, no significant differences were observed in the distribution of gender frequency, marital status, education, occupation and income level.

The results of the statistical analysis of variable scores of the DEBQ (emotional eating component) questionnaire in two therapeutic approaches (dialectical behavior therapy and metacognitive psychotherapy) has been shown in table 3. The table also shows the mean of the emotional component variable in the groups which is 3.2±0.6 in the pre-test group, 2.4±0.7 in the post-test group, and 2.5±0.7 in the follow-up group.

Comparing the mean scores of the DEBQ (emotional component) questionnaire in general in the two groups of dialectical behavior therapy and metacognitive psychotherapy is significant (Pvalue<0.001). As a result, it can be stated that there is a significant difference between the mean scores of the DEBQ (emotional component) questionnaire in the pre-test, post-test, and follow-up, regardless of the experimental groups (effect on dialectical behavioral therapy and metacognitive psychotherapy were 0.84 and 0.75, respectively). Summary of analysis of variance indicates that the two approaches of dialectical behavior therapy and metacognitive psychotherapy are effective in reducing the mean scores of the DEBQ (emotional component) questionnaire (table 4).

Statistical analysis of body mass index variable in two therapeutic approaches (dialectical behavior therapy and metacognitive psychotherapy) in the study groups: Mean and standard deviation of body mass index variable in pre-test 33±0.7, Post-test was 32.2±2.2 and in follow-up was 32.2±2.2, which is shown in table 5 separating the study groups.

The results of table 6 show us that the comparison of the mean body mass index in the two groups of dialectical behavior therapy and metacognitive psychotherapy is significant (Pvalue<0.001). As a result, it can be stated that there is a significant difference between the mean of total body mass index in the pre-test, post-test, and follow-up, regardless of the experimental groups. (The effect size in the approach of dialectical behavior therapy and cognitive psychotherapy is 0.77 and 0.65, respectively).

Table 1. Age distribution of participants by study groups

Variable age	Mean	Standard deviation	Least view	Most viewed	Kolmogorov-smirnov	Pvalue
Control group	54.7	1.4	43	65	0.112	0.061
Dialectical behavior therapy	54.6	1.6	40	65		
Metacognitive psychotherapy	56.7	1.2	46	64		
Total	55.3	6.5	40	65		

Table 2. Comparison of gender frequency, marital status, education, occupation and income level in the study groups

Variables	Groups		Frequency	Percent	X^2	Pvalue
Gender	Control	Man	7	35	0.44	0.803
		Female	13	65		
	Dialectical Behavior Therapy	Man	8	40		
		Female	12	60		
	Metacognitive psychotherapy	Man	6	30		
		Female	14	70		
Marital status	Control	Single	1	5	0.982	1.10
		Married	14	70		
		Divorced	2	10		
		Widow	3	15		
	Dialectical behavior therapy	Single	1	5		
		Married	14	70		
		divorced	1	5		
		Widow	4	20		
	Metacognitive psychotherapy	Single	1	5		
		Married	12	60		
		Divorced	2	10		
		Widow	5	25		
Education	Control	≤ Diploma	12	60	2.03	0.730
		Post-Diploma and bachelor's degree	6	30		
		≥ Masters	2	10		
	Dialectical behavior therapy	≤ Diploma	11	55		
		Post-diploma and bachelor's degree	6	30		
		≥ Masters	3	15		
	Metacognitive psychotherapy	≤ Diploma	13	65		
		Post-diploma and bachelor's degree	3	15		
		≥ Masters	4	20		
Job status	Control	Manual worker	1	5	0.995	2.12
		Employee	4	20		
		Housewife	7	35		
		Self-employment	3	15		
		Retired	2	10		
		Other	3	15		
	Dialectical Behavior Therapy	Manual worker	1	5		
		Employee	4	20		
		Housewife	9	45		
		Self-employment	3	15		
		Retired	1	10		
		Other	2	5		
	Metacognitive psychotherapy	Manual worker	1	5		
		Employee	3	15		
		Housewie	10	50		
		Self-employment	3	15		
		Retired	2	10		
		Other	1	5		
Income status	Control	Low	5	25	0.905	1.03
		Medium	11	55		
		Much	4	20		
	Dialectical behavior therapy	Low	6	30		
		Medium	9	45		
		Much	5	25		
	Metacognitive psychotherapy	Low	7	35		
		Medium	10	50		
		Much	3	15		

Table 3. Comparison of the mean of DEBQ questionnaire variables in the three groups

Variables	Groups		Number	Average	Standard deviation
Emotional component	Control	Pre-test	20	3.1	0.7
		Post-test	20	3	0.7
		Follow up	20	3	0.7
	Dialectical behavior therapy	Pre-test	20	3.4	0.6
		Post-test	20	2	0.4
		Follow up	20	2.1	0.3
	Metacognitive psychotherapy	Pre-test	20	3.2	0.5
		Post-test	20	2.2	0.6
		Follow up	20	2.3	0.5
	Total	Pre-test	60	3.2	0.6
		Post-test	60	2.4	0.7
		Follow up	60	2.5	0.7

Table 4. Results of post hoc analysis of variance for DEBQ (emotional component) questionnaire scores in the study groups

Source of changes	Groups	Sum of squares	Average of squares	F	Significant*	Effect size
Emotional component	Control	0.12	0.11	0.8	0.3	0.04
	Dialectical behavior therapy	23.6	20.7	105.4	0.000	0.84
	Metacognitive psychotherapy	11.1	9.7	57.4	0.000	0.75

* Significant level was set at 0.05

Table 5. Comparison of the mean of body mass index variable in the three groups under study

Variables	Groups		Number	Average	Standard deviation
Body mass index	Control	Pre-test	20	33.6	1.7
		Post-test	20	33.6	1.7
		Follow up	20	33.6	1.8
	Dialectical behavior therapy	Pre-test	20	32.6	2
		Post-test	20	31.1	2
		Follow up	20	31.1	2
	Metacognitive psychotherapy	Pre-test	20	32.9	1.5
		Post-test	20	31.8	2
		Follow up	20	31.8	2
	Total	Pre-test	60	33	1.7
		Post-test	60	32.2	2.2
		Follow up	60	32.2	2.2

Table 6. Results of post hoc analysis of variance of body mass index in the study groups

Source of changes	Groups	Sum of squares	Average of squares	F	Significant*	Effect size
Body mass index	Control	0.02	0.01	0.2	0.8	0.01
	Dialectical behavior therapy	28.3	26.9	65.7	0.000	0.77
	Metacognitive psychotherapy	15.7	14.4	35.4	0.000	0.65

* Significant level was set at 0.05

Discussion

Diabetic patients due to exposure to the stresses caused by the disease and the destructive physical effects that affect mental health Suffer from emotional turmoil and reduced quality of life, and psychological problems, in turn, affect people's ability to implement self-management, therefore, it is necessary to use psychological methods to improve self-management and reduce the psychological complications caused by them. Therefore, the study aimed to investigate the effect of dialectical behavior therapy and metacognitive psychotherapy on body mass index and emotional eating behavior in diabetic patients. The results of this study showed that both interventions reduced emotional eating behavior and decreased body mass index in patients with type 2 diabetes. As the analysis of statistical data showed the results regarding the effectiveness of dialectical behavior therapy and metacognitive psychotherapy in reducing emotional eating behavior, the subjects in the experimental group compared to the subjects in the control group showed a significant reduction in emotional eating behavior measured by the Dutch eating behavior questionnaire and maintained this reduction for up to three months after the end of treatment. As a result, it can be stated that regardless of the experimental groups, there is a significant difference between the mean scores of the Dutch eating behavior questionnaire in the pre-test, post-test, and follow-up (effect size in dialectical behavior therapy approach 0.84 and metacognitive psychotherapy 0.75). These results are based on the findings of Braden et al. (2020),[22] Beaulac et al. (2019),[23] Roosen et al. (2012)[24] who studied the effectiveness of dialectical behavior therapy on emotional eating symptoms in obese people with Emotional eating examined is consistent. Also, the findings of this study are in line with the findings of Robertson et al. (2020),[25] Vann et al. (2014),[26] Cooper et al. (2007)[27] and Rezaei et al. (1398)[28] that metacognitive therapy, eating disorders, and obesity was examined. Also, in the present study, the effect of dialectical behavior therapy and metacognitive psychotherapy on body mass index was investigated. The results showed that the comparison of the mean body mass index in the subjects was significant (Pvalue<0.05) also, the results of repeated measures analysis of variance showed that the subjects in the experimental group (dialectical behavior therapy and metacognitive psychotherapy) had a significant difference in body mass index compared to the subjects in the control group and maintained this difference for up to three months after the end of treatment (effect size in dialectical behavior therapy approach 0.77 and metacognitive psychotherapy 0.65). These research results about the effect of dialectical behavior therapy are consistent with the findings of Schuster de Souza et al. (2019),[29] Maciel Cancian et al. (2019),[30] as well as Matinfar et al. (2014).[31] Considering that in the present discussion, the review of available information sources shows that so far there is no similar published research on the effectiveness of metacognitive psychotherapy on the body mass index of patients with type 2 diabetes. However, the results of the present study are in line with some studies

conducted to justify the effectiveness of psychological interventions on biological indicators. This finding is based on the findings of studies conducted by Rezaei et al. (1398),[28] Robertson et al. (2020),[25] Vann et al. (2014),[26] Rahimi et al. (2020)[32] and pajoheshgar et al. (2020)[33] supports. For example, in this field, Rahimi et al., in evaluating the effectiveness of psychological treatment on biomarkers of type 2 diabetic patients, concluded that there is a significant difference between the mean post-test scores of biomarkers in the experimental and control groups and this treatment changes the effective markers of diabetes by improving the mental state of diabetics.[32] Therefore, it can be explained that DBT by teaching more adaptive methods in managing painful emotions, including emotion regulation and disturbance tolerance, it teaches people to deal more effectively with the emotions that motivate them to eat and to control negative emotions. It, therefore, leads to an increase in the power of the individual to perceive the value of eating in its original place, that is, to satisfy the physiological need of the person when hungry to establish biological balance, instead of resorting to eating as a way to escape from troublesome emotions and when emotions are controlled and the person is in control of their emotions, adherence to the treatment regimen increases, as a result, managing meals prevents eating and does not respond to environmental stimuli such as taste, smell, sound, and images of food and people are not stimulated to eat these stimuli.

Also, in relation to metacognitive skills training, it should be acknowledged that many obese patients have emotional disturbances and have learned to use excessive appetite to eat as a tool to deal with psychological problems due to access to the overeating mechanism in their living environment. Emotions and lack of cognitive control harm people who have no control over their eating and increase their food intake. Negative emotions reduce people's cognitive capacity and overeating occurs due to pressure on cognitive resources. Because emotional disorders are the result of metacognitive processes that lead to the formation of specific thinking styles, they place the person in long-term, recurrent states of negative information processing. Therefore, improving metacognitive skills helps people not to be overwhelmed by negative emotions and to be able to use it as an effective coping mechanism in the face of psychological problems. This is especially important in people with emotional eating behaviors who need a coping mechanism.

From this study, it is concluded that dialectical behavior therapy and metacognitive psychotherapy have an effect on patients with type 2 diabetes and reduce emotional eating behavior and reduce body mass index in type 2 diabetic patients. Emotions and lack of cognitive control harm people who have no control over their eating and increase their food intake. Negative emotions reduce people's cognitive capacity and overeating occurs due to pressure on cognitive resources. Thus, the behavioral element of dialectical therapy for eating behavior can focus on normalizing eating patterns. Also use conscious eating, meal planning, nutrition education, and ending the overeating cycle use, and the person is taught to consume smaller amounts of food regularly, and the cognitive element of metacognitive therapy is the change in cognitions and behaviors that begin or continue the eating cycle. This is done by dealing with dysfunctional thoughts associated with overeating. Therefore, identifying and dealing with these dysfunctional thoughts makes the person aware of the feelings and thoughts that started the eating behavior, and by replacing them with effective thoughts, this behavior will stop. These behavioral mechanisms that make lifestyle changes are effective in controlling emotional eating. In justifying the lack of difference in the effectiveness of dialectical behavior therapy and metacognitive therapy on the dependent variables of the research, it can be stated that in both interventions, by emphasizing the role of cognitive factors on the experienced emotions and feelings, the subjects are taught that they are not victims and captives of the existing conditions, but can overcome their negative feelings by changing their attitude and positive thinking and can experience more positive emotions. It should be noted that the data of this study were collected to investigate the effect of these two interventions on patients with type 2 diabetes with limited volume and more accurate judgment is needed to consider patients with a larger volume and over a longer period to increase the generalizability of the results.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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