

# Comparison of the Effectiveness of Acceptance - Commitment Therapy and Mindfulness Therapy on Improving Blood Sugar Control and Weight Control in People with Diabetes II

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## Abstract

**Objective:** Type 2 diabetes is a chronic and complex disease that requires constant medical and psychological care. This study aimed to compare the effectiveness of acceptance, commitment, and mindfulness therapy in improving blood sugar control and weight control in people with type 2 diabetes.

**Method:** The research method was quasi-experimental with a pre-test-post-test design and a two-month follow-up with a control group. The statistical population of this study included all men with type 2 diabetes and overweight in Tehran in 2021. The research samples were 60 patients who were selected through the purposeful sampling method and randomly assigned into three equal groups including experimental group A (under acceptance and commitment therapy), experimental group B (under mindfulness therapy), and control group (without intervention). The data collection tool in this study was the HBA1C test to control blood sugar and BMI to control weight. Data were analyzed using repeated measures analysis of variance.

**Results:** The results showed a significant difference between the mean scores of blood sugar control and weight control in the acceptance and commitment therapy group and the control group ( $p < 0.001$ ). Also, there was a significant difference between the blood sugar control and weight control scores of the mindfulness therapy group and the control group ( $p < 0.05$ ).

**Conclusion:** It is concluded that both interventions, especially acceptance and commitment therapy to reduce the psychological and physical problems of patients with type 2 diabetes.

**Keywords:** Acceptance and commitment therapy, Type 2 diabetes, Mindfulness, Blood sugar control, Weight control.

## Introduction

One of the most important chronic diseases is diabetes. Diabetes is the main cause of blindness, kidney failure, heart attacks, strokes, and lower limb amputations (Oraki & Eisazadeh, 2021. Al Mansour, 2019). In 2014, the International Diabetes Federation announced that one death occurred every 7 seconds due to diabetes (Alam et al, 2021).

Diabetes, like other chronic and debilitating diseases, causes problems for a person, as a result of which all aspects of a person's life are affected (Mosenzon et al, 2021).

Lack of blood sugar control and weight control are among the most common and important problems of patients with type 2 diabetes (Juna et al, 2022). Blood sugar control is the most important factor in preventing the consequences and complications of diabetes (Araszkiewicz et al, 2021). Currently, the best and most advanced blood sugar control test is the glycosylated hemoglobin (HBA1C) test (Maan

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et al, 2021). This test indicates the amount of glucose (sugar) along with hemoglobin in the blood and the average blood sugar of the patient in the last 2 to 3 months. Therefore, if the blood sugar level during the last two or three months is higher than normal, the result indicates improper control of blood sugar and as a result, the possibility of more complications of diabetes (Lau & Tar-Choon, 2020). Weight control is a process in which eating and drinking usually cause weight loss. However, in some cases, weight control is done to gain weight or regulate the consumption of nutrients (Tilanca et al, 2021). Weight control is vital in people with diabetes because being overweight causes insulin resistance (Parmar, 2018). BMI is a method to determine the degree of obesity and is useful for people over 20 years old regardless of gender (Khanna et al, 2022). To determine the body mass index, one must divide the weight in kilograms by the square of the height in meters and check the obtained figure, and the number above 30 indicates obesity (Arumugam et al, 2021). Obese people are weaker in blood sugar control (Parmar, 2018).

To reduce the psychological problems of people with diabetes and control their disease, useful treatment methods should be used. One of the most important treatments of the third wave is acceptance and commitment therapy and mindfulness treatment. Commitment and Acceptance Therapy (ACT) is a combination of 4 approaches: conscious attention, acceptance, commitment, and behavior change aiming to achieve psychological flexibility (Cao et al., 2022). The acceptance and commitment approach changes the association between problematic thoughts and feelings so that people do not perceive them as symptoms of disease but harmless (even if they are annoying and unpleasant). In fact, in the Acceptance and Commitment Approach (ACT), the goal is to help people learn about their internal events, and judge and accept them, especially unwanted ones. This

approach also helps a person gain a sense of self-transcendence. The purpose of the ACT approach is to help clients identify their life values and act based on them. (Ahmadi et al, 2020).

Mindfulness is a form of meditation that has its roots in Eastern religious teachings and practices, especially Buddha, and in simple terms it means being aware of thoughts, behavior, emotions and feelings, and it is considered a special form of attention in which the two basic elements of presence (Venkatesh kumar et al, 2022). Therefore, how people deal with unusual conditions, violence and the frequency of disorders is more important. One of the innovations in treatments psychological, especially in diabetes, integration of Eastern spiritual traditions, from Including meditation techniques Mindfulness, behavioral therapy It is cognitive-traditional. Mindfulness, a receptive and non-receptive awareness judgment is from current events. Awareness that is due to attention on the target the current moment, without the inference of the moment it is created instantly. (Ahmadi et al, 2020).

Considering the effectiveness of treatment based on acceptance and commitment and mindfulness therapy on improving the physical and mental complications of people with diabetes and its confirmation in past researches therefore, the present study aimed to compare the effectiveness of acceptance and commitment therapy and mindfulness therapy in the improvement of blood sugar control and weight control in people with type 2 diabetes.

## Method

The research method was semi-experimental with a pre-test-post-test and two-month follow-up with a control group design. The variables under investigation included two independent variables (acceptance-commitment and mindfulness therapies) and two dependent variables (psychological well-

being and weight control). The statistical population included all men with type 2 diabetes who were also overweight and were members of the Iranian Diabetes Association in 2021. The statistical sample was 60 of whom 20 people were assigned to experimental group A, 20 people to experimental group B, and 20 people to the control group. Experimental group A received eight 90-minute sessions (one session per week) of acceptance and commitment therapy, and experimental group B received ten 90-minute sessions (one session per week) of mindfulness therapy. The control group did not receive any intervention. Given that the statistical sample of the present study was selected based on the inclusion criteria of the study, the sampling was done through the purposeful sampling method. Research treatments were implemented in Iran Diabetes Association. Then, they were assigned to experimental and control groups through simple random sampling. In other words, in the first stage, purposeful sampling was used, but in the second stage, the simple random sampling method was used to assign the subjects into two experimental groups and one control group. The inclusion criteria of the study were having type 2 diabetes with HBA1C higher than 7, obesity and overweight based on body mass index (BMI), male gender, not suffering from psychiatric disease, not using psychiatric drugs, education of at least a diploma, not receiving any similar educational program before and during interventions, and informed consent to participate in the study. The exclusion criteria of the research were the absence of more than one session in intervention sessions and the unwillingness to continue participating in the research. In order to start the research, questionnaires were given to 71 people who had the conditions to enter the research; However, only 60 people completed the questionnaires. However, there was no decrease in participants after the start of the research. It is also

worth noting that the average age of the participants in groups A, B, and control was 57.3, 56.9, and 55.3, respectively. The average duration of disease in groups A, B, and control was 12.9, 12.1, and 11.1 years, respectively.

In this research, in order to comply with ethical principles, the research sample was reminded that participation in the study is completely optional and they were asked to participate in this study with their own desire. In addition, they were told that this research is in line with research work and their information will remain confidential and there is no need to write names in completing the questionnaire. It was also explained that the psychological interventions of this research are not dangerous for them and do not endanger their health, and they were assured that the results of this research will be provided to them if they wish. Also, the written consent form of willingness to participate in this research was completed by the participants. It is worth mentioning that after the completion of the research, 3 summary therapy sessions based on acceptance and commitment along with mindfulness were implemented for the members of the control group.

The data collection tool in this research was the HBA1C test to control blood sugar and the calculation of Body Mass Index (BMI) to control weight.

*Glycated Hemoglobin (HBA1C) test:* Glycated Hemoglobin test is used to evaluate the effectiveness of treatment and determine the need for adjustment in the treatment program. The Glycated Hemoglobin test was done at the expense of the researcher and in the equipped laboratories of Tehran. The test results are as follows: Healthy (4%-5.6%), At high risk for diabetes (5.7%-6.4%), A patient with diabetes ( $6.5\% \leq$ ), A person with diabetes with good disease control ( $7\% \geq$ ), A person with diabetes with acceptable disease control (7.1%-8.9%), A person

with diabetes with poor disease control ( $9\% \leq$ ).

**Body Mass Index (BMI):** The calculation of the body mass index is done by dividing weight (in kilograms) by the square of height (in meters) (Arumugam et al, 2021). In the present study, weight was measured using a digital scale with a sensitivity of 100 grams, and height was measured using a non-expandable measuring tape with an accuracy of 0.5 cm. The measurement results are as follows: Underweight ( $18.5 \geq$ ), Normal weight (18.6-24.9), Weight Gain (25-29.9), Grade 1 obesity (30-34.9), Grade 2 obesity (35-39.9), Grade 3 obesity ( $40 \leq$ ).

#### **Content of acceptance and commitment therapy sessions**

The protocol of treatment sessions of experimental group A, acceptance and commitment therapy, derived from the book *Acceptance and Commitment* by Hayes et al. (2006) was held in eight 90-minute sessions during eight consecutive weeks. The summary of the meetings is as follows.

**First session:** Establishing a therapeutic relationship, explaining diabetes, implementing pre-test questionnaires, and concluding a treatment contract.

**Second session:** Creating a desire to change behavior, changing and understanding the concept of control, and providing homework.

**Third session:** Identifying and clarifying values, goals and obstacles, explaining the concept of acceptance in diabetes, and providing homework.

**Fourth session:** Continuing the discussion of clarifying values and behavioral commitment and presenting homework.

**Fifth session:** Improving the communication style of patients, introducing and understanding self-conceptualized fusion and cognitive breakdown, performing exercises to strengthen cognitive breakdown and self-observation, and providing homework.

**Sixth session:** Committed action and self-observation, mindfulness training, focusing on

improving social relationships, and providing homework.

**Seventh session:** Practicing mindfulness, listing the most important values of the subjects and possible obstacles in their pursuit, summarizing the previous sessions, and providing homework.

**Eighth session:** Understanding the nature of commitment to action, identifying behavioral plans by values and making a commitment to act on them, examining the life story and committed action, ending the treatment, and conducting the post-test.

#### **Content of mindfulness therapy sessions**

The protocol of the treatment sessions of experimental group B, mindfulness therapy, derived from the mindfulness training protocol of Segal et al. (2012), was held during ten 90-minute sessions in 10 consecutive weeks. The summary of the meetings is as follows.

**First session:** Establishing a therapeutic relationship, defining mindfulness, and meditation, as well as the purpose and benefits of mindfulness and the connection between mindfulness and diabetes, performing a body scan for 30 minutes and providing homework.

**Second session:** Difference between thoughts and feelings, doing sitting meditation and giving homework.

**Third session:** Practicing walking, smiling, seeing and hearing, three-minute breathing interval practice, teaching the technique of consciously eating raisins and discussing it, and providing homework.

**Fourth session:** Four-dimensional sitting meditation training, discussion about stress responses and alternative behaviors, practicing mindful walking, and presenting homework.

**Fifth session:** Sitting meditation, practicing quick stress reduction, strengthening motivation, relaxing, strengthening patience, practicing getting rid of negative emotions, and submitting homework.



**Sixth session:** Doing a three-minute breathing space exercise, enjoying the moment and looking from a positive angle, doing four meditation exercises and conscious yoga for one hour consecutively, and providing homework.

**Seventh session:** Training to combat automatic thoughts, using mindfulness to deal with anxiety, and providing homework.

**Eighth session:** Performing a combination of four-dimensional meditation exercises, awareness of everything that enters the consciousness at the moment, three-minute breathing space, and presenting homework.

**Ninth session:** Performing body scan meditation, discussing the benefits of mindfulness, and finally giving homework.

**Tenth session:** Performing body scan meditation, teaching how to use what they have learned so far, 3-minute breathing interval practice, discussion on methods to deal with the obstacles of doing meditation, and finally conducting the post-test.

In the present study, inferential statistics and analysis of variance tests with repeated measurement of multiple variables were used to investigate the research hypotheses and the results were analyzed by SPSS-24 software.

## Results

Mean and standard deviation of research variables in three groups in the pre-test, post-test, and follow-up stages are presented in Table 4.

According to Table 1, which shows the mean and standard deviation of the studied groups in the three stages of pre-test, post-test, and follow-up, the mean score of blood sugar control scores in the post-test (6.91) and follow-up (7.10) has decreased compared to the pre-test (8/45) in the experiment group A who were under commitment and acceptance therapy (ACT), indicating the improvement of blood sugar control in the post-test and follow-up phases. Also, the blood sugar control scores in the post-test (7.50) and follow-up (7.89) compared to the pre-test (8.75) in the experiment group B who were under mindfulness therapy slightly decreased, which indicates a slight improvement in blood sugar control in the post-test and follow-up phases. The mean blood sugar control scores in the control group that did not undergo any treatment are not significantly different in the pre-test (8.87), post-test (8.81), and follow-up (8.70). In addition, the mean scores of weight control in the post-test (28.50) and follow-up (29.80) compared to the pre-test (35.10) in experiment group A decreased. It indicates the improvement of weight control in the post-test and follow-up phase. Also, the weight control scores in the post-test (30/03) and follow-up (31/28) compared to the pre-test (35/29) in the experiment group B have slightly decreased, which indicates a slight improvement in weight control in the post-test and follow-up phases. The mean scores of weight control in the control group that did not undergo any treatment are not significantly different

**Table 1.** Mean and standard deviation of pre-test, post-test, and follow-up stage of research variables by experimental and control groups

Variable	Group	Pre-	test	Post-	test	Follow-	Up
		Mean	standard deviation	Mean	standard deviation	Mean	standard deviation
Blood Sugar	Experimental 1	8.45	0.80	6.91	0.32	7.10	0.31
	Experimental 2	8.75	0.71	7.50	0.44	7.89	0.49
	Control	8.87	0.60	8.81	0.48	8.70	0.68
Weight Control	Experimental 1	35.10	2.87	28.50	1.49	29.80	2.57
	Experimental 2	35.29	3.67	30.03	2.56	31.28	2.71
	Control	34.80	3.43	35.40	3.92	33.98	2.83

in the pre-test (34.80), post-test (35.40), and follow-up (33.98).

To use the analysis of variance test with repeated measurement, the assumptions of this test were examined and all of them were approved. In other words, all assumptions were established and there was no obstacle to using the variance analysis method; therefore, analysis of variance was used. The hypothesis of the research was whether there is a difference between the effectiveness of acceptance

and commitment therapy and mindfulness therapy on blood sugar control and weight control.

Table 3 shows the effects of acceptance and commitment therapy (ACT) and mindfulness therapy on research variables. Based on these results, the within-group effects of measurement time ( $p < 0.001$ ,  $F = 101.96$ ), the interaction of time and group ( $p < 0.001$ ,  $F = 45.27$ ), and the within-group effects ( $F = 0.001$ ,  $p > 50.90$ ) for the blood sugar control variable showed that there was a significant difference in the

**Table 2.** Results of analysis of variance with repeated measures for intergroup effects of time and group interaction on research variables

Variable	Source of changes	Test	Value	F value	Assumed df	Error df	Sig	Eta Squared
Blood Sugar	Measurement time	Wilks Lambda	0.20	41.06	2	56	0.001*	0.82
Control	time $\times$ group	Wilks Lambda	0.19	35.81	4	112	0.001*	0.80
Weight	Measurement time	Wilks Lambda	0.35	80.63	2	56	0.001*	0.93
Control	time $\times$ group	Wilks Lambda	0.42	258.69	4	112	0.001*	0.89

\*  $p < 0.001$ .

and commitment therapy and mindfulness therapy in improving blood sugar control and weight control in people with type 2 diabetes. To investigate this hypothesis, an analysis of variance with repeated measurements was used. The results of these hypotheses are presented in the following tables.

The results of Table 2 showed that the interaction effect of time and group on the variable of blood sugar control ( $p < 0.001$ ,  $F = 35.81$ ) was significant. The eta square also shows that for blood sugar control, 80% of the variance of the groups' scores is related to group membership. Also, the interaction effect of time and group on the variable of weight control ( $p < 0.001$ ,  $F = 258.69$ ) was significant. The eta square also shows that for weight control, 89% of the variance of the groups' scores is related to group membership. According to the results of the table, analysis of variance with repeated measurements can be used to investigate the effectiveness of acceptance

blood sugar control scores at least between one or two experimental groups A and B with the control group. The eta squared values also indicate that the size of the within-group effect of measurement time ( $\eta^2 = 0.88$ ), time and group interaction ( $\eta^2 = 0.90$ ), and between-group effect ( $\eta^2 = 0.47$ ) is acceptable ( $\eta^2 > 0.14$ ). Also, the within-group effects of measurement time ( $p < 0.001$ ,  $F = 268.90$ ), the interaction of time and group ( $p < 0.001$ ,  $F = 295.38$ ), and between-group effects ( $p < 0.001$ ,  $F = 66.29$ ) for weight control variable showed that there was a significant difference in weight control scores at least between one or both experimental groups A and B with the control group and the eta squared values indicate the size of the effect of within-group ( $\eta^2 = 0.94$ ), time and group interaction ( $\eta^2 = 0.93$ ), and between-group ( $\eta^2 = 0.56$ ) are acceptable ( $\eta^2 > 0.14$ ). The results of Table 6 show the effectiveness of acceptance-commitment therapy (ACT) and

**Table 3.** Summary of the results of the intra-group and inter-group effects test using analysis of variance with repeated measurements on research variables

Effects	Variable	Source of changes	Total squares	df	Mean of squares	F value	Sig	Eta Squared
Intragroup	Blood	Measurement time	819.07	2	397.81	101.96	0.001*	0.88
	Sugar	Time × group	772.36	4	325.14	45.27	0.001*	0.90
	Control	Error	40.12	114	1.97			
Intergroup	Blood	Constant	1439.83	1	1439.83	331.15	0.001*	0.86
	Sugar	Group	1064.59	2	316.42	5.90	0.001*	0.47
	Control	Error	802.28	57				
Intragroup	Weight	Measurement time	1142.39	1.33	775.13	268.90	0.001*	0.94
	Control	Time × group	1510.84	2.65	829.59	295.38	0.001*	0.34
		Error	71.17	59.15	1.47			
Intergroup	Weigh	Constant	201255.61	1	201255.61	603.45	0.001*	0.93
	Control	Group	3182.99	2	1972.43	66.29	0.001*	0.56
		Error	1892.87	57				

\* p&lt;0.001.

**Table 4.** Bonferroni post hoc test results for pairwise comparison of mean scores in pre-test, post-test and follow-up for research variables

Variable	Base group	Comparison group	Mean differences	Standard error	Sig
Blood Sugar	Pre-test	Post-test	1.51	0.19	0.001*
		Follow-up	1.10	0.18	0.001*
	Post-test	Pre-test	-1.51	0.19	0.001*
		Follow-up	-0.29	0.07	0.09
	Follow-up	Pre-test	-1.10	0.18	0.001*
		Post-test	0.29	0.07	0.09
Weight	Pre-test	Post-test	5.93	0.59	0.001*
		Follow-up	4.65	0.57	0.001*
	Post-test	Pre-test	-5.93	0.59	0.001*
		Follow-up	-1.27	0.17	0.10
	Follow-up	Pre-test	-4.65	0.57	0.001*
		Post-test	1.27	0.17	0.10

mindfulness therapy on research variables in the pre-test, post-test, and follow-up stages. Based on the results of the table, HbA1c test scores, the measure of blood sugar control, were significantly reduced in the post-test ( $p<0.001$ ) and follow-up ( $p<0.001$ ) compared to the pre-test (increased blood sugar control). There was no significant difference between the level of blood sugar control in the post-test and follow-up ( $p<0.05$ ) stages. This indicates that therapeutic interventions have increased blood sugar control in the experimental groups and these changes remained stable during the follow-up phase. Also, the BMI scores, which were the criteria for weight control, decreased significantly in the post-test ( $p<0.001$ ) and follow-up ( $p<0.001$ ) compared to

used, the results of which are presented in Table 5.

Table 5 shows the results of the pairwise comparison of the mean scores of the research variables between the experimental and control groups. The results showed that there was a significant difference between the mean scores of blood sugar control of the acceptance-commitment therapy group and the control group ( $p<0.001$ ). Also, there was a significant difference between the blood sugar control scores of the mindfulness therapy group and the control group ( $p<0.05$ ). Also, there was a significant difference between the mean scores of weight control of the acceptance-commitment group and the control group ( $p<0.001$ ). Also, there was a significant difference between the weight control scores of the mindfulness

**Table 5.** Bonferroni's post hoc test results for pairwise comparison of mean scores of research variables

Variable	Base group	Comparison group	Mean differences	Standard error	Sig
Blood Sugar	Act	Mindfulness	-0.59	0.11	0.04*
		Control	-1.90	0.19	0.001**
	Mindfulness	Act	0.59	0.11	0.04*
		Control	-1.31	0.15	0.03*
	Control	Act	1.90	0.19	0.001**
		Mindfulness	1.31	0.15	0.03*
Weight	Act	Mindfulness	-1.53	0.18	0.04*
		Control	-6.90	1.33	0.001**
	Mindfulness	Act	1.53	0.18	0.04*
		Control	-5.37	1.27	0.02*
	Control	Act	6.90	1.33	0.001*
		Mindfulness	5.37	1.27	0.02*

\*  $p<0.05$ . \*\*  $p<0.001$ .

the pre-test (increase in weight control). There was no significant difference between the amount of weight control in the post-test and follow-up ( $p<0.05$ ). This indicates that therapeutic interventions have increased weight control in the experimental groups and these changes remained stable in the follow-up stage. To investigate the difference between the effectiveness of interventions on blood sugar control and weight control, Bonferroni's post hoc test was

treatment group and the control group ( $p<0.05$ ). This means that both treatments are effective and efficient to increase blood sugar control and weight control; however, the effectiveness of acceptance and commitment therapy was greater than the mindfulness therapy, and this difference remained constant in the follow-up period. According to these results, the research hypothesis was confirmed. In other words, there is a significant difference between



the effectiveness of acceptance and commitment therapy and mindfulness therapy in improving blood sugar control and weight control in people with type 2 diabetes.

## Discussion and Conclusion

The results showed that both treatments based on acceptance and commitment and mindfulness are effective and efficient to improve blood sugar control and weight control; however, the effectiveness of the acceptance and commitment therapy was greater than the mindfulness therapy and this difference remained constant in the follow-up stages; therefore, the research hypothesis was confirmed.

Regarding the variable of blood sugar control, the results of this study with are consistent with the findings of Hosseini et al. (2021), Har et al. (2017), Ni et al. (2020), Shukla et al. (2021), and Sakamoto et al. (2022). In the explanation of the findings of the current research on the effectiveness of mindfulness therapy in improving blood sugar control, it can be stated that meditation and yoga techniques are used in mindfulness therapy. All these techniques lead to the reduction of stress and anxiety in people with diabetes (Shukla et al, 2021). Psychological stress is a common phenomenon among people with diabetes and is related to unfavorable metabolic regulation. Therefore, it seems that the mindfulness training program that includes sitting meditation, four-dimensional sitting meditation, pain and stress reduction, body scan, mindful walking, and smiling practice, seeing and hearing practice, 3 3-minute breathing exercises, relaxing, and strengthening patience can simultaneously reduce stress and blood sugar, as well as blood, glycosylated hemoglobin levels.

According to the results of this study, acceptance and commitment therapy (ACT) is more effective than mindfulness therapy in improving blood sugar control in patients with type 2 diabetes. In

explaining this finding, it can be stated that in acceptance and commitment therapy, people learn to accept their feelings without avoidance and get rid of the disturbing content of their thoughts by focusing more consciously on their thinking process and associate it with goal-based action (Vasiliou et al, 2022). Increasing acceptance among people with diabetes causes them to attach more importance to themselves and their health and to perform better and more self-care behaviors, that is, they try to take prescribed medications and insulin on time, from the recommended diet, follow better, do more physical activity, and measure their daily blood sugar, which all improve the body's metabolism. Improving metabolism increases the permeability of the muscle cell membrane to glucose due to the increase in the number of glucose transporters in the plasma membrane. During this process, the sensitivity of body cells to insulin increases, the effect of insulin on glucose metabolism is improved, the amount of peripheral glucose uptake increases, and the patient's glycosylated hemoglobin level decreases (Sakamoto et al, 2022)

The results of the current research, regarding the variable of weight control, are in line with the findings of Etefaghi et al. (2019), Ashrafi et al. (2020), Iturbe et al. (2021) and Carl et al. (2022). In the explanation of the findings of the current research on the effectiveness of mindfulness therapy in improving weight control, it can be stated that one of the characteristics of mindfulness therapy is that the client gets to know the etiology of their disorders and their physical and psychological mechanisms. This awareness reduces a person's level of anxiety and increases the level of concentration on his conscious thoughts and desires, and finally enables a person to decide to use these strategies and repeated actions or ruminate them again to relieve negative emotional states (Ashrafi et al, 2020) In addition, mindfulness meditation can be effective in reducing

the frequency of overeating and thereby lead to weight loss (Dunn et al, 2018). Since there are many dissatisfactions in people with obesity-related to eating habits and their effect on various functional areas and their appearance, learning mindfulness skills and applying them in nutrition and as a result improving and modifying eating behaviors can reduce psychological pressures and worries caused by unhealthy eating patterns and improving the general quality of a person's life (Iturbe et al, 2021). Also, according to the results of the present study, acceptance and commitment therapy (ACT) is more effective than mindfulness therapy in improving and increasing weight control in patients with type 2 diabetes. In explaining this finding, it can be stated that in acceptance and commitment therapy, it is believed that thoughts are the product of a natural mind. What turns thoughts into beliefs is the person's mixing with the content of thoughts. When a person acts according to the content of a thought, it means that the act of eating is mixed with the content of that thought, and the result of this mixing is gluttony, which is considered a pattern of experiential avoidance. Acceptance and commitment therapy, through interventions related to cognitive dissonance, seeks to help patients not inflexibly surrender to their thoughts and mental rules, and instead develop ways to interact more effectively with the world that is directly experienced (Etefaghi et al, 2019).

Acceptance and commitment therapy teaches people to deal with the distressing experiences they face when trying to lose weight (such as hunger, negative emotions, fatigue from activity and exercise, cravings and ...) instead of avoiding them, accepting them, and being open to them. They learn that any action to avoid or control these unwanted inner experiences is ineffective or even aggravates them. Although the act of eating relieves them in the short term, in the long term, the intensity and impact of

these experiences increase, and more efforts must be made to control them. Therefore, they learn to accept these experiences without any effort to control or eliminate them. After that, this therapy focuses on identifying and internalizing the values and goals of a person's life, and by introducing committed action, it commits the person to perform actions that are in line with his values (such as health) and goals (such as fitness) and not his thoughts and feelings. If until now the person used to eat to avoid his thoughts and feelings, now he learns to eat for the value of health. In addition, acceptance and commitment therapy by teaching mindfulness techniques helps clients to be aware of their weight loss goals and eating behaviors when faced with external and internal obstacles (such as their disturbing thoughts, feelings, desires, and bodily sensations) which leads to a reduction in unconscious eating behaviors and ultimately a reduction in weight loss.

Treatment based on commitment and acceptance emphasizes on values, meaning in life, suffering and growing up in the heart of suffering, and metaphors (which metaphor is intertwined with the culture of statistical society); Therefore, it is a more effective treatment than mindfulness treatment. Also, in the treatment based on acceptance and commitment, values are also emphasized in addition to mindfulness techniques that lead to paying attention to the present and now and paying attention to the body. Emphasis on values can target the values that a person has regarding the disease of diabetes and in this way improve self-care activities and as a result improve the consequences of diabetes and further through commitment which is one of the principles of treatment based on It is acceptance and commitment, self-care behaviors are institutionalized in people. Because, while accepting the disease of diabetes, a person realizes that in order to have a better life, he needs to commit to self-care activities, which are sometimes exhausting, (such as diets, physical

activity, daily and timely medication and insulin) to pay.

According to the results of the present study, acceptance and commitment therapy is a more efficient treatment for patients with type 2 diabetes compared to mindfulness therapy. This treatment is justifiable. In addition, in following the treatment, behavioral change does not occur in the patient, if 1) he does not find the necessary motivation in this field, 2) he does not understand the importance of the recommended behavior in managing his diabetes, and 3) he does not have the necessary skills to create the behavior. Treatment based on acceptance and commitment takes steps toward these three areas. So it is expected to have more lasting effects on the individual's behavior. Therefore, the use of this intervention can help patients with diabetes to return to their normal lives and control the effects of diabetes, control blood sugar, and control weight.

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