

## The Effectiveness of Acceptance and Commitment Therapy on Physical and Psychological Symptoms in Patients with Type 2 Diabetes

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### ABSTRACT

**Objective:** The aim of the present study was to investigate the effectiveness of Acceptance and Commitment Therapy (ACT) on the physical and psychological symptoms of patients with type 2 diabetes.

**Methods and Materials:** This quasi-experimental study used a pre-test, post-test design with a control group. The statistical population included all patients with type 2 diabetes in endocrinology clinics in Tehran from September to November 2021. A total of 40 patients (20 in each group) were selected through convenience sampling and randomly assigned to experimental and control groups using block randomization. The World Health Organization Quality of Life Questionnaire, the Diabetes Acceptance and Action Scale, a digital scale, and blood sugar tests were used in the pre-test and post-test. The ACT intervention was implemented for the experimental group in 8 consecutive weekly sessions. Data analysis was conducted using covariance analysis with SPSS v.27.

**Findings:** The findings indicated a significant decrease in acceptance and action ( $P < 0.001$ ,  $MD = -24.20$ ,  $\eta^2 = 0.50$ ), weight ( $P < 0.001$ ,  $MD = -9.24$ ,  $\eta^2 = 0.64$ ), and HbA1c levels ( $P < 0.001$ ,  $MD = -0.33$ ,  $\eta^2 = 0.34$ ) in the intervention group compared to the control group at a significance level of less than 0.05. The post-test quality of life score in the intervention group was higher than in the control group, but this difference was not significant at the 0.05 level ( $P = 0.48$ ,  $MD = 3.5$ ,  $\eta^2 = 0.02$ ).

**Conclusion:** The use of Acceptance and Commitment Therapy is effective in improving the physical and psychological symptoms of patients with type 2 diabetes, and it is recommended to be used alongside medical interventions.

**Keywords:** Type 2 Diabetes, Acceptance and Commitment Therapy, Psychological Flexibility, Quality of Life.

## 1. Introduction

Experiencing physical illness is a part of human experience. While some illnesses are transient and treatable, many become chronic, posing ongoing challenges for individuals, families, communities, and healthcare systems. Diabetes, as a chronic disease, occurs when the body is unable to produce sufficient insulin or cannot use the insulin it produces effectively (Lau & Aw, 2020). Diabetes is a prevalent condition and one of the most significant health issues worldwide, thus the World Health Organization (WHO) has referred to it as a silent epidemic. In type 1 diabetes, the destruction of beta cells in the pancreas leads to insulin production deficiency, while in type 2 diabetes, progressive insulin resistance can eventually lead to the destruction of pancreatic beta cells and complete insulin production deficiency (Carneiro, 2021). As one of the most common metabolic disorders, the prevalence of diabetes is estimated at 9.3% (463 million) and is projected to reach 10.9% (700 million) by 2045, with type 2 diabetes accounting for nearly 90% of all cases (Eisazadeh et al., 2022). The rapid increase in type 2 diabetes is currently attributed to population aging, lifestyle changes such as overeating (especially high-fat diets), lack of exercise, obesity, stress, and improved healthcare and medical conditions (Polonsky et al., 1995). Studies indicate that obese individuals are more at risk of developing type 2 diabetes (Reddy et al., 2013), and weight control is vital for individuals with diabetes since excess weight causes insulin resistance, complicating blood sugar control (Wijk et al., 2023; Winkley et al., 2020).

Glycated hemoglobin or HbA1c is known for identifying, monitoring, and controlling diabetes. Hemoglobin reflects the average glucose level over the past 3 to 4 months, with higher glucose concentration and exposure time leading to a higher percentage of glycated hemoglobin, indicating poor blood sugar control over the past two to three months and showing how successful the patient has been in managing diabetes. Additionally, many adults with type 2 diabetes experience significant psychosocial burdens and mental health problems related to the disease (Chew et al., 2017). The daily needs of individuals living with type 2 diabetes increase the risk of diabetes-related distress, which reflects the stress-related emotions associated with the challenges of diabetes management and concerns about diabetes complications (Polonsky et al., 1995). Diabetes-related distress is a syndrome comprising multidimensional components such as worry, conflict, frustration, and

discouragement that intertwine with the life of the diabetic patient, affecting treatment adherence behavior and being associated with higher HbA1c levels, lower self-efficacy, poorer dietary and physical activity habits (Linden et al., 2018).

As mentioned, unhealthy lifestyle factors, including dietary habits, physical activities, and psychological skills, can lead to other chronic diseases such as diabetes, which negatively impacts patients' quality of life (Linden et al., 2018; Zheng et al., 2022). Quality of life is defined as an individual's perception of their position in life within the context of the culture and value systems in which they live, in relation to their goals, expectations, standards, and concerns (Alho et al., 2022). The limitations caused by diabetes are a determining factor in reducing the quality of life, affecting individuals' perception and satisfaction with their health, leading to reduced physical, psychological, social, and environmental quality of life (Nejat et al., 2006). It is now established that diabetes control and prevention from progression can effectively prevent physical and psychological complications and enhance patients' psychological well-being (Jun, Choi, & Kim, 2022). Alongside the often long-term and challenging treatment process for diabetes, individuals' attitudes and approaches towards diabetes and its treatment can influence prognosis. It has been shown that non-acceptance of the disease and its accompanying problems lead to negative treatment outcomes, whereas adaptation to treatment in diabetic patients improves blood sugar control (Momeniarbat et al., 2017; Schmitt et al., 2014). Psychological flexibility is a concept that recent studies have shown to be effective in the development of diabetes, metabolic control, hemoglobin levels, and quality of life in diabetic patients (Kamody et al., 2018; Momeniarbat et al., 2017). It refers to the "ability to fully contact the present moment and connect with inner experiences without judgment or defense and the ability to take action in line with values" (Hayes et al., 2006; Hayes et al., 2011). The psychological flexibility model has been found to impact many clinical conditions and chronic conditions related to diabetes and quality of life (Bai et al., 2020; Swain et al., 2015). Moreover, studies have shown that cognitive flexibility improves self-care behaviors and adaptation to psychiatric problems in patients with type 1 diabetes (Kamody et al., 2018). In a study by Gregg et al. (2007), a reduction in HbA1c and an increase in quality of life were reported as outcomes of psychological flexibility (Gregg et al., 2007).

Given the aforementioned points, the importance of an acceptance-based process in coping with diabetes and its related psychological issues is evident. Assessing and monitoring the level of disease acceptance in diabetic patients is crucial in the treatment process, as acceptance is considered a criterion for treatment participation and integrating diabetes management into daily life (Reddy et al., 2013). Based on these studies and results, clinicians in clinical settings and researchers have recently been encouraged to use psychological treatments as an adjunct to medical treatment for diabetic patients (Kamody et al., 2018). One of these psychological treatments is Acceptance and Commitment Therapy (ACT). The goal of this therapy is to increase psychological flexibility. As mentioned, psychological flexibility focuses on the present moment and effective action in an acceptable and non-judgmental way, even when thoughts and feelings contradict one's values (Bai et al., 2020). Psychological flexibility can be fostered through six core processes: values, committed action, self-as-context, cognitive defusion, acceptance, and contact with the present moment. Each of these processes is a psychological skill that can be taught and reinforced (Halliburton & Cooper, 2015). In other words, ACT combines mindfulness and acceptance strategies with commitment and behavior change strategies to increase flexibility and utilizes psychological acceptance. The aim of ACT is to help individuals relate to their experiences in new ways and fully engage in meaningful and value-based living (Hosseini et al., 2021). Psychological flexibility enhances individuals' ability to make practical choices about the most appropriate decisions when making decisions. It also increases individuals' ability to fully connect with the present moment and change or maintain behavior (Azadmanesh et al., 2021). The ACT approach has shown positive effects on quality of life, psychological symptoms, and psychological flexibility, and studies in the diabetes field have shown that avoidance of unpleasant thoughts and feelings related to diabetes is associated with poor diabetes management during treatment (Swain et al., 2015). A recent study indicated that higher levels of psychological flexibility were associated with better blood sugar control and lower levels of depression and anxiety symptoms (Linden et al., 2018). Given the points mentioned and reviewing the studies conducted on the acceptance and commitment therapy approach, although various variables have been examined, no study has been conducted in the Iranian population of diabetic patients on the effectiveness of this therapy, which aims to increase psychological flexibility, on patients'

attitudes and acceptance of diabetes and how to cope with it. Attention to such an issue adds to the innovation of the study to be able to take more effective measures for intervention, rehabilitation improvement, and enhancement of patients' quality of life and well-being. Additionally, as Iran, as a developing country, has one of the highest diabetes prevalence rates globally, and according to WHO statistics, without special measures, the number of diabetics will grow alarmingly (Khalatbari et al., 2020), clinical research and treatment interventions in the field of diabetes are deemed necessary. Therefore, the present study addressed the impact of ACT on some physical symptoms, including weight and blood sugar, as well as quality of life and acceptance of diabetes in patients with type 2 diabetes.

## 2. Methods and Materials

### 2.1. Study design and Participant

This quasi-experimental study used a pre-test, post-test design with a control group. The statistical population included all patients with type 2 diabetes referred to endocrinology clinics in Tehran from September to November 2021. The sample size was calculated using G\*Power v 3.1 software, with  $\alpha = 0.05$ , power = 0.80, a large effect size, two groups, and one controlled variable, resulting in 20 participants per group. In this study, based on inclusion and exclusion criteria, 40 individuals were selected through convenience sampling and randomly assigned to experimental and control groups using block randomization. After the study, 2 participants from each group dropped out, and 18 participants were evaluated in the final analysis. To collect samples, a call for participation in the study, along with the researcher's contact number, was placed in private offices and endocrinology and metabolism clinics. Volunteers contacted the researcher, and after being fully informed about the study objectives, they provided their demographic details and handwritten consent for participation, reviewing inclusion and exclusion criteria.

Inclusion criteria were a confirmed diagnosis of type 2 diabetes from medical records and clinic specialist approval, age over 30, high school education or higher, no mental or physical disabilities, no hospitalization, no use of psychiatric medications, and willingness to participate. Exclusion criteria included receiving simultaneous psychological treatments, missing more than two intervention sessions, unwillingness to continue, and having chronic physical illnesses like cancer. After reviewing demographic characteristics and selecting participants through random

assignment, patients were placed in experimental and control groups. Ethical considerations assured all participants that their information would be used solely for thesis results and remain confidential. After random assignment, the WHO Quality of Life Questionnaire and the Diabetes Acceptance and Action Scale were administered, and digital scales measured weight, while HbA1c levels were assessed through blood tests as pre-tests for both groups. At the end of the intervention, all participants completed the post-test. To maintain ethical principles, the control group also received a similar intervention after the study.

## 2.2. Measures

### 2.2.1. Weight

A digital scale measures body weight in grams and kilograms. In a study by Kumar et al. (2014), the reliability coefficient for the digital scale was 0.94 to 0.97, and the area under the curve for the digital scale was 0.68 with a 95% confidence interval, indicating acceptable diagnostic power (Htwe et al., 2014).

### 2.2.2. HbA1c

Glycated Hemoglobin Test for HbA1c Measurement test evaluates long-term diabetes control, indicating glucose levels over the past 12 weeks and reflecting the percentage of hemoglobin combined with sugar. The higher the percentage, the higher the average blood sugar level. This value should be less than 7, with a closer proximity to 7 indicating a higher risk of diabetes complications. This study used fasting blood glucose tests conducted by a nurse in the laboratory, where venous blood was drawn from the brachial vein in the elbow area and blood glucose levels were estimated by the laboratory (Lau & Aw, 2020; Schmitt et al., 2014).

### 2.2.3. Quality of Life

The WHO Quality of Life Questionnaire (1989) consists of 26 items assessing four subscales: physical health (items 3, 4, 10, 15, 16, 17, 18), psychological health (items 5, 6, 7, 11, 19, 26), social relationships (items 20, 21, 22), and environmental health (items 8, 9, 12, 13, 14, 23, 24, 25) on a 5-point Likert scale ranging from 1 (not at all) to 5 (extremely). The first two items do not belong to any subscale. Bonomi reported an internal reliability of 0.95, and in 2000, the questionnaire was designed and translated simultaneously in 15 countries. Standardization, translation,

and psychometric evaluation of the Iranian version were conducted by Nejat et al. (2006), with Cronbach's alpha values above 0.70 for all subscales and an overall reliability of 0.84 (Nejat et al., 2006).

### 2.2.4. Psychological Flexibility

The Diabetes Acceptance and Action Questionnaire was developed by Gregg et al. (2007) to assess the level of acceptance and psychological flexibility in individuals with type 2 diabetes. This scale includes 11 items measuring the level of non-acceptance of diabetes on a 7-point Likert scale ranging from 1 (not at all) to 7 (always). The reliability of this questionnaire in the original version was reported with a Cronbach's alpha of 0.96 (Gregg et al., 2007). Recently, in a study by Khajepoor et al. (2023) conducted on patients with type 2 diabetes, a Cronbach's alpha of 0.91 was obtained, and test-retest reliability showed a significant positive correlation. Confirmatory factor analysis in the Iranian study indicated appropriate item intensity with the intended construct (Khajepoor & Mojtabaei, 2022).

## 2.3. Interventions

### 2.3.1. Acceptance and Commitment Therapy

The intervention group received weekly ACT sessions for two months (eight sessions) conducted by three certified specialists, following the following treatment protocol (Hayes et al., 2006; Hayes et al., 2011), while the control group received no educational intervention.

#### Session 1: Building Rapport

The goal of the first session is to establish rapport and introduce the principles of Acceptance and Commitment Therapy (ACT). The session begins with introductions and an explanation of the importance and objectives of ACT. Participants complete pre-test questionnaires. The session includes a discussion on the significance of caregivers' actions for their child's health and the impact of suppressing emotions. The concept of emotional suppression and its negative effects are explained. Homework: Participants are asked to create a list of their feelings and emotions and report instances of emotional suppression.

#### Session 2: Reducing Emotional Control

In this session, the homework from the previous session is reviewed. Participants discuss how worrying about their child's problems can make them more attached to these issues. Exercises and metaphors such as "person in a pit," "feeding the tiger," "driving with a rearview mirror,"



"throwing away old things to make room for new ones," the illusion of control, and the consequences of control are introduced. Homework: Participants identify their avoidance behaviors.

Session 3: Increasing Acceptance

The session begins with a review of homework, followed by a discussion on accepting the child's illness and problems. Participants learn to accept what is beyond their control and express rather than suppress their emotions. Exercises and metaphors such as "tug-of-war with a monster," empathy, the serenity prayer, journaling events, eye contact exercises, and "the grumpy child" metaphor are practiced. Homework: Participants identify what they need to accept to move towards their values and practice some of the metaphors.

Session 4: Increasing Cognitive Defusion

Homework is reviewed, and participants identify situations where they are overly attached to their beliefs and expectations based on right/wrong or good/bad. Exercises and metaphors like "pickles," "watching the thought train," "soldiers marching," and "who is in charge? (you or your mind?)" are conducted. Homework: Participants describe real-life situations, noting what their mind was saying versus their actual experience.

Session 5: Present Moment Awareness

Homework is reviewed, and the discussion focuses on being preoccupied with the future or past and telling unproductive life stories. Participants practice being present in the current environment, noting their current feelings, paying full attention, and practicing mindfulness. Exercises include continuous response writing, "leaves on a stream," and distinguishing between past, present, and future. Homework: Participants practice mindfulness exercises at home.

Session 6: Self-as-Context and Values Clarification

Homework is reviewed to determine if participants can distinguish between emotionally charged content and the self. Exercises and metaphors such as "the observer," "chessboard metaphor," and "furniture in the house" are used to explore the distance between current behaviors and values. Additional exercises include the "tombstone metaphor," "funeral metaphor," and brainstorming to clarify values. Homework: Participants write a list of their life values and what they would like to be inscribed on their tombstone.

Session 7: Committed Action and Reducing Emotional Control

Homework is reviewed to see if participants are engaging in behaviors that lead to successful outcomes and if they demonstrate a step-by-step action pattern. The session includes discussing how they adapt their methods when actions fail. Exercises and metaphors include "skiing down a mountain," "the winding path and driving on the road," teaching forgiveness, and practicing "person in a pit," "feeding the tiger," "driving with a rearview mirror," and "throwing away old things." Homework: Participants choose items from their values list and are encouraged to implement them over the next week.

Session 8: Closure

The final session reviews the content of previous sessions and the homework assignments. Participants address any remaining questions and prepare for the end of the sessions. Post-test questionnaires are administered to evaluate the outcomes of the intervention.

2.4. Data Analysis

Data analysis involved ANCOVA, with pre-test as a controlled variable and post-test as the evaluated variable, using SPSS v.27, with a significance level of 0.05.

3. Findings and Results

In this study, 36 participants were divided into two groups of 18 each. The mean age and standard deviation for the intervention group were  $37.44 \pm 5.14$  years, and for the control group were  $36.77 \pm 6.80$  years, showing homogeneity. Educational levels for the intervention group included 3 individuals (16.7%) with a bachelor's degree, 4 (22.2%) with a master's degree, and 11 (61.1%) with a doctorate. For the control group, there were 4 individuals (22.2%) with a bachelor's degree, 5 (27.8%) with a master's degree, and 9 (50%) with a doctorate, indicating no significant difference in educational distribution. Marital status for the intervention group showed 7 individuals (38.9%) were single and 11 (61.1%) were married, compared to the control group with 8 (44.4%) single and 10 (55.6%) married participants. The number of women in the intervention and control groups was 8 (44.4%) and 10 (55.6%) respectively, while the number of men was 10 (55.6%) and 8 (44.4%) respectively.

**Table 1**

*Descriptive Statistics of Quality of Life, Acceptance and Action, Weight, and HbA1c Levels by Group*

Variables	Measurement Stage	Group	Mean	Standard Deviation	Shapiro-Wilk Statistic	Shapiro-Wilk Significance
Quality of Life	Pre-test	Intervention	81.38	1.35	0.96	0.67
		Control	102.22	2.32	0.92	0.16
	Post-test	Intervention	82.77	1.63	0.97	0.70
		Control	84.44	1.98	0.98	0.96
Acceptance and Action	Pre-test	Intervention	37.88	1.81	0.93	0.19
		Control	55.50	1.90	0.89	0.05
	Post-test	Intervention	34.88	1.86	0.90	0.08
		Control	58.33	1.94	0.91	0.09
Weight	Pre-test	Intervention	88.94	3.50	0.93	0.25
		Control	89.27	1.89	0.96	0.69
	Post-test	Intervention	85.50	2.26	0.92	0.11
		Control	86.16	1.83	0.97	0.70
HbA1c Levels	Pre-test	Intervention	7.68	0.15	0.94	0.39
		Control	7.66	0.16	0.96	0.75
	Post-test	Intervention	7.16	0.14	0.90	0.06
		Control	7.48	0.15	0.96	0.62

The results in Table 1 indicate that the quality of life in the intervention group slightly increased from pre-test to post-test, while the control group showed a decreasing trend. Acceptance and action levels decreased in the intervention group during the training period, whereas they increased in the control group. Weight in the intervention group decreased, although the control group did not show a significant difference. HbA1c levels in both groups decreased, but the decrease was more pronounced in the

intervention group. The study design used univariate covariance analysis to control for pre-test and examine the effect of the intervention in the post-test. Normality assumptions were assessed using the Shapiro-Wilk test, showing no significant deviations ( $P > 0.05$ ). Homogeneity of variances and regression slope homogeneity between groups and post-test for each variable were assessed using Levene's test and interaction effects, indicating no violations ( $P > 0.05$ ).

**Table 2**

*Covariance Analysis for Quality of Life, Acceptance and Action, Weight, and HbA1c Levels*

Variables	Factor	Mean Squares	F Statistic	Significance Level	Partial Eta Squared	Bonferroni Adjusted Mean Difference
Quality of Life	Pre-test	111.39	1.92	0.17	0.05	3.50
	Group	29.41	0.50	0.48	0.02	
Acceptance and Action	Pre-test	3.92	0.06	0.81	0.002	-24.20
	Group	2274.62	3.69	<0.001	0.50	
Weight	Pre-test	2164.19	162.02	<0.001	0.83	-9.24
	Group	802.59	60.08	<0.001	0.64	
HbA1c Levels	Pre-test	11.82	206.58	<0.001	0.86	-0.33
	Group	0.99	17.32	<0.001	0.34	

The analysis of covariance (ANCOVA) results indicate significant differences between the intervention and control groups for several key variables. For quality of life, the group effect was not significant ( $F(1, 33) = 0.50, p = 0.48, \eta^2 = 0.02$ ). However, significant differences were observed for acceptance and action, with the intervention group showing a greater reduction compared to the control group ( $F(1, 33) = 3.69, p < 0.001, \eta^2 = 0.50$ ). For weight, the intervention group showed a significant decrease compared to the control group ( $F(1, 33) = 60.08, p < 0.001, \eta^2 = 0.64$ ).

Additionally, HbA1c levels also significantly decreased in the intervention group compared to the control group ( $F(1, 33) = 17.32, p < 0.001, \eta^2 = 0.34$ ). These results suggest that the Acceptance and Commitment Therapy (ACT) intervention had a meaningful impact on reducing weight and HbA1c levels, as well as improving acceptance and action in patients with type 2 diabetes.

#### 4. Discussion and Conclusion

The present study aimed to investigate the effectiveness of Acceptance and Commitment Therapy (ACT) on physical and psychological symptoms in patients with type 2 diabetes. The results indicated that ACT significantly improved psychological flexibility, weight, and blood sugar levels in patients with type 2 diabetes. The finding on the impact of ACT on patients' weight in the intervention group is consistent with prior studies (Cox et al., 2023; Eisazadeh et al., 2022; Newsome et al., 2022), which showed promising effects of ACT interventions on weight. This can be explained by the fact that ACT interventions help patients not to succumb to their thoughts and mental rules but to engage more effectively with the real world directly experiencing their emotions.

In the present study, patients were taught through ACT techniques to share their distressing inner experiences (e.g., experiencing diabetes, weakness, hunger, negative emotions, fatigue from activity and exercise, desire to eat) and accept and deal with them rather than avoiding them. They learned that any effort to avoid or control these unwanted inner experiences is futile or even intensifies them. Although excessive eating behavior provides short-term relief, it increases the intensity and impact of these experiences in the long run, requiring more effort to control. Thus, they learned to accept these experiences without attempting to control or eliminate them. Additionally, another technique in this intervention that appeared to significantly impact weight reduction in the intervention group was focusing on identifying and internalizing values and life goals, committing individuals to actions that align with these values (e.g., valuing health) and goals (e.g., having a suitable weight to improve diabetes).

Another finding of this study was the impact of ACT on HbA1c levels in the intervention group, similar to prior findings (Khalatbari et al., 2020; Winkley et al., 2020). Contrary to this finding, Ingrid Wijk et al. (2023) recently reported no significant effect on HbA1c after the ACT program, but the results became significant during a two-year follow-up. Similarly, Alho et al. (2022) showed a significant beneficial effect of ACT on HbA1c in adolescents with type 1 diabetes. This indicates that ACT positively affects improving glycated hemoglobin levels in patients with type 2 diabetes (Alho et al., 2022). ACT helps change thoughts and emotions, aiding patients in accepting negative emotions and thoughts, thereby identifying and committing to their goals. Through the training process,

using acceptance techniques, being present in the moment, and observing without judgment, patients with diabetes established a more realistic relationship with their disease symptoms and acceptance. This treatment, through metaphoric techniques, assignments, and mindfulness skills, reduces psychological problems and consequently affects physical aspects and glycated hemoglobin levels. One study showed that mindfulness interventions are effective in calming and subsequently improving glycated hemoglobin levels, with mindfulness techniques influencing HbA1c levels and reducing clinical symptoms in patients with type 2 diabetes.

The present study also found that ACT significantly impacted acceptance levels in patients with type 2 diabetes in the intervention group compared to the control group. This suggests that ACT significantly affects patients' acceptance of the disease. This part of the findings, evaluated using the Diabetes Acceptance and Action Scale in patients with type 2 diabetes, has recently been standardized in the Iranian diabetic patient community. No study in Iran has assessed flexibility and acceptance in patients with type 2 diabetes using this tool. Since individuals' attitudes and approaches towards diabetes and its treatment are factors influencing prognosis and treatment outcomes, this study showed that ACT significantly impacts individuals' acceptance of the disease and reduces avoidance of disease experiences. Similar findings in previous studies indicated that avoidant coping strategies are considered factors that prevent adaptation to diabetes treatment and promote disease progression. Such behavior significantly reduces self-care, increases HbA1c levels, increases diabetes-related stress, and elevates depression symptoms.

In the present study, pre-test results showed high avoidance of disease experience among patients with type 2 diabetes. According to the theoretical literature in this field, individuals with experiential avoidance tend to avoid special private experiences like bodily sensations, emotions, thoughts, memories, and unpleasant behavioral tendencies. These individuals are more vulnerable to stress because this avoidant response pattern inhibits effective behaviors for coping with stress, potentially increasing the frequency of these unwanted inner experiences, leading to chronic stress and exacerbating anxiety and depression. In ACT training, the focus is on changing individuals' relationships with their thoughts, emphasizing acceptance rather than eliminating or controlling unpleasant thoughts and emotions.

In a study on adult patients with diabetes, Gregg et al. (2007) found that psychological flexibility, as the primary

mechanism of change in ACT-based interventions, plays a mediating role in changes in blood glucose following ACT treatment (Gregg et al., 2007). Given these findings, the importance of an acceptance-based process in coping with diabetes and its related psychological issues is evident. Non-acceptance or avoidance of diabetes is considered a barrier to self-care, indicating the need for active, direct treatment when identified. Assessing acceptance in diabetic patients is essential because acceptance is a criterion for treatment participation and integrating diabetes management into daily life. The present study's results confirmed that ACT significantly impacts the acceptance and flexible attitude of diabetic patients.

Additionally, the present study found no significant effect of ACT on the quality of life of patients with type 2 diabetes in the intervention and control groups. Although higher quality of life scores were observed in the intervention group, they were not significant. Contrary to this finding, studies showed that ACT is a unique intervention for improving quality of life in diabetes by helping individuals accept unpleasant thoughts and feelings related to the disease (Alho et al., 2022; Swain et al., 2015). Studies also indicated that since diabetes is related to lifestyle and negatively impacts patients' quality of life, effective interventions, including ACT and mindfulness-based treatments, help individuals relate to their experiences in various ways and align fully with meaningful, value-based living (Alho et al., 2022; Bai et al., 2020; Swain et al., 2015). This alignment is effective in controlling diabetes, preventing its progression, and enhancing physical and psychological well-being.

In explaining this finding, it can be argued that although diabetic patients participating in therapy sessions learned through metaphoric techniques like "person in a pit," "feeding the tiger," and "driving with a rearview mirror" to accept their inner experiences, including unpleasant thoughts, emotions, and bodily sensations related to the disease, the concept of quality of life is multidimensional. Its assessment is influenced by various factors. Moreover, changes in patients' quality of life may be long-term, requiring individual, social, economic, and cultural efforts. Therefore, the lack of significance in this hypothesis is logical given these conditions. Furthermore, evidence indicates that most diabetic individuals tend to perceive their disease as a threat rather than a challenge and, unfortunately, use ineffective adaptive strategies like denial and avoidance, leading to lower quality of life. Thus, the necessity of long-

term training in disease coping strategies for better control is always emphasized.

## 5. Limitations and Suggestions

One limitation of this study was the lack of follow-up due to the patients' transportation limitations to the clinic. It is suggested that future studies include follow-up stages, which might provide different interpretations of quality of life-related findings. Another limitation was the restriction to a sample of patients with type 2 diabetes, and it is recommended that future studies compare the general diabetic patient population. Moreover, since this study did not account for the expectation effect, it is suggested that future studies specifically consider this aspect.

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## Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

## Declaration of Interest

The authors of this article declared no conflict of interest.

## Ethics Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

## Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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## Authors' Contributions

All authors contributed equally.



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