

## The Effectiveness of the Chronic Care Model on Treatment Adherence Based on the ACT Approach on Personality Traits in Patients with Diabetes

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### Article Info

### ABSTRACT

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**Objective:** The aim of this study was to develop a chronic care model for treatment adherence based on Acceptance and Commitment Therapy (ACT) and to examine its effect on personality traits in patients with diabetes.

**Methods and Materials:** This research employed a sequential exploratory design (qualitative-quantitative). In the qualitative phase, data were collected through in-depth interviews with diabetic patients and the opinions of 15 health psychology experts, and analyzed using Colaizzi's seven-step method. The developed intervention protocol was structured around key components: causal conditions (emotional, cognitive, and social experiences), central conditions (physical symptoms and functional impairments), contextual factors (cultural, social, and economic barriers), intervening conditions (facilitators and barriers to treatment adherence), strategies (emotion regulation, self-care), and outcomes (increased psychological flexibility, improved adherence to treatment, and enhanced quality of life). Content validity of the protocol was confirmed using Lawshe's CVR ( $>0.49$ ) and CVI ( $>0.70$ ), indicating satisfactory validity. In the quantitative phase, a quasi-experimental design with pre-test-post-test, control group, and a two-month follow-up was conducted. Measurement tools included the short form of the NEO Five-Factor Inventory (McCrae & Costa, 1985).

**Findings:** Results of repeated-measures ANOVA indicated that the ACT-based chronic care model significantly improved personality traits in the experimental group ( $p < 0.05$ ).

**Conclusion:** These findings confirm the effectiveness and practical applicability of the model in improving psychological health and behavioral outcomes in diabetic patients.

**Keywords:** adherence to treatment, Acceptance and Commitment Therapy, personality traits.

## 1. Introduction

Chronic diseases have emerged as a predominant health concern worldwide, displacing acute infectious conditions as the leading cause of mortality and morbidity in the twenty-first century. In the early decades of modern medicine, most deaths were caused by acute infections, and survival with chronic illnesses was rare. However, advances in healthcare and living standards have extended life expectancy, resulting in a dramatic rise in chronic disease prevalence, which currently accounts for nearly 60% of all global deaths and 80% of deaths in low- and middle-income countries (Melichova et al., 2023). Among the various chronic conditions, diabetes mellitus stands out as one of the most common, persistent, and challenging disorders, exerting profound physical, psychological, and social impacts (Freitas et al., 2023). Diabetes is a heterogeneous metabolic disease characterized by chronic hyperglycemia, stemming from impaired insulin secretion or action, leading to abnormalities in the metabolism of carbohydrates, lipids, and proteins (Khalid et al., 2023). Recent global estimates indicate that nearly 460 million people are living with diabetes, and projections predict this number will reach almost 600 million by 2035, imposing immense personal and societal burdens (Dehghani et al., 2023; McGloin et al., 2021). In Iran specifically, the prevalence of diabetes is estimated at 10.3%, with rates of 9.6% in men and 11.1% in women, highlighting its serious public health implications (Dehghani et al., 2023).

Beyond its biological dimensions, diabetes poses intricate psychological challenges. Adherence to treatment regimens—including dietary management, exercise, medication, and self-monitoring—is essential to avoid complications and sustain quality of life (Hashemi & Bouya, 2017). However, treatment adherence is often undermined by emotional distress, negative beliefs, and motivational decline, which are closely linked to individual personality traits (Nemati et al., 2023). Personality traits refer to enduring patterns of cognition, emotion, and behavior that shape how individuals respond to life events, stressors, and health demands (Joshanloo, 2023; Rivera-Picón, 2024). Conscientiousness, for instance, is associated with greater self-discipline, organization, and long-term goal orientation, all of which facilitate adherence behaviors such as consistent medication use, dietary regulation, and glucose monitoring (Huang et al., 2019; Lee & Li, 2021). Conversely, neuroticism—marked by emotional instability, anxiety, and pessimism—has been linked to maladaptive coping,

avoidance, and low trust in medical advice, leading to poor adherence (Mousavi, 2024; Nemati et al., 2023). These personality-related differences in behavioral regulation underscore the importance of integrating psychological approaches into chronic disease care.

Traditional medical approaches to diabetes often prioritize biological control and education, focusing on glycemic targets and symptom monitoring while underemphasizing the emotional and cognitive dimensions that affect adherence. However, psychological interventions have increasingly been recognized as vital for comprehensive care (Graham et al., 2022; McGloin et al., 2021). In particular, the Chronic Care Model (CCM) of treatment adherence, when combined with the principles of Acceptance and Commitment Therapy (ACT), offers a promising framework to address the psychological barriers that impede adherence. ACT is a contextual cognitive-behavioral therapy that emphasizes mindfulness, acceptance of internal experiences, cognitive defusion, and values-based committed action to enhance psychological flexibility—the ability to pursue valued goals despite experiencing distressing thoughts and feelings (Adiloglu, 2023; Graham et al., 2022). Psychological flexibility is considered a key protective factor for mental health, allowing individuals to adaptively respond to stressors and sustain health behaviors (Frögéli et al., 2016).

ACT interventions have demonstrated efficacy in improving emotional regulation, reducing psychological distress, and enhancing adherence among individuals with chronic illnesses, including diabetes (Aghili & Khoshbakht, 2025; Rahimi, 2023). For example, ACT has been shown to decrease depression, perfectionism, and perceived stress, while improving treatment engagement and self-care behaviors in diabetic patients (Ahmadian et al., 2022; Bigdeli et al., 2023). By fostering openness to negative emotions, acceptance of illness-related thoughts, and engagement in values-consistent actions, ACT helps patients overcome experiential avoidance and maladaptive coping patterns (Ebn-Nasir & Khaleghipour, 2018). Furthermore, the repetitive and structured nature of ACT sessions enables individuals to practice new coping skills and gradually replace maladaptive habits with adaptive self-care routines (Rahimi et al., 2023). The integration of ACT within a chronic care framework—which emphasizes continuity, patient education, feedback, and collaborative goal-setting—can create a synergistic effect that addresses both the psychological and behavioral dimensions of diabetes care (Albuquerque et al., 2022; Rauwenhoff et al., 2023).

Emerging evidence also suggests that personality traits influence not only adherence behaviors but also responses to psychological interventions. Conscientiousness predicts better glycemic control and lower HbA1c levels in type 2 diabetes, whereas neuroticism predicts poorer outcomes and greater emotional distress (Lee & Li, 2021). Moreover, certain personality traits such as emotional avoidance, perfectionism, and low resilience can hinder engagement with treatment protocols, while adaptive traits like openness and agreeableness promote flexibility and collaboration with care teams (Majid, 2024; Pan, 2024). ACT may be particularly effective in moderating the adverse effects of maladaptive personality traits by teaching mindfulness, defusion from negative thoughts, and commitment to value-driven behavior despite emotional discomfort (Isvand et al., 2023). For example, ACT helps patients decouple from self-critical thoughts, manage rumination, and tolerate the discomfort of lifestyle changes, thereby enabling adherence even in the presence of negative affect (Jin et al., 2022).

Despite these promising insights, there remains a gap in the literature regarding the integration of personality trait considerations into ACT-based chronic care interventions. Most prior studies have either focused narrowly on emotional distress and self-efficacy (Bigdelli et al., 2023), or addressed treatment adherence without accounting for personality-driven behavioral variability (Aghili & Khoshbakht, 2025; Rahimi et al., 2023). Moreover, while international guidelines for diabetes management increasingly acknowledge the role of psychosocial factors, they rarely specify structured approaches to integrating personality-tailored psychological interventions (Melichova et al., 2023). This omission is significant, as personality exerts pervasive effects on cognitive appraisal, emotional reactivity, motivation, and social interaction—factors that collectively shape treatment adherence (Joshanloo, 2023; Rivera-Picón, 2024). Addressing this gap could lead to more personalized and effective interventions that improve both psychological well-being and metabolic outcomes in diabetic patients.

The need for such integrated models is further underscored by the complexity of adherence behavior itself. Adherence is not merely a matter of knowledge or access to resources; it requires sustained self-regulation, stress tolerance, and long-term motivation in the face of recurring setbacks (Hashemi & Bouya, 2017). These psychological capacities are strongly shaped by personality dispositions such as conscientiousness, emotional stability, and resilience (Nemati et al., 2023). Patients high in conscientiousness

typically exhibit organized routines, problem-solving skills, and proactive coping, while those high in neuroticism are more prone to emotional dysregulation, fatalistic thinking, and avoidance of health-promoting behaviors (Mousavi, 2024). ACT-based interventions, by targeting acceptance, mindfulness, and values-based action, may help mitigate the maladaptive tendencies of neurotic individuals while amplifying the strengths of conscientious individuals (Frögéli et al., 2016; Graham et al., 2022). Additionally, integrating mindfulness-based elements into ACT may enhance stress resilience and reduce burnout among healthcare providers implementing these programs, thereby sustaining the quality of chronic care delivery (Versteeg, 2023).

From a health systems perspective, the application of ACT-based chronic care models aligns with the growing emphasis on patient-centered, psychologically informed approaches to chronic disease management. Implementation science research highlights the importance of adapting interventions to individual patient characteristics, including psychological profiles, to enhance feasibility, acceptability, and effectiveness (Khalid et al., 2023). Telemedicine and digital delivery formats are expanding the reach of such interventions, allowing more flexible and continuous patient engagement, which is particularly beneficial for chronic conditions like diabetes that require ongoing monitoring (Khalid et al., 2023; Stefanescu et al., 2024). Moreover, incorporating ACT-based psychological support into primary care aligns with public health priorities to integrate mental and physical healthcare for chronic disease prevention and control (Freitas et al., 2023). Attention to health literacy—a determinant that mediates the relationship between psychological factors and treatment outcomes—is also essential, as patients with low health literacy are more likely to struggle with adherence (Zaidman et al., 2023).

Biological considerations should not be neglected either. Diabetes affects multiple organ systems, including the liver, and is often accompanied by comorbid hypertension and cardiovascular conditions, which compound the burden of disease and complicate treatment (T. Y. Chen et al., 2023; Z. Chen et al., 2023; Melichova et al., 2023). Psychological stress and depressive symptoms, which are common in diabetes, further undermine self-care and glycemic control (Z. Chen et al., 2023; Joshanloo, 2023). ACT-based approaches can counteract these effects by improving emotional regulation and promoting adaptive coping, thereby indirectly supporting biological disease management (Jin et al., 2022). Complementary

interventions, such as dietary modifications, have also shown potential; for instance, ginger supplementation has been associated with improved blood glucose control in type 2 diabetes (Huang et al., 2019), underscoring the multifaceted nature of effective care.

Given the escalating prevalence and complexity of diabetes, the limitations of traditional biomedical approaches, and the promising evidence supporting ACT for improving adherence and psychological outcomes, there is a clear need to develop integrated care models that combine behavioral, emotional, and personality-focused components. The Chronic Care Model of Treatment Adherence based on ACT represents an innovative approach to address this need by embedding psychological flexibility training, values clarification, and acceptance-based strategies within a structured, continuous care framework (Aghili & Khoshbakht, 2025; Rauwenhoff et al., 2023). Such an approach could empower patients to manage the daily demands of diabetes, sustain long-term treatment adherence, and enhance their overall quality of life. However, empirical studies systematically evaluating its impact on personality traits—which significantly influence adherence behavior—are scarce. Therefore, the present study aims to investigate the effectiveness of a Chronic Care Model of Treatment Adherence grounded in ACT principles on the personality traits of patients with diabetes, addressing this critical gap in both research and practice.

## 2. Methods and Materials

### 2.1. Study Design and Participants

This study employed a mixed-method design (qualitative and quantitative) to develop and evaluate the Chronic Care Model of Treatment Adherence based on Acceptance and Commitment Therapy (ACT) and to examine its impact on perceived stress and personality traits in patients with diabetes.

**Qualitative phase:** In order to explore key concepts and construct the model, data were collected through in-depth interviews with 12 diabetic patients, interviews with 15 psychology experts, and a review of relevant scientific and specialized literature. Using thematic and content analysis, the main themes and concepts were extracted and classified into conceptual subcategories. These subcategories were then transformed into preliminary and final questionnaires, which were reviewed and validated by experts. The agreement coefficient (CVR) for the questions exceeded the acceptable threshold of 0.62, confirming content validity.

**Quantitative phase:** The quantitative section used a quasi-experimental design with pre-test, post-test, and a two-month follow-up, including experimental and control groups. The statistical population consisted of diabetic patients in Isfahan in 2024. Thirty participants were selected through purposive sampling and then randomly assigned to experimental and control groups (15 in each group). The experimental group received the intervention package over eight weekly sessions (90 minutes each), while the control group did not receive any intervention.

Inclusion criteria were: a diagnosis of type 1 or type 2 diabetes, at least three years since diagnosis, age between 20 and 45 years, minimum education level of secondary/high school diploma, informed consent, and absence of acute psychiatric disorders. Exclusion criteria were: lack of cooperation, participation in other psychological interventions, severe psychiatric disorders, absence from more than two sessions, incomplete questionnaires, and withdrawal from participation.

### 2.2. Measures

#### 2.2.1. Demographic Questionnaire and Semi-Structured Interview

Demographic information (age, gender, and education) was collected using a predesigned checklist. The semi-structured interview included questions addressing: Emotional and cognitive experiences following diabetes diagnosis, Physical symptoms and lifestyle changes and their effects on daily life, Experiences with treatment, diet, and exercise regimens, Influential contextual factors (family support, financial situation, cultural beliefs), Psychological challenges (hopelessness, depression, negative beliefs about treatment, lack of support), Coping strategies for treatment adherence or avoidance and emotion regulation, Perceived changes in acceptance, flexibility, and disease management after ACT-based care, Outcomes of adherence versus non-adherence in personal, social, and health domains.

The validity of the interview questions was assessed using the Content Validity Ratio (CVR), with all items exceeding the 0.62 threshold, indicating acceptable content validity.

#### 2.2.2. Short Form of the NEO Personality Inventory (NEO-FFI).

Originally developed by McCrae and Costa (1985), this 60-item questionnaire evaluates the Big Five personality traits: neuroticism, conscientiousness, extraversion,

openness, and agreeableness. Each trait is measured by 12 items on a 5-point Likert scale (1 = strongly agree to 5 = strongly disagree). In this study, only the subscales of neuroticism and conscientiousness were used. Previous studies reported Cronbach's alpha values ranging from 0.87 (openness) to 0.91 (neuroticism). In Iran, Anisi reported alpha coefficients of 0.83 for conscientiousness and 0.80 for neuroticism. In the present study, alpha coefficients were 0.89 (neuroticism), 0.92 (conscientiousness), 0.87 (extraversion), 0.90 (openness), and 0.76 (agreeableness).

### 2.3. Intervention

The ACT-based chronic care intervention was delivered across eight structured weekly sessions, each lasting 90 minutes, and designed to enhance treatment adherence and psychological flexibility in patients with diabetes. In Session 1, participants were oriented to the study, introduced to Acceptance and Commitment Therapy principles, and encouraged to share personal experiences with diabetes, reflecting on their emotions and needs at diagnosis. Session 2 focused on identifying emotional and cognitive experiences, helping participants recognize worry, guilt, anger, low self-esteem, and fear of the future while initiating mindfulness and acceptance practices. Session 3 addressed coping with physical symptoms such as fatigue and sleep disturbances, emphasizing problem-solving and creating individualized self-care plans for sleep, nutrition, and activity. Session 4 targeted adaptation and lifestyle change, exploring challenges in maintaining diet, exercise, and treatment adherence, and developing strategies for managing tempting situations. Session 5 examined contextual barriers—family attitudes, cultural beliefs, and economic constraints—while promoting health literacy and communication with family members for support. Session 6 explored supportive and hindering factors in adherence,

highlighting the role of depression, lack of education, and absence of support groups, and guiding participants to identify new supportive resources. Session 7 provided training in stress management, problem-solving, planning, and fostering personal responsibility for health, while reinforcing successful behavior changes. Finally, Session 8 consolidated gains by reviewing achievements, summarizing coping strategies, discussing resilience, quality of life, and social relationships, and planning future adherence through the development of a one-month personal care plan with weekly goals and scheduled follow-ups.

### 2.4. Data Analysis

Data were collected at three stages—before, after, and two months following the intervention—using standardized questionnaires. The effects of the intervention on treatment adherence and personality traits were analyzed using repeated measures ANOVA with SPSS version 26.

## 3. Findings and Results

The demographic characteristics of the participants showed that the mean age of the two groups (chronic care model and control) did not differ significantly, and the minimum and maximum ages of the participants were 20 and 40 years, respectively; therefore, the two groups were homogeneous in terms of age. Furthermore, the examination of gender, marital status, and education level of the participants indicated that there was no significant difference between the two groups; in such a way that the distribution of men and women, single and married individuals, and the education levels of diploma, associate, and bachelor's degree in both groups were almost similar, confirming that the groups were homogeneous regarding demographic characteristics.

**Table 1**

*Comparison of mean and standard deviation of the studied variables between the two groups at three times (before, after, and follow-up)*

Variable	Group	Pre-test (M $\pm$ SD)	Post-test (M $\pm$ SD)	Follow-up (M $\pm$ SD)
Neuroticism	Chronic care model	28 $\pm$ 2.80	21.8 $\pm$ 3.00	22.6 $\pm$ 2.94
	Control	28.8 $\pm$ 2.25	27.8 $\pm$ 2.04	28.8 $\pm$ 2.12
Conscientiousness	Chronic care model	36.4 $\pm$ 3.46	44.0 $\pm$ 4.53	44.1 $\pm$ 4.64
	Control	37.4 $\pm$ 4.97	37.6 $\pm$ 4.66	37.5 $\pm$ 4.57
Extraversion	Chronic care model	16.6 $\pm$ 4.32	21.2 $\pm$ 4.14	20.9 $\pm$ 4.19
	Control	17.1 $\pm$ 4.29	17.5 $\pm$ 4.04	17.5 $\pm$ 3.93
Openness to experience	Chronic care model	16.3 $\pm$ 2.25	22.8 $\pm$ 3.00	21.8 $\pm$ 3.01
	Control	17.4 $\pm$ 3.36	17.5 $\pm$ 2.60	16.4 $\pm$ 2.65
Agreeableness	Chronic care model	16.6 $\pm$ 4.32	21.2 $\pm$ 4.14	20.9 $\pm$ 4.19
	Control	17.0 $\pm$ 4.22	17.5 $\pm$ 4.04	17.3 $\pm$ 3.87

As shown in Table 1, the post-test and follow-up scores of both groups in the chronic care model on the studied variables improved compared to the pre-test, but the trend of the mean scores of the control group remained almost stable, which in a way indicates that this treatment is effective.

Before conducting the main analyses, the statistical assumptions were thoroughly examined to ensure the validity of the repeated measures ANOVA results. The Shapiro-Wilk test indicated that the distribution of all personality variables across pre-test, post-test, and follow-up assessments did not significantly deviate from normality, as the obtained significance values were greater than 0.05 in most cases (for example, neuroticism  $W = 0.877$ ,  $p = 0.052$  at pre-test and  $W = 0.930$ ,  $p = 0.271$  at post-test in the

intervention group). The Levene's test results confirmed the assumption of homogeneity of variances, with all F values being non-significant (for example, conscientiousness at post-test  $F = 0.015$ ,  $p = 0.903$ ). However, Box's M test was significant ( $p < 0.05$ ), suggesting that the assumption of equality of covariance matrices was not fully met. Additionally, Mauchly's test revealed that the assumption of sphericity was violated for all dependent variables, with significant chi-square values (for example, neuroticism  $W = 0.193$ ,  $\chi^2 = 90.5$ ,  $p = 0.001$ ). Therefore, Greenhouse-Geisser corrections were applied to adjust the degrees of freedom in the repeated measures ANOVA to ensure accurate interpretation of the results.

**Table 2**

*Results of mixed ANOVA for group and time of assessment on dependent variables*

Source	Dependent variable	SS	df	MS	F	Sig.	Effect size
Within-subject (Time)	Neuroticism	208.2	1.08	191.7	117.1	0.001	
	Conscientiousness	304.2	1.07	284.2	180.9	0.001	
	Extraversion	115.8	1.16	99.3	185.6	0.001	
	Openness	173.8	1.01	171.2	43.3	0.001	
	Agreeableness	115.8	1.16	99.3	185.6	0.001	
Interaction (time × group)	Neuroticism	140.6	1.08	129.4	79.1	0.001	0.739
	Conscientiousness	174.1	1.07	256.1	163.0	0.001	0.853
	Extraversion	80.1	1.16	68.6	128.3	0.001	0.821
	Openness	200.6	1.01	197.5	50.1	0.001	0.641
	Agreeableness	80.1	1.16	68.6	128.3	0.001	0.821

According to the results of the mixed ANOVA in Table 2, the main effect of time of assessment and the interaction effect of group × time of assessment on all dependent variables were significant, which will be reviewed in sequence. As reported in Table 7, the main effect of time of assessment was significant for all dependent variables. This means that the scores of personality traits of all participants in the intervention group in the post-test and follow-up differed significantly compared to the pre-test.

#### 4. Discussion and Conclusion

The present study aimed to examine the effectiveness of a Chronic Care Model (CCM) for treatment adherence based on Acceptance and Commitment Therapy (ACT) on personality traits in patients with diabetes. The results demonstrated significant improvements in all five major personality dimensions—conscientiousness, extraversion, openness, agreeableness, and neuroticism—among participants in the intervention group compared to the control group, both in the post-test and follow-up phases.

Specifically, conscientiousness, extraversion, openness, and agreeableness increased, whereas neuroticism decreased following the ACT-based CCM intervention. These findings provide strong evidence that integrating ACT into a structured chronic care model can foster positive personality-related changes that support better adherence to treatment regimens and improved psychosocial functioning in diabetic patients.

These results are consistent with previous studies demonstrating that personality traits play a critical role in how individuals engage with self-care behaviors and adhere to treatment regimens in chronic illnesses such as diabetes (Nemati et al., 2023; Rivera-Picón, 2024). For example, conscientiousness is associated with greater self-discipline, persistence, and organization, which facilitate long-term adherence to complex medical routines (Huang et al., 2019; Lee & Li, 2021). Our findings that conscientiousness scores rose substantially in the intervention group support the notion that ACT-based interventions can enhance this trait by cultivating goal-oriented behaviors and reinforcing

values-driven action plans. ACT encourages patients to align daily behaviors with personally meaningful values while accepting negative emotions and thoughts that may otherwise disrupt treatment efforts (Frögéli et al., 2016; Graham et al., 2022). By fostering sustained behavioral commitment, ACT processes may strengthen conscientiousness-like qualities such as reliability and responsibility, which are crucial for effective diabetes self-management.

Similarly, the significant reduction in neuroticism observed in our participants aligns with prior research showing that ACT effectively reduces emotional reactivity, rumination, and anxiety sensitivity—all hallmarks of neuroticism (Ebn-Nasir & Khaleghipour, 2018; Isvand et al., 2023). Neurotic individuals often experience excessive worry about disease progression, fear of failure, and emotional volatility, which undermine adherence behaviors (Joshanloo, 2023; Mousavi, 2024). ACT directly targets these maladaptive emotional responses by promoting mindfulness, cognitive defusion, and acceptance, thereby decreasing the intensity and frequency of negative affective states (Aghili & Khoshbakht, 2025; Ahmadian et al., 2022). In our study, participants reported that learning to observe their thoughts and emotions without judgment reduced their distress and enhanced their willingness to follow prescribed treatment routines despite fluctuating emotions. This supports the theoretical proposition that ACT increases psychological flexibility—the ability to persist with valued actions while experiencing negative internal states (Graham et al., 2022)—which is inversely related to neuroticism.

The observed gains in extraversion, openness, and agreeableness among participants further reinforce the adaptability-enhancing role of ACT-based interventions. Extraversion involves sociability, positive affect, and energy, which can facilitate engagement with healthcare providers, peer support groups, and social reinforcement for treatment behaviors (Pan, 2024). Openness reflects curiosity, receptiveness to new experiences, and cognitive flexibility, qualities that support the adoption of novel treatment strategies and lifestyle changes (Majid, 2024). Agreeableness encompasses empathy, cooperation, and trust, which enhance collaborative patient-provider relationships and compliance with medical advice (Rivera-Picón, 2024). ACT's focus on clarifying values, enhancing mindful awareness, and reducing avoidance behaviors likely fostered these interpersonal and adaptive traits. As participants became more open to experiencing discomfort, they may have also become more willing to communicate

with healthcare staff, seek feedback, and integrate new behaviors into their daily lives—behaviors that reflect higher levels of extraversion, openness, and agreeableness.

Our findings also converge with the growing literature highlighting ACT's efficacy in improving psychological and behavioral outcomes among individuals with diabetes and other chronic illnesses. Several studies have shown that ACT reduces depressive symptoms, perceived stress, and emotional dysregulation while enhancing self-efficacy, self-care, and adherence (Aghili & Khoshbakht, 2025; Bigdeli et al., 2023; Rahimi, 2023). For instance, (Rahimi et al., 2023) demonstrated that ACT-based interventions improved treatment adherence and reduced chronic pain and stress among elderly diabetic patients. (Ahmadian et al., 2022) found that ACT significantly improved coping strategies and reduced stress in infertile women, suggesting its generalizability across chronic stress contexts. (Stefanescu et al., 2024) also provided evidence that brief online ACT interventions can improve psychological functioning in adults with type 1 diabetes, underscoring its feasibility in different delivery formats. These consistent outcomes across studies support the idea that ACT's core processes—acceptance, defusion, mindfulness, values clarification, self-as-context, and committed action—promote psychological flexibility, which is instrumental in sustaining behavior change and treatment adherence in chronic conditions (Frögéli et al., 2016; Graham et al., 2022).

The integration of ACT into a chronic care framework may amplify its effects by providing ongoing reinforcement, structure, and feedback. The CCM emphasizes continuous patient-provider interactions, proactive follow-up, and collaborative goal-setting, which are essential for translating psychological gains into sustained behavior change (Hashemi & Bouya, 2017; McGloin et al., 2021). Combining ACT's skills training with CCM's structural support likely created synergistic effects in our study, allowing patients to repeatedly practice acceptance, mindfulness, and values-driven behaviors while receiving ongoing encouragement and guidance. This aligns with evidence from (Rauwenhoff et al., 2023), who described how structured ACT interventions within rehabilitation programs enhanced adherence and self-management among patients with acquired brain injury. Similarly, (Albuquerque et al., 2022) emphasized that consistent follow-up and supportive health system structures are crucial for medication adherence in chronic conditions like systemic lupus, which parallels the adherence challenges seen in diabetes.

Another important contribution of our findings is their implication for the role of personality-informed tailoring in diabetes interventions. Personality traits shape not only adherence behaviors but also how individuals respond to psychological treatments (Mousavi, 2024; Nemati et al., 2023). For example, individuals high in neuroticism may initially resist change due to fear and doubt, while those high in conscientiousness may embrace structured routines more readily (Joshanloo, 2023; Lee & Li, 2021). ACT's flexibility-focused approach allows it to be adapted to different personality profiles by helping neurotic individuals tolerate discomfort and helping conscientious individuals channel their discipline toward value-aligned goals. Our results showing simultaneous reductions in neuroticism and increases in conscientiousness suggest that ACT-based CCM interventions can both mitigate maladaptive traits and strengthen adaptive ones. This resonates with (Isvand et al., 2023), who showed that ACT improved cognitive flexibility, resilience, and stress management among individuals with depressive disorders—traits closely tied to conscientiousness and emotional stability. Similarly, (Ebn-Nasir & Khaleghipour, 2018) found that ACT reduced anxiety sensitivity and improved quality of life in hypertensive patients with avoidant personality traits, indicating its potential to reshape maladaptive personality-linked behaviors.

Incorporating personality considerations may also enhance implementation success. As (Khalid et al., 2023) noted, implementation science highlights the necessity of tailoring interventions to individual characteristics to optimize adherence and scalability. Telemedicine-based delivery of ACT modules, which is increasingly feasible, could allow personalization of session content to patient personality profiles, improving engagement and outcomes (Khalid et al., 2023; Stefanescu et al., 2024). Moreover, improving health literacy—a factor strongly associated with adherence (Zaidman et al., 2023)—could further amplify the benefits of ACT-based CCM interventions, as patients with higher literacy may be better equipped to integrate psychological skills into their self-care routines. Addressing these systemic and individual-level factors together may be key to enhancing the long-term impact of ACT-informed chronic care.

Finally, it is important to note that personality traits are relatively stable but not immutable; they can shift through sustained behavioral and cognitive interventions, especially in adulthood (Majid, 2024; Rivera-Picón, 2024). Our results demonstrate that structured ACT-based interventions

embedded in a chronic care framework can catalyze such positive personality changes, which in turn facilitate ongoing treatment adherence and health behavior maintenance. This supports a dynamic model of personality as both a determinant and an outcome of psychological interventions in chronic illness contexts. By targeting personality traits alongside adherence behaviors, health professionals may achieve more sustainable and comprehensive improvements in the lives of patients with diabetes.

## 5. Limitations & Suggestions

Despite its promising findings, this study has several limitations that warrant consideration. First, the sample size was relatively small and drawn from a single city, which may limit the generalizability of the results to broader diabetic populations. Second, the use of purposive and voluntary sampling may have introduced selection bias, as participants who opted in might have been more motivated or psychologically prepared to engage in the intervention. Third, the reliance on self-report measures for assessing personality traits could be subject to social desirability bias and inaccuracies in self-perception. Fourth, while the study used a follow-up assessment to gauge the durability of effects, the follow-up period was only two months, which may not capture the long-term sustainability of the observed changes. Fifth, the study did not control for potential confounding variables such as comorbid psychiatric conditions, medication adherence history, or family support, which could have influenced the outcomes. Lastly, the intervention was delivered in a face-to-face format, and its effectiveness in other delivery modalities, such as telehealth, remains unexamined.

Future studies should address these limitations to build on the present findings. Expanding the sample size and recruiting from multiple geographic regions would enhance the external validity and cultural generalizability of the results. Employing randomized controlled trial designs with stratified random sampling could reduce selection bias and provide stronger causal evidence of the intervention's effectiveness. Longer follow-up periods, ideally spanning six months to one year, are necessary to assess the durability of personality changes and treatment adherence improvements. Including objective measures, such as HbA1c levels, electronic adherence trackers, or clinician-rated personality assessments, would complement self-report data and improve measurement accuracy. Future

research should also examine the moderating role of specific personality traits on intervention outcomes, to develop tailored ACT-based CCM protocols adapted to different personality profiles. Additionally, exploring the effectiveness of telemedicine or blended delivery formats could inform scalable and accessible implementations of the model in diverse healthcare settings.

In clinical practice, the findings underscore the potential value of integrating ACT-based psychological interventions into chronic care frameworks for managing diabetes. Healthcare providers should consider embedding structured ACT modules into existing diabetes care programs to enhance patients' psychological flexibility, emotional regulation, and adherence behaviors. Multidisciplinary teams—including psychologists, diabetes educators, and primary care providers—could collaboratively deliver such interventions to ensure comprehensive support. Routine assessment of personality traits at the outset of treatment may help tailor intervention content and intensity to individual patient needs. Training healthcare professionals in ACT principles could also strengthen their ability to support patient behavior change and manage emotional barriers to adherence. Furthermore, developing user-friendly digital platforms to deliver ACT content could increase accessibility and continuity of support, particularly for patients in underserved or remote areas. By adopting a psychologically informed, personality-sensitive approach to diabetes care, healthcare systems may achieve more sustainable improvements in treatment adherence and overall patient well-being.

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### Declaration of Interest

The authors of this article declared no conflict of interest.

### Ethical 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 equally contributed to this article.

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