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Comparison of the Effectiveness of Acceptance and Commitment-Based Group Therapy and Quality of Life Therapy on Cognitive Fusion, Quality of Life, and Anxiety in Students with Diabetes

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A B S T R A C T

Purpose: The present study aimed to compare the effectiveness of acceptance and commitment-based group therapy and quality of life therapy on cognitive fusion, quality of life, and anxiety among students with diabetes.

Methods and Materials: This study employed a semi-experimental design with pre-test, post-test, and follow-up phases along with a control group. The statistical population consisted of all students with diabetes in Zahedan. Using convenience sampling, 45 participants who obtained scores above the average on measures of cognitive fusion, anxiety, and impaired quality of life were selected and randomly assigned into two experimental groups and one control group (15 participants in each group). The first experimental group received acceptance and commitment-based group therapy, while the second experimental group participated in quality of life therapy sessions. Both interventions were implemented in eight weekly two-hour sessions. Data collection instruments included the Cognitive Fusion Questionnaire developed by Gillanders and colleagues, the Revised Children's Manifest Anxiety Scale developed by Reynolds and Richmond, and the Diabetes Quality of Life Questionnaire for Adolescents. Data were analyzed using multivariate analysis of covariance through SPSS-22 software.

Findings: The findings demonstrated that both acceptance and commitment-based therapy and quality of life therapy significantly improved cognitive fusion, quality of life, and anxiety compared with the control group in the post-test and follow-up stages ($P<0.05$). The multivariate covariance analysis indicated significant differences among the groups on the combined dependent variables in both post-test and follow-up phases. Furthermore, pairwise comparisons showed that acceptance and commitment-based therapy was significantly more effective than quality of life therapy in reducing cognitive fusion and increasing defusion, whereas quality of life therapy produced greater improvement in quality of life scores. No statistically significant difference was observed between the two interventions regarding anxiety reduction. The therapeutic gains remained stable during the follow-up phase, indicating the durability of treatment effects over time.

Conclusion: The results suggest that both acceptance and commitment-based group therapy and quality of life therapy are effective psychological interventions for

improving cognitive fusion, quality of life, and anxiety in students with diabetes. Acceptance and commitment therapy appears to be particularly effective in modifying maladaptive cognitive fusion processes, while quality of life therapy demonstrates greater efficacy in enhancing perceived life satisfaction and well-being. Therefore, integrating these therapeutic approaches into psychological and educational support services for adolescents with diabetes may contribute substantially to their psychological adjustment and overall quality of life.
Keywords: *Acceptance and commitment therapy, quality of life therapy, cognitive fusion, anxiety, quality of life, diabetes, students.*

1. Introduction

Diabetes mellitus is one of the most prevalent chronic metabolic disorders among children and adolescents and is increasingly recognized as a major public health challenge due to its long-term physical, psychological, and social consequences. Adolescents with diabetes are frequently exposed to complex emotional experiences related to disease management, dietary restrictions, insulin dependence, fear of complications, and concerns regarding social acceptance and academic functioning. These stressors often contribute to heightened levels of anxiety, emotional dysregulation, impaired psychological functioning, and diminished quality of life. In recent years, researchers have increasingly emphasized that the burden of diabetes extends beyond physiological symptoms and includes significant psychological and behavioral dimensions that directly influence treatment adherence, disease management, and overall well-being. Consequently, modern approaches to diabetes care increasingly highlight the integration of psychological interventions with medical treatment in order to improve adaptive functioning and long-term mental health outcomes (Geda et al., 2021; Harris & Samuel, 2020; Parmar et al., 2021; Prokopowicz et al., 2021). Adolescence itself represents a vulnerable developmental period characterized by emotional instability, identity formation, interpersonal sensitivity, and heightened susceptibility to stress and anxiety. When chronic illness is superimposed on these developmental challenges, adolescents may experience substantial psychological distress and difficulties in coping effectively with everyday demands. Several investigations have demonstrated that chronic health conditions in adolescence are associated with increased emotional disorders, anxiety symptoms, experiential avoidance, and lower psychological resilience (Mahony et al., 2022; Ning et al., 2024; Pires et al., 2023; Türk, 2024). Therefore, understanding the psychological mechanisms underlying emotional distress in adolescents with diabetes and identifying effective intervention strategies are of considerable importance for both clinical practice and preventive mental health care.

One of the central psychological constructs receiving growing attention in contemporary clinical psychology is psychological flexibility, which refers to the ability to remain in contact with present-moment experiences while engaging in behaviors aligned with personal values despite unpleasant thoughts or emotions. Psychological flexibility is regarded as a core indicator of adaptive psychological functioning and mental health, whereas psychological inflexibility is associated with experiential avoidance, cognitive rigidity, maladaptive coping, and emotional disorders (Cervantes-Perea et al., 2025; Chełkowska-Zacharewicz & Baran, 2023; Lee et al., 2021). Cognitive fusion, one of the major processes underlying psychological inflexibility, occurs when individuals become overly entangled with their thoughts and interpret internal experiences as literal truths rather than transient psychological events. Individuals experiencing cognitive fusion often respond rigidly to distressing thoughts and emotions, leading to maladaptive behavioral patterns, increased anxiety, and impaired quality of life (Aydın & Güneri, 2021; Fang et al., 2022; Lee et al., 2025). Research has shown that cognitive fusion is strongly associated with depression, anxiety disorders, body image disturbances, emotional dysregulation, and diminished psychological well-being across adolescent and adult populations (Figueiredo et al., 2023; Lee et al., 2025; Padır et al., 2024). In adolescents with chronic illnesses such as diabetes, cognitive fusion may intensify disease-related fears and contribute to catastrophic interpretations of bodily sensations, treatment experiences, and social interactions. As a result, psychological interventions targeting cognitive fusion and enhancing psychological flexibility may play an important role in reducing distress and improving adaptation among diabetic adolescents.

Acceptance and Commitment Therapy (ACT) has emerged as one of the most influential third-wave behavioral therapies designed to enhance psychological flexibility and reduce maladaptive experiential avoidance. ACT emphasizes acceptance of unpleasant internal experiences, mindfulness, cognitive defusion, self-as-context, values clarification, and committed action as mechanisms for

Iranian Journal of Educational Sociology
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promoting adaptive functioning and emotional well-being (Davis, 2026; Lee et al., 2021). Unlike traditional cognitive-behavioral approaches that primarily focus on modifying the content of thoughts, ACT seeks to transform the individual's relationship with thoughts and emotions by encouraging openness, awareness, and value-based action. Through this process, individuals learn to observe distressing cognitions without becoming dominated by them, thereby weakening cognitive fusion and increasing psychological flexibility (Krafft et al., 2020; Levin et al., 2020). Recent empirical evidence has consistently demonstrated the effectiveness of ACT across a wide range of psychological disorders and vulnerable populations. Studies have reported significant benefits of ACT in reducing depression, anxiety, social anxiety symptoms, emotional dysregulation, and maladaptive behaviors among adolescents and university students (Alves et al., 2022; Davis, 2026; Farley & Twohig, 2023; Smith et al., 2020). Additionally, ACT has shown promising outcomes in populations with chronic health conditions and medically related psychological distress. For example, ACT interventions have been found effective in improving psychological flexibility and emotional regulation among patients with spinal cord injuries, reducing fear of disease progression among breast cancer patients, and decreasing emotional symptoms in individuals with irritable bowel syndrome (Alimolk et al., 2024; Khanjani et al., 2021; Shahkaram et al., 2024). Such findings suggest that ACT may represent a particularly valuable therapeutic approach for adolescents with diabetes who struggle with chronic stress, anxiety, and cognitive fusion.

In addition to ACT, quality of life-oriented interventions have gained considerable importance in positive psychology and mental health promotion. Contemporary approaches to psychological treatment increasingly emphasize not only symptom reduction but also enhancement of subjective well-being, life satisfaction, psychological flourishing, and adaptive functioning. Quality of life therapy focuses on improving satisfaction across multiple domains of life, including interpersonal relationships, self-esteem, academic functioning, emotional well-being, and physical health. These interventions integrate cognitive-behavioral techniques with positive psychology principles in order to foster optimism, emotional balance, self-care, and resilience (Mahony et al., 2022; Prokopowicz et al., 2021; Viator et al., 2024). Adolescents with chronic illnesses often experience significant disruptions in daily functioning and social participation, which negatively influence their quality of life and emotional adjustment. Therefore, interventions specifically targeting life satisfaction and adaptive functioning may help these individuals develop more positive coping mechanisms and healthier perceptions of themselves and their future. Research has shown that improvements in psychological flexibility are strongly associated with enhanced well-being and quality of life across various populations (Chełkowska-Zacharewicz & Baran, 2023; Padır et al., 2024; Türk, 2024). Furthermore, studies examining ACT-based interventions among students and adolescents have reported reductions in academic anxiety, emotional distress, procrastination, and psychological inflexibility alongside improvements in psychological functioning and life satisfaction (Kohli et al., 2025; Mahony et al., 2022; Pang et al., 2022). These findings highlight the close relationship between psychological flexibility, emotional regulation, and perceived quality of life.

Another important consideration is the growing evidence supporting the transdiagnostic role of psychological inflexibility and cognitive fusion across multiple forms of psychopathology. Recent investigations have demonstrated that cognitive fusion, experiential avoidance, and psychological inflexibility are not disorder-specific constructs but rather broad underlying mechanisms contributing to depression, anxiety disorders, obsessive-compulsive symptoms, emotional dysregulation, and maladaptive coping patterns (Fang et al., 2023; Krafft & Ong, 2024; Lee et al., 2025). This transdiagnostic perspective is particularly valuable in adolescent populations because emotional difficulties often co-occur and interact dynamically during developmental transitions. ACT-based interventions may therefore provide broad-spectrum psychological benefits by targeting core mechanisms underlying multiple emotional and behavioral difficulties simultaneously. Several randomized clinical trials and systematic reviews have confirmed the effectiveness of ACT interventions for anxiety disorders, emotional difficulties, body dysmorphic symptoms, academic stress, and behavioral problems among adolescents and young adults (Krafft et al., 2020; Moshkabadi et al., 2024; Nissling et al., 2023; Torkian et al., 2022). Additionally, internet-based and teletherapy ACT programs have demonstrated significant effectiveness in reducing anxiety and depressive symptoms, increasing treatment accessibility, and improving emotional functioning in youth populations (Jia et al., 2024; Nissling et al., 2023; Roberts et al., 2024). Such evidence underscores the adaptability and clinical utility of ACT-based

Iranian Journal of Educational Sociology
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interventions for contemporary adolescent mental health challenges.

Despite the growing body of evidence regarding ACT and psychological flexibility, relatively limited research has specifically examined the comparative effectiveness of ACT-based interventions and quality of life therapy on cognitive fusion, quality of life, and anxiety among adolescents with diabetes. Existing studies have primarily focused on adults, university students, or specific psychiatric populations, while adolescents coping with chronic medical conditions remain comparatively underrepresented in the literature (Alimolk et al., 2024; Geda et al., 2021; Parmar et al., 2021). Moreover, although previous investigations have independently demonstrated the beneficial effects of ACT and quality of life-oriented approaches on emotional functioning and psychological well-being, few studies have directly compared these interventions in terms of their impact on cognitive fusion and anxiety among diabetic students. Given the psychological vulnerability associated with chronic illness during adolescence and the potential role of cognitive fusion in maintaining emotional distress, comparative examination of these interventions may contribute important insights regarding the most effective therapeutic strategies for this population. Therefore, the present study aimed to compare the effectiveness of acceptance and commitment-based group therapy and quality of life therapy on cognitive fusion, quality of life, and anxiety among students with diabetes.

2. Methods and Materials

2.1. Study Design and Participants

The present study employed a semi-experimental design with pre-test, post-test, and one-month follow-up assessments alongside a control group. The target population consisted of all students diagnosed with diabetes mellitus in Zahedan during the study period. Participants were recruited using convenience sampling from diabetes treatment and counseling centers. Following the initial screening process, students who obtained scores above the average on measures of cognitive fusion, anxiety, and impaired quality of life were considered eligible for participation in the study. A total of 45 participants meeting the inclusion criteria were selected and randomly assigned into three equal groups, including an acceptance and commitment therapy (ACT) group, a quality of life therapy (QOLT) group, and a control group, with 15 participants in each group. Prior to implementation of the interventions, all participants completed the research questionnaires as the pre-test assessment. The two experimental groups subsequently received their respective interventions across eight weekly sessions, each lasting approximately two hours, whereas the control group received no psychological intervention during the study period. Upon completion of the intervention sessions, all participants completed the post-test measures, and one month later the follow-up assessment was administered in order to evaluate the stability and persistence of treatment effects over time.

2.2. Data Collection Tools

The Cognitive Fusion Questionnaire (CFQ) developed by David Gillanders and colleagues was used to assess the level of cognitive fusion among participants. This self-report instrument consists of 12 items designed to evaluate the extent to which individuals become entangled with their thoughts and interpret cognitive experiences as literal truths. The questionnaire includes two dimensions, namely cognitive fusion and cognitive defusion, and items are scored on a six-point Likert scale ranging from “never true” to “always true.” Higher scores indicate greater levels of maladaptive cognitive fusion. The psychometric properties of the instrument have been supported in previous studies, and the Persian version standardized by Zare demonstrated satisfactory validity and reliability among Iranian university students. The Cronbach’s alpha coefficient reported for the questionnaire was 0.76, indicating acceptable internal consistency.

Quality of life was measured using the Diabetes Quality of Life Questionnaire for Adolescents developed by Ingersoll and Marrero. This instrument was specifically designed to evaluate quality of life in adolescents with type 1 diabetes and consists of 52 items assessing multiple dimensions of functioning and well-being. The questionnaire examines domains including satisfaction with life, treatment effects, the impact of diabetes on daily activities, disease-related worries, and parental control. Most items are scored on a five-point Likert scale ranging from “never” to “always,” while one general item assessing overall quality of life is rated on a four-point scale from “very poor” to “excellent.” Scores in each domain are converted to a 0–100 scale, with lower scores reflecting a more favorable quality of life. Previous validation studies have reported strong psychometric characteristics for the instrument. Novato and colleagues reported a Cronbach’s alpha coefficient of 0.93 in a Brazilian sample, and the

Iranian Journal of Educational Sociology
E-ISSN: 2645-3460

Persian version has also demonstrated acceptable validity and reliability in Iranian populations.

Anxiety symptoms were assessed using the Revised Children's Manifest Anxiety Scale (RCMAS) developed by Cecil Reynolds and Richmond. This self-report questionnaire contains 37 items, of which 28 items measure anxiety symptoms and nine items function as lie-detection or validity items. The scale evaluates several dimensions of anxiety, including physiological anxiety, worry and oversensitivity, and social concerns and concentration difficulties. Participants respond to items using dichotomous choices scored as either zero or one, with higher total scores indicating greater levels of anxiety. Previous studies have confirmed the psychometric adequacy of the instrument across clinical and non-clinical samples. In Iranian populations, Taghavi and Alishahi reported acceptable retest reliability coefficients, while Singh and colleagues demonstrated satisfactory validity and reliability coefficients ranging from 0.81 to 0.87. Additionally, Cronbach's alpha coefficients reported in previous research ranged from 0.88 to 0.89, indicating strong internal consistency.

2.3. Interventions

The acceptance and commitment therapy intervention was implemented according to the protocol proposed by Steven C. Hayes and colleagues. The intervention consisted of eight weekly group sessions, each lasting approximately two hours. The initial session focused on establishing therapeutic rapport, introducing participants to the treatment structure, and providing psychoeducation regarding psychological flexibility and experiential avoidance. During subsequent sessions, participants explored their personal experiences and learned to recognize ineffective control strategies and maladaptive behavioral patterns. Cognitive defusion techniques were introduced to help participants separate themselves from distressing thoughts and emotions rather than becoming overly attached to them. Additional sessions emphasized mindfulness practices, present-moment awareness, self-as-context, and acceptance of unpleasant internal experiences without judgment. The final sessions concentrated on identifying personal values, clarifying meaningful life directions, and developing committed actions aligned with these values. Throughout the intervention, experiential exercises, metaphors, mindfulness activities, and group discussions were employed to enhance psychological flexibility and reduce cognitive fusion and emotional distress.

The quality of life therapy intervention was conducted based on the integrative positive psychology and cognitive-behavioral framework developed by Michael Frisch. Similar to the ACT program, the intervention consisted of eight weekly two-hour group sessions. Early sessions focused on introducing participants to the concept of quality of life, life satisfaction, happiness, and emotional well-being, while also encouraging self-reflection regarding different domains of functioning. Participants were introduced to the CASIO model, which includes circumstances, attitudes, standards, importance, and overall satisfaction as the primary dimensions influencing quality of life. Through cognitive restructuring and positive psychology techniques, participants learned to identify maladaptive beliefs and replace them with more adaptive perspectives. Subsequent sessions emphasized strategies for increasing happiness, improving interpersonal relationships, promoting healthy coping mechanisms, and enhancing satisfaction across various life domains. Participants also engaged in discussions regarding self-care, optimism, emotional regulation, and balancing personal expectations with realistic life conditions. The final sessions focused on integrating learned principles into daily life situations and reinforcing adaptive cognitive and behavioral patterns aimed at sustaining long-term psychological well-being and improved quality of life.

2.4. Data Analysis

Data analysis was conducted using SPSS version 22. Descriptive statistics, including means and standard deviations, were first calculated for all research variables across the pre-test, post-test, and follow-up stages. To evaluate the effectiveness of the interventions, multivariate analysis of covariance (MANCOVA) was employed while controlling for pre-test scores. Prior to conducting the inferential analyses, the assumptions underlying multivariate covariance analysis were examined. Normality of data distribution was assessed using the Shapiro–Wilk test, homogeneity of variances was evaluated through Levene's test, and homogeneity of regression slopes was examined to ensure equality of regression coefficients across groups. Following confirmation of these assumptions, multivariate covariance analysis was performed to determine overall group differences on the dependent variables. Subsequently, univariate covariance analyses and Bonferroni post hoc comparisons were conducted to identify the specific differences between the acceptance and

Iranian Journal of Educational Sociology
E-ISSN: 2645-3460

commitment therapy group, the quality of life therapy group, and the control group at post-test and follow-up stages. Statistical significance was considered at the 0.05 level.

3. Findings and Results

Table 1 presents the descriptive statistics, including means and standard deviations, for cognitive fusion, cognitive defusion, quality of life, and anxiety across the pre-test, post-test, and follow-up stages in the acceptance and commitment therapy group, the quality of life therapy group, and the control group.

Table 1

Descriptive Statistics of Cognitive Fusion, Cognitive Defusion, Quality of Life, and Anxiety Across Groups and Measurement Stages

Variables	Stage	Acceptance and Commitment Group Mean	SD	Quality of Life Group Mean	SD	Control Group Mean	SD
Cognitive Fusion	Pre-test	26.46	8.01	27.53	5.12	25.33	6.46
	Post-test	16.06	5.12	23.06	6.06	24.80	7.67
	Follow-up	16.20	6.46	23.26	6.97	24.46	7.52
Cognitive Defusion	Pre-test	8.26	3.05	7.93	2.12	9.13	2.35
	Post-test	13.66	3.30	9.33	2.63	9.14	2.19
	Follow-up	13.80	2.98	9.26	3.41	8.86	2.79
Quality of Life	Pre-test	110.73	12.95	115.28	16.17	111.26	14.96
	Post-test	85.20	14.83	76.40	15.51	111.40	14.19
	Follow-up	84.60	15.37	74.06	15.98	110.26	15.05
Anxiety	Pre-test	21.26	2.96	21.40	2.16	20.33	1.91
	Post-test	10.93	2.54	12.80	2.00	19.66	3.30
	Follow-up	10.46	2.58	13.46	1.88	17.46	3.27

As shown in Table 1, the pre-test means of cognitive fusion, quality of life, and anxiety were relatively similar across the three groups, indicating baseline equivalence prior to intervention implementation. Following the intervention, the acceptance and commitment therapy group and the quality of life therapy group demonstrated substantial reductions in cognitive fusion, anxiety, and quality of life scores, while cognitive defusion scores increased. Considering that lower scores on the quality of life questionnaire indicate better quality of life, both intervention groups showed meaningful improvement during the post-test and follow-up phases. In contrast, the control group exhibited minimal changes across all variables throughout the study period.

To evaluate the overall effectiveness of the interventions on the combined dependent variables, multivariate analysis of covariance (MANCOVA) was conducted. The results of Wilks' Lambda indicated a statistically significant multivariate effect for group membership in both the post-test and follow-up stages. At post-test, Wilks' Lambda was 0.028 with $F(8, 70)=43.74$, $P<0.001$, and $\eta^2=0.833$, while at follow-up Wilks' Lambda was 0.051 with $F(8, 70)=30.06$, $P<0.001$, and $\eta^2=0.775$. These findings demonstrated that the intervention groups significantly differed from the control group on the combined dependent variables of cognitive fusion, cognitive defusion, quality of life, and anxiety.

Iranian Journal of Educational Sociology
E-ISSN: 2645-3460

Table 2

Results of Univariate Analysis of Covariance for Cognitive Fusion, Cognitive Defusion, Quality of Life, and Anxiety in the Post-test and Follow-up Stages

Stage	Variable	Source	SS	df	MS	F	P	η^2
Post-test	Cognitive Fusion	Group	713.97	2	356.98	20.60	0.001	0.520
		Error	658.51	38	17.32	-	-	-
	Cognitive Defusion	Group	233.08	2	116.54	29.37	0.001	0.607
		Error	150.77	38	3.96	-	-	-
	Quality of Life	Group	10490.31	2	5245.15	57.25	0.001	0.751
		Error	3481.14	38	91.60	-	-	-
	Anxiety	Group	623.16	2	311.58	47.88	0.001	0.716
		Error	247.26	38	6.50	-	-	-
Follow-up	Cognitive Fusion	Group	665.12	2	327.56	15.55	0.001	0.450
		Error	800.22	38	21.05	-	-	-
	Cognitive Defusion	Group	251.61	2	125.80	18.99	0.001	0.500
		Error	251.69	38	6.62	-	-	-
	Quality of Life	Group	10498.45	2	5249.22	46.46	0.001	0.710
		Error	4293.26	38	112.98	-	-	-
	Anxiety	Group	360.07	2	180.03	27.47	0.001	0.591
		Error	249.02	38	6.55	-	-	-

As indicated in Table 2, statistically significant differences were observed among the groups for all dependent variables during both post-test and follow-up stages ($P<0.001$). The effect sizes demonstrated moderate to large intervention effects across variables. The strongest effect size was observed for quality of life at post-test ($\eta^2=0.751$), indicating that a substantial proportion of variance in quality of life outcomes was explained by group membership. Significant group effects were also found for cognitive fusion, cognitive defusion, and anxiety, suggesting that both therapeutic interventions were effective in improving psychological functioning among students with diabetes.

Table 3

Bonferroni Post Hoc Pairwise Comparisons of Cognitive Fusion, Cognitive Defusion, Quality of Life, and Anxiety Among the Acceptance and Commitment Therapy Group, Quality of Life Therapy Group, and Control Group

Variable	Group Comparison	Mean Difference	Standard Error	P
Cognitive Fusion	ACT vs. Quality of Life	-6.13	1.69	0.003
	ACT vs. Control	-9.41	1.72	0.001
	Quality of Life vs. Control	-3.28	1.76	0.213
Cognitive Defusion	ACT vs. Quality of Life	4.56	0.95	0.001
	ACT vs. Control	5.49	0.97	0.001
	Quality of Life vs. Control	0.93	0.99	1.000
Quality of Life	ACT vs. Quality of Life	14.17	3.92	0.003
	ACT vs. Control	-24.89	4.00	0.001
	Quality of Life vs. Control	-39.06	4.09	0.001
Anxiety	ACT vs. Quality of Life	-3.13	0.94	0.006
	ACT vs. Control	-7.14	0.96	0.001
	Quality of Life vs. Control	-4.01	0.98	0.001

The findings presented in Table 3 revealed that both acceptance and commitment therapy and quality of life therapy significantly improved cognitive fusion, quality of life, and anxiety compared with the control group. Furthermore, significant differences were observed between the two intervention groups on cognitive fusion and quality of life outcomes. Specifically, acceptance and commitment therapy was more effective in reducing cognitive fusion and increasing cognitive defusion, whereas quality of life therapy demonstrated greater effectiveness in improving quality of life scores. Although both interventions significantly reduced anxiety relative to the control group,

Iranian Journal of Educational Sociology
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the differences between the two intervention approaches regarding anxiety reduction were not clinically substantial. The persistence of these differences during the follow-up assessment further indicated the stability and maintenance of treatment effects over time.

4. Discussion and Conclusion

The present study aimed to compare the effectiveness of acceptance and commitment-based group therapy and quality of life therapy on cognitive fusion, quality of life, and anxiety among students with diabetes. The findings demonstrated that both interventions significantly improved cognitive fusion, cognitive defusion, quality of life, and anxiety compared with the control group during both post-test and follow-up stages. Furthermore, the results indicated that acceptance and commitment therapy (ACT) was more effective in reducing cognitive fusion and increasing cognitive defusion, whereas quality of life therapy demonstrated greater effectiveness in improving quality of life scores. The findings also revealed that both interventions significantly reduced anxiety symptoms, although the differences between the two treatment approaches regarding anxiety reduction were not statistically substantial. Importantly, the stability of these improvements during the follow-up phase suggests that the psychological gains achieved through both interventions were maintained over time and were not merely temporary changes associated with participation in treatment sessions.

The effectiveness of ACT in reducing cognitive fusion among diabetic students can be explained through the theoretical foundations of psychological flexibility. According to the ACT model, cognitive fusion occurs when individuals become overly entangled with their thoughts and interpret internal experiences as objective truths rather than transient cognitive events. Adolescents with diabetes may experience persistent illness-related worries, fears of complications, social concerns, and negative self-evaluations that become fused with their sense of identity and behavioral functioning. ACT specifically targets these maladaptive cognitive processes by teaching mindfulness, acceptance, and cognitive defusion skills that enable individuals to observe their thoughts without becoming dominated by them (Davis, 2026; Lee et al., 2021). Through experiential exercises and present-moment awareness techniques, participants learn that distressing thoughts and emotions do not necessarily require avoidance or rigid behavioral responses. Consequently, adolescents become more psychologically flexible and more capable of engaging in adaptive behaviors despite unpleasant internal experiences. The present findings are consistent with previous studies demonstrating that ACT effectively enhances psychological flexibility and reduces cognitive fusion across diverse clinical populations (Fang et al., 2022; Lee et al., 2025; Padır et al., 2024). Similarly, research conducted by (Khanjani et al., 2021) indicated that ACT significantly improved psychological flexibility and emotional regulation among patients with spinal cord injuries, while (Alimolk et al., 2024) found that group-based ACT reduced fear of disease progression among breast cancer patients. These studies support the notion that ACT is particularly effective for individuals coping with chronic medical conditions characterized by persistent emotional distress and maladaptive cognitive processes.

The findings regarding the superiority of ACT in reducing cognitive fusion are also aligned with studies emphasizing the central role of cognitive defusion as a therapeutic mechanism within third-wave behavioral therapies. Research has consistently shown that cognitive fusion is associated with emotional disorders, anxiety symptoms, maladaptive coping, and diminished psychological functioning (Figueiredo et al., 2023; Lee et al., 2025). ACT directly addresses these processes through interventions designed to alter the individual's relationship with thoughts rather than attempting to eliminate or suppress them. This therapeutic orientation may be particularly important for adolescents with diabetes because chronic illness often generates unavoidable stressors and uncertainties that cannot be entirely controlled. By learning to accept unpleasant experiences and reduce experiential avoidance, participants may develop greater emotional resilience and behavioral adaptability. The current findings are congruent with studies demonstrating the effectiveness of ACT for social anxiety, body dysmorphic symptoms, emotional disorders, and academic distress among adolescents and university students (Alves et al., 2022; Farley & Twohig, 2023; Kohli et al., 2025; Torkian et al., 2022). Furthermore, (Levin et al., 2020) emphasized that openness and engagement components within ACT interventions play a substantial role in reducing emotional distress and enhancing adaptive functioning among college students. Therefore, the observed reduction in cognitive fusion among diabetic students may reflect increased acceptance of illness-related experiences and decreased rigid attachment to negative cognitions regarding health, social relationships, and personal competence.

Iranian Journal of Educational Sociology
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Another major finding of the present study was that quality of life therapy produced greater improvements in perceived quality of life compared with ACT. This finding is theoretically meaningful because quality of life therapy explicitly focuses on enhancing satisfaction across multiple domains of functioning, including interpersonal relationships, emotional well-being, self-esteem, daily activities, and future goals. Adolescents with diabetes often experience disruptions in daily routines, feelings of difference from peers, academic stress, and concerns regarding physical limitations, all of which can negatively affect their subjective quality of life. Quality of life therapy addresses these issues by integrating cognitive-behavioral strategies with positive psychology principles aimed at fostering happiness, life satisfaction, optimism, and adaptive coping. Through interventions emphasizing self-awareness, positive emotional experiences, goal clarification, and balanced evaluation of life circumstances, participants may become more capable of recognizing personal strengths and developing constructive perspectives regarding their illness and future. The present findings are consistent with studies showing that interventions targeting psychological flexibility and positive functioning significantly enhance well-being and quality of life (Chełkowska-Zacharewicz & Baran, 2023; Türk, 2024; Viator et al., 2024). Additionally, (Mahony et al., 2022) reported that ACT-based coaching interventions improved emotional well-being and performance-related anxiety among students, while (Pires et al., 2023) demonstrated that compassion-, acceptance-, and mindfulness-based interventions enhanced emotional functioning and reduced test anxiety in adolescents. These findings collectively suggest that interventions emphasizing acceptance, adaptive cognition, and positive functioning may substantially contribute to improved subjective well-being among adolescents facing chronic stressors.

The significant reduction in anxiety symptoms observed in both intervention groups further highlights the psychological benefits of acceptance-based and quality of life-oriented therapeutic approaches. Adolescents with diabetes frequently experience elevated anxiety due to concerns about disease management, fear of complications, social judgment, and uncertainty regarding future health outcomes. Chronic anxiety may negatively affect both psychological well-being and adherence to medical treatment regimens. ACT reduces anxiety by encouraging acceptance of emotional experiences, reducing avoidance behaviors, and promoting engagement in meaningful activities despite fear or distress (Davis, 2026; Lee et al., 2021). Similarly, quality of life therapy may alleviate anxiety by improving emotional balance, enhancing positive experiences, and strengthening perceptions of competence and satisfaction in everyday life. The current findings align with numerous studies demonstrating the effectiveness of ACT-based interventions for anxiety disorders and emotional distress (Krafft et al., 2020; Nissling et al., 2023; Roberts et al., 2024). For instance, (Smith et al., 2020) found that ACT group interventions significantly improved psychological well-being among adolescents, while (Harris & Samuel, 2020) concluded in a systematic review that ACT-based prevention and intervention programs effectively reduced mental health difficulties among children and young people. Likewise, (Moshkabadi et al., 2024) reported that ACT reduced high-risk behaviors and emotional problems among self-injurious adolescents, suggesting that the therapeutic principles underlying ACT may generalize across a variety of emotional and behavioral difficulties.

The maintenance of treatment gains during the follow-up period is another important aspect of the present findings. Sustained improvements suggest that participants were able to internalize and continue applying the psychological skills learned during the intervention process. ACT emphasizes long-term behavioral flexibility and value-based action rather than temporary symptom suppression, which may explain the persistence of treatment effects over time (Lee et al., 2021; Levin et al., 2020). Similarly, quality of life therapy encourages enduring cognitive and emotional changes by helping individuals identify meaningful goals, develop adaptive perspectives, and cultivate positive emotional experiences. The long-term stability observed in the present study is consistent with findings reported by (Nissling et al., 2023), who found sustained improvements following internet-delivered ACT for adolescents with anxiety disorders, and by (Krafft et al., 2020), who demonstrated the effectiveness of ACT self-help interventions for social anxiety over time. These findings support the growing literature suggesting that acceptance-based and positive psychology-oriented interventions can produce durable psychological benefits in adolescent populations.

From a broader theoretical perspective, the findings of this study further support the transdiagnostic model of psychological inflexibility. Contemporary research increasingly conceptualizes cognitive fusion, experiential avoidance, and psychological inflexibility as core mechanisms underlying multiple emotional disorders rather

Iranian Journal of Educational Sociology
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than disorder-specific phenomena (Fang et al., 2023; Krafft & Ong, 2024; Lee et al., 2025). The observed improvements across anxiety, cognitive fusion, and quality of life suggest that interventions targeting these core processes may simultaneously influence several dimensions of psychological functioning. This perspective is especially relevant in adolescents with chronic illnesses because emotional difficulties, social concerns, and maladaptive coping strategies often co-occur and interact dynamically. The findings of the present study therefore contribute to the growing evidence supporting process-based and transdiagnostic approaches to psychological intervention in youth mental health populations.

One limitation of the present study was the relatively small sample size and the use of convenience sampling, which may limit the generalizability of the findings to broader populations of adolescents with diabetes. Additionally, all data were collected using self-report questionnaires, making the results potentially vulnerable to response biases and social desirability effects. Another limitation was the relatively short follow-up period, which restricted examination of the long-term durability of intervention effects. Furthermore, the study focused exclusively on students with diabetes in one geographical region, and cultural or contextual factors may have influenced participants' psychological responses and treatment experiences.

Future research is recommended to employ larger and more diverse samples drawn from multiple clinical and educational settings in order to improve the external validity of findings. Researchers should also investigate the long-term effectiveness of ACT and quality of life therapy through extended follow-up assessments lasting several months or years. Comparative studies examining these interventions alongside other third-wave behavioral therapies and cognitive-behavioral approaches may provide a more comprehensive understanding of their relative effectiveness. Future investigations could additionally explore mediating variables such as resilience, self-compassion, emotional regulation, and illness perceptions in order to clarify the mechanisms through which these interventions influence psychological functioning among adolescents with chronic illnesses.

From a practical perspective, the findings suggest that acceptance and commitment therapy and quality of life therapy can be effectively integrated into psychological support services for adolescents with diabetes. Mental health professionals, school counselors, and healthcare providers may benefit from incorporating acceptance-based strategies, mindfulness exercises, and quality of life enhancement techniques into intervention programs designed for chronically ill adolescents. Educational institutions and diabetes treatment centers can also implement structured group-based psychological interventions to improve emotional adjustment, reduce anxiety, and strengthen adaptive coping skills among students with diabetes. Such interventions may not only improve psychological well-being but also contribute to better disease management, greater treatment adherence, and improved overall quality of life.

Authors' Contributions

Authors equally contributed to this article.

Declaration

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

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

All procedures performed in studies involving human participants were under the ethical standards of the institutional and, or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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