



The Effectiveness of Acceptance and Commitment Therapy on Cognitive Flexibility, Rumination and Negative Automatic Thoughts in Students with Self-Harming Behaviors

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ABSTRACT

This study aimed to examine the effectiveness of Acceptance and Commitment Therapy (ACT) on cognitive flexibility, rumination, and negative automatic thoughts in adolescent girls engaging in deliberate self-harm in Kermanshah. The present research employed a quasi-experimental design with a pretest-posttest and control group. The statistical population included all adolescent girls aged 16 to 18 years in Kermanshah in 2025-2026. 40 participants scoring average or above on the Deliberate Self-Harm Inventory (Gratz, 2001) were randomly selected and assigned to either the experimental (20) or control group (20) following parental consent. The experimental group received 10 weekly 90-minute sessions of ACT, including exercises in acceptance, cognitive defusion, mindfulness, values clarification, self-compassion, and committed action (Turrell, Bell & Wilson, 2016). Research instruments included the Deliberate Self-Harm Inventory (DSI), the Cognitive Flexibility Inventory (CFI), the Ruminative Responses Scale (RRS), and the Negative Automatic Thoughts Questionnaire (NATQ). Data were analyzed using multivariate analysis of covariance (MANCOVA) in SPSS version 26. ACT significantly reduced self-harming behaviors, negative automatic thoughts, and rumination, while increasing cognitive flexibility compared to the control group. The findings indicate that ACT is an effective intervention for improving cognitive flexibility, reducing rumination, and decreasing negative automatic thoughts in adolescent girls engaging in deliberate self-harm, highlighting its potential utility in school and clinical settings.

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Introduction

Self-harm, defined as the deliberate, non-suicidal act of causing physical harm to oneself, is a significant mental health concern among high school students (Nawaz et al., 2024). It is often associated with emotional dysregulation, psychological distress, and maladaptive coping mechanisms (Noroozi Homayoon et al., 2023). Global studies suggest that the prevalence of self-harm among adolescents ranges from 10 to 20%, with higher rates in high-stress environments such as schools. In Iran, research indicates a prevalence of % 24.4 among high school students, with cultural and social factors contributing to its occurrence (Abbasi-Ghahramanloo, et al., 2024). Self-harm is frequently linked to cognitive inflexibility, rumination, and negative automatic thoughts, which exacerbate emotional distress and impair psychological functioning (Richardson et al., 2024). The lack of timely interventions increases the risk of chronic self-harm, suicidal ideation, and long-term mental health issues (Radunz et al., 2025).

Variable that appears to be strongly associated with self-harm is cognitive flexibility. Cognitive flexibility, defined as the ability to adaptively shift perspectives and generate alternative solutions to problems, is often impaired among students who engage in self-harm (Chung et al., 2024). According to cognitive theories, such as Hayes' Relational Frame Theory (2004), cognitive inflexibility stems from rigid thinking patterns and an overreliance on maladaptive cognitive frameworks, which hinder adaptive problem-solving (Patil et al., 2025). In students, this rigidity may manifest as difficulty adjusting to academic or social challenges, ultimately contributing to heightened emotional distress and self-harming behaviors (Westhoff et al., 2024). In Iran, cultural pressures such as high academic expectations and strong social conformity further intensify cognitive inflexibility, making the development of targeted interventions crucial. Moreover, research indicates that strengthening cognitive flexibility skills can significantly reduce rumination, improve emotional adjustment, and decrease tendencies toward high-risk behaviors (Azar et al., 2025).

Another variable that appears to be strongly associated with self-harm is Rumination. Rumination, defined as the repetitive and passive focus on negative emotions and experiences, is a major risk factor for self-harming behaviors and Suicidal tendencies (Le et al., 2025). According to Nolen-Hoeksema's Response Styles Theory (1991), rumination intensifies negative affect and undermines emotional regulation, functioning as a maladaptive coping mechanism (Sadri et al., 2025). Among students, it often emerges in response to academic failures, peer conflicts, or family stressors, which can heighten psychological distress and increase vulnerability to self-harm (Sun et al., 2025). Persistent rumination not only impairs problem-solving but also prolongs emotional suffering, creating a cycle of negative thinking and maladaptive behaviors. Therefore, interventions that directly target rumination are essential for reducing self-harm and promoting positive mental health outcomes in adolescents (Kpeno et al., 2024).

Another variable that appears to be strongly associated with self-harm is Negative automatic thoughts. Negative automatic thoughts, involving self-critical and self-deprecating internal dialogue, is highly prevalent among students who engage in self-harm (Wu et al., 2025). According to Beck's (1976) cognitive model, negative automatic thoughts originates from cognitive distortions such as overgeneralization and catastrophizing, which intensify feelings of worthlessness and hopelessness (Rogers et al., 2025). Among students, these maladaptive inner dialogues can result in social withdrawal, diminished academic motivation, and a heightened risk of self-harming behaviors. Furthermore, cultural factors, including strong academic pressures and the stigma surrounding mental health difficulties, may exacerbate these patterns of negative thinking (Ji hoon, 2024). Over time, persistent negative automatic thoughts not only deepens emotional distress but also perpetuates cycles of maladaptive behavior. Thus,

interventions aimed at modifying cognitive distortions and reducing negative automatic thoughts are essential for fostering resilience and promoting psychological well-being in adolescents. (Murali & Avudaiappan, 2024).

Various interventions, such as Cognitive Behavioral Therapy (CBT), have been used to address self-harm, this study focuses on Acceptance and Commitment Therapy (ACT). Developed by Hayes (2004), ACT emphasizes acceptance of difficult emotions, cognitive defusion, mindfulness, values clarification, and committed action to promote psychological flexibility (Barraca et al., 2025). ACT is particularly suitable for individuals with self-harm behaviors due to its focus on reducing experiential avoidance and fostering adaptive coping strategies (Bektaş-Aydın & Yüksel-Şahin, 2025). Research findings indicate the effectiveness of ACT on cognitive flexibility (Rad et al., 2025; Zou et al., 2024; Rahman Nia et al., 2024), rumination (Wang et al., 2025; Naghashzadeh, S. and Amani, 2025; Kolahkaj & Bakhshi Soorshjani, 2024) and negative automatic thoughts (Anusuya & Gayatri Devi, 2025; Thompson et al., 2022; Sevilla-Liu, 2022). In the Iranian context, particularly in Kermanshah, ACT's structured and group-based approach makes it feasible for school settings with limited resources. This study addresses a gap in the literature by examining the effectiveness of ACT on cognitive flexibility, rumination, and negative automatic thoughts in high school students engaging in self-harm, aiming to provide culturally relevant interventions to improve mental health outcomes.

Method

Setting and Participants

This study employed a quasi-experimental pretest–posttest design with a control group to examine the effectiveness of Acceptance and Commitment Therapy (ACT) on cognitive flexibility, rumination and negative automatic thoughts among adolescents with self-harming behaviors. The target population consisted of all female adolescents aged 16 to 18 years in Kermanshah, Iran, during 2025. Participants were initially screened using the Deliberate Self-Harm Inventory (DSHI), and those who scored above the predetermined cutoff point (>10) were considered eligible for participation. A total of 44 eligible adolescents were selected through purposive sampling. After obtaining written informed consent from both the participants and their parents, they were randomly assigned to either the ACT intervention group ($n = 22$) or the control group ($n = 22$). Inclusion criteria were: (a) obtaining a score above 10 on the DSHI, (b) being between 16 and 18 years of age, (c) willingness to participate in the study, (d) enrollment in secondary school, and (e) not receiving concurrent psychological or pharmacological treatment. Exclusion criteria included severe psychiatric disorders requiring immediate clinical intervention, substance use, absence from more than two treatment sessions, failure to complete the study measures, or withdrawal from the study.

Instruments

Deliberate Self-Harm Inventory

This 17-item inventory was developed by Gratz (2001) to measure the frequency, intensity, duration, and type of non-suicidal self-injury over the past year. Participants respond to each item with “Yes” (1) or “No” (0). Scores range from 0 to 17, with higher scores indicating more frequent non-suicidal self-injury. Internal consistency and test-retest reliability over 2–4 weeks were reported as 0.83 and 0.68, respectively. The inventory demonstrates acceptable convergent and discriminant construct validity (Gratz, 2001). In Shahani & Mansouri (2023), internal consistency was 0.73. In the present study, Cronbach's alpha was 0.79.

Ruminative Response Scale

This 10-item scale was developed by Treynor, Gonzalez & Nolen-Hoeksema (2003) to measure the tendency to engage in rumination. It uses a 4-point Likert scale ranging from 1 (almost never) to 4 (almost always) and has a two-factor structure (brooding and reflective pondering). Cronbach's alpha for the total scale and subscales in the original study were 0.85, 0.80, and 0.76, respectively. For the Persian version, alphas were 0.80, 0.66, and 0.72 (Mansouri, Mansouri & Mansouri, 2015). In this study, Cronbach's alpha for the total scale and subscales were 0.76, 0.69, and 0.74.

Cognitive Flexibility Inventory

This 20-item self-report scale was developed by Dennis & Vander-Wal (2010) to assess multiple aspects of cognitive flexibility, including the perception of difficult situations as controllable, recognizing multiple alternatives, and generating alternative solutions. It uses a 5-point Likert scale. Concurrent validity with the Beck Depression Inventory was reported as -0.39 . Internal consistency for the total scale, control, and alternative options subscales were 0.91, 0.91, and 0.84. In Iran, test-retest reliability over two weeks was 0.90 for the total scale and 0.87, 0.89, and 0.75 for the subscales (Lakani & Akbari, 2021). In this study, Cronbach's alpha was 0.86 for the total scale and 0.83, 0.88, and 0.76 for the subscales.

Automatic Thoughts Questionnaire

This 30-item scale was developed by Hollon & Kendall (1980) to assess negative self-referential cognitions in depression. Scores above 70 indicate highly negative automatic thoughts. Items are scored on a 5-point Likert scale (1–5). Wishire reported construct validity via correlation with the Rumination Questionnaire ($r = 0.41$, $p < 0.001$) and internal consistency ($\alpha = 0.81$). Test-retest correlations over 2 weeks ranged from 0.57 to 0.76 (Tabatabaei, 2011). In the present study, Cronbach's alpha was 0.82.

Intervention Protocol

The intervention was implemented according to the Acceptance and Commitment Therapy protocol for adolescents developed by Turrell, Bell, and Wilson (2016). The program consisted of 10 weekly group sessions, each lasting approximately 90 minutes. The protocol is a structured, manualized intervention specifically designed for adolescents and systematically targets the six core ACT processes, including acceptance, cognitive defusion, present-moment awareness, self-as-context, values clarification, and committed action. Throughout the sessions, participants engaged in experiential exercises, mindfulness practices, metaphors and group discussions aimed at enhancing psychological flexibility while reducing maladaptive cognitive and emotional processes associated with self-harming behaviors. The intervention was delivered in a standardized manner to ensure treatment fidelity and consistency across all sessions.

Table 1. ACT Group Intervention Sessions (Turrell, Bell & Wilson, 2016)

Session	Content
1	Assessment and orientation: Introduction of participants and therapist, establishment of group rules, screening and baseline assessment, introduction to the principles of Acceptance and Commitment Therapy (ACT), clarification of treatment goals and expectations, and preparation for group participation.
2	Creative hopelessness and psychological flexibility: Smarties exercise, object-based mindfulness practice, introduction to the DOTS model and the ACT Matrix, exploration of experiential avoidance, and metaphors illustrating the illusion of control and the costs of avoidance.
3	Values clarification: Mindfulness practice, identification of personally meaningful life values, distinguishing values from externally imposed rules and goals, and increasing awareness of value-consistent living.
4	Committed action and goal setting: Mindful eating exercise, formulation of value-based behavioral goals, development of action plans consistent with personal values, and the "Devils in the Boat" exercise to promote persistence despite internal obstacles.

Session	Content
5	Acceptance and willingness: Experiential mindfulness exercises (e.g., chair-jumping and wrinkled sock activities), practicing openness toward difficult emotions and thoughts, the "Mosquitoes" exercise, and formulation of three-month value-based goals.
6	Cognitive defusion: Bubble mindfulness exercise, metaphors illustrating the nature of thoughts, learning to observe thoughts without attachment or judgment, and practicing multiple cognitive defusion techniques.
7	Defusion from self-stories: Mindful walking practice, integration of previously learned ACT processes, word-chain and group storytelling exercises to challenge rigid self-narratives and promote psychological flexibility.
8	Self-as-context: Informal mindfulness practices, introduction to the observing self (self-as-context), experiential exercises designed to strengthen perspective-taking and reduce identification with internal experiences.
9	Self-compassion: Development of self-kindness through compassionate imagery and exercises involving the "younger self" and "older self," open-eye mindfulness, and fostering a compassionate relationship with oneself.
10	Integration and relapse prevention: Review and integration of all ACT processes, five-senses mindfulness practice, the "Passengers on the Bus" metaphor, development of individualized maintenance strategies, expression of gratitude, group feedback, and therapeutic termination.

Procedure

Following approval from the university ethics committee and authorization from the Kermanshah Department of Education, the researchers coordinated with administrators of public girls' secondary schools to recruit participants. Eligible students were invited to complete the Deliberate Self-Harm Inventory (DSHI) as a screening measure. Students whose scores exceeded the established cutoff point were identified as eligible, and their parents were contacted to provide detailed information regarding the study. After obtaining written informed consent from both parents and adolescents, 44 participants were enrolled and randomly assigned to either the ACT group or the control group. At baseline, all participants completed the Cognitive Flexibility Inventory (CFI), the Ruminative Response Scale (RRS), and the Automatic Thoughts Questionnaire (ATQ). Participants in the experimental group subsequently received 10 weekly group sessions of Acceptance and Commitment Therapy, each lasting approximately 90 minutes, following the adolescent ACT protocol developed by Turrell, Bell, and Wilson (2016). The intervention included psychoeducation about ACT, creative hopelessness, values clarification, values-based goal setting, acceptance of internal experiences, cognitive defusion, mindfulness exercises, self-as-context, self-compassion, and committed action. Participants in the control group received no psychological intervention during the study period and were placed on a waitlist. Upon completion of the intervention, both groups completed the posttest assessments using the same instruments administered at baseline. Data were analyzed using IBM SPSS Statistics version 27, and multivariate analysis of covariance (MANCOVA) was employed to evaluate the intervention effects while controlling for baseline scores. Statistical significance was set at $p < .05$. Ethical principles were strictly observed throughout the study, including voluntary participation, confidentiality of participants' information, the right to withdraw from the study at any time without penalty, and the provision of the ACT program to the waitlist control group after completion of the study upon request.

Results

Participants ranged in age from 16 to 18 years. Of the total sample, 22% were 16 years old, 58% were 17 years old, and 20% were 18 years old, indicating that the majority of participants were in middle to late adolescence. Regarding educational level, 25% of the participants were enrolled in the 10th grade, 55% in the 11th grade, and 20% in the 12th grade. Most 10th-grade students were 16 years old, most 11th-grade students were 17 years old, and the majority of 12th-grade students were 18 years old. Descriptive statistics for the study variables by group and assessment phase are presented in Table 2.

Table 2. Descriptive Statistics of Study Variables Across Phases

Group	Variable	Pretest Mean	Pretest SD	Posttest Mean	Posttest SD
ACT	Self-harm	14.50	1.34	7.00	0.84
	Negative automatic thoughts	112.30	4.71	72.80	3.20
	Rumination	23.20	2.42	16.86	1.68
	Cognitive flexibility	88.20	15.72	101.26	13.68
Control	Self-harm	15.00	1.31	14.50	1.50
	Negative automatic thoughts	115.20	4.96	110.80	4.21
	Rumination	20.73	1.49	20.53	1.99
	Cognitive flexibility	86.60	14.00	86.66	13.80

To examine the study hypotheses, a multivariate analysis of covariance (MANCOVA) was conducted. Prior to the analysis, the assumptions of normality, homogeneity of variances, and homogeneity of variance–covariance matrices were evaluated. The results of the Shapiro–Wilk test indicated that the distributions of self-harm, negative automatic thoughts, rumination, and cognitive flexibility did not significantly deviate from normality, with significance values of .914, .544, .744, and .159, respectively ($P > .05$). Levene's test also confirmed the assumption of homogeneity of variances, yielding significance values of .876, .541, .139, and .596 for self-harm, negative automatic thoughts, rumination, and cognitive flexibility, respectively ($P > .05$). Furthermore, the assumption of equality of variance–covariance matrices was assessed using Box's M test. As the test was non-significant ($P > .05$), this assumption was considered satisfied. Accordingly, because all assumptions for MANCOVA were met, the analysis was performed to compare the posttest scores of self-harm, negative automatic thoughts, rumination and cognitive flexibility between the ACT and control groups while controlling for pretest scores. To examine the overall effect of the independent variable on the linear combination of dependent variables, multivariate tests in MANCOVA were conducted. The results are presented in Table 3.

Table 3. Multivariate Tests of Significance for MANCOVA

Test Type	Value	Hypothesis df	Error df	F	Sig.
Pillai's Trace	0.774	4.000	82.000	12.953	0.001
Wilks' Lambda	0.236	4.000	80.000	21.181	0.001
Hotelling's Trace	3.196	4.000	78.000	31.163	0.001
Roy's Largest Root	3.183	2.000	41.000	65.243	0.001

Based on Table 3, the results of multivariate tests in MANCOVA indicated a significant overall difference between the groups in terms of the linear combination of dependent variables. The Pillai's Trace value was 0.774 with a significance level of 0.001, indicating a significant effect of the intervention on the dependent variables collectively. Furthermore, other multivariate tests including Wilks' Lambda (0.236), Hotelling's Trace (3.196), and Roy's Largest Root (3.183) were all significant at $p < 0.001$, confirming this finding. In other words, there is a significant difference between the experimental and control groups in at least one of the dependent variables, and the intervention has successfully exerted its effect on the dependent variables. Therefore, with 99% confidence, it can be concluded that the overall difference between the groups on the dependent variables, after controlling for pretest scores, is statistically significant.

Following the confirmation of overall significant group differences in multivariate tests, univariate between-subjects effects were examined to determine the specific impact of the intervention on each dependent variable separately. The results of these tests within the MANCOVA framework are presented in Table 4.

Table 4. MANCOVA Results for Posttest Scores

Variable	Source	SS	DF	MS	F	p	η^2
Self-harm	Pretest	358.500	1	358.500	218.812	.001	0.842
	Group	203.199	1	101.600	57.668	.001	0.738
Negative automatic thoughts	Pretest	1801.820	1	1801.820	769.155	.001	0.949
	Group	390.748	1	195.374	83.400	.001	0.803
Rumination	Pretest	120.789	1	120.789	128.933	.001	0.759
	Group	197.031	1	98.515	105.157	.001	0.837
Cognitive flexibility	Pretest	6658.796	1	6658.796	1276.521	.001	0.969
	Group	2586.612	1	1293.306	247.933	.001	0.924

As presented in Table 4, the results indicate that ACT was significantly effective across all measured variables. Specifically, Acceptance and Commitment Therapy (ACT) led to a significant reduction in self-harming behaviors, negative automatic thoughts, and rumination, while significantly increasing cognitive flexibility compared to the control group ($P < .001$). The multivariate effect was also statistically significant, indicating a strong overall impact of the intervention on the combined dependent variables ($P < .001$). These findings suggest that ACT produced meaningful improvements in cognitive and emotional functioning, supporting its effectiveness for adolescents with self-harming behaviors when controlling for baseline differences.

Discussion and Conclusion

The aim of the present study was to examine the effectiveness of Acceptance and Commitment Therapy (ACT) on cognitive flexibility, rumination, and negative automatic thoughts in students engaging in self-harming behaviors. The first hypothesis demonstrated that Acceptance and Commitment Therapy had a significant positive effect on improving cognitive flexibility in students engaging in self-harm. The results of the first hypothesis were consistent with previous findings on cognitive flexibility (Rad et al., 2025; Zou et al., 2024; Rahman Nia et al., 2024). ACT, by teaching cognitive defusion and mindfulness, enabled students to detach from rigid thought patterns and adopt more adaptive perspectives. From a neuroscientific perspective, ACT likely enhanced the activity of the dorsolateral prefrontal cortex (dlPFC), which is involved in cognitive flexibility and problem-solving. Neuroimaging studies suggest that individuals with self-harm behaviors exhibit reduced dlPFC activity, contributing to cognitive rigidity. ACT's mindfulness exercises, such as observing thoughts without judgment, likely increased functional connectivity between the dlPFC and the anterior cingulate cortex (ACC), facilitating adaptive cognitive processing. From a psychological perspective, cognitive defusion techniques helped students distance themselves from maladaptive thoughts, reducing their impact on behavior. The values clarification component encouraged students to align their actions with personal goals, fostering flexible thinking in response to academic and social challenges. The group-based ACT setting, which promoted acceptance and non-judgment, enhanced students' confidence in adapting to stressors, aligning with Hayes' Relational Frame Theory (2004). Improved cognitive flexibility led to better problem-solving, reduced emotional distress, and decreased reliance on self-harm as a coping mechanism. Compared to CBT, ACT's emphasis on acceptance and values-driven action produced stronger effects on cognitive flexibility. Students reported improved ability to handle academic pressures and peer conflicts, indicating enhanced psychological resilience.

The second hypothesis showed that ACT had a significant positive effect on reducing rumination in students engaging in self-harm. The results of the second hypothesis were consistent with previous findings, including Wang (2025), Naghashzadeh & Amani (2025), and Kolahkaj & Bakhshi Soorshjani (2024). ACT's focus on acceptance and mindfulness helped students interrupt repetitive negative thought patterns and reduce emotional fixation on distressing experiences. From a neuroscientific perspective, ACT likely reduced hyperactivity

in the default mode network (DMN), particularly the medial prefrontal cortex (mPFC), which is associated with rumination. Neuroimaging studies indicate that excessive DMN activity contributes to repetitive negative thinking in self-harming individuals. ACT's mindfulness practices, such as present-moment awareness, likely decreased DMN hyperactivity while enhancing insula activity, improving emotional awareness and regulation. From a psychological perspective, acceptance techniques enabled students to acknowledge negative emotions without becoming entangled in ruminative cycles, aligning with Nolen-Hoeksema's Response Styles Theory (1991). Cognitive defusion helped students view ruminative thoughts as transient mental events rather than absolute truths, reducing their emotional impact. The group-based setting fostered a sense of shared experience, reducing feelings of isolation that fuel rumination. Compared to CBT, ACT's focus on experiential acceptance produced faster reductions in rumination. Students reported decreased preoccupation with negative thoughts and improved emotional regulation, which contributed to reduced self-harm behaviors.

The third hypothesis demonstrated that ACT had a significant positive effect on reducing negative automatic thoughts in students engaging in self-harm. The results of the third hypothesis were consistent with previous findings on negative automatic thoughts (Anusuya & Gayatri Devi, 2025; Thompson et al., 2022; Sevilla-Liu, 2022). ACT's cognitive defusion and values clarification techniques helped students reframe negative self-evaluations and reduce self-deprecating thoughts. From a neuroscientific perspective, ACT likely enhanced the activity of the ventrolateral prefrontal cortex (vlPFC), which is involved in cognitive reappraisal and emotional regulation. Neuroimaging studies suggest that individuals with self-harm behaviors exhibit reduced vlPFC activity, contributing to persistent negative automatic thoughts. ACT's mindfulness exercises increased functional connectivity between the vlPFC and the insula, enabling students to process negative emotions without engaging in self-critical thoughts. From a psychological perspective, cognitive defusion allowed students to observe negative automatic thoughts as passing thoughts rather than facts, aligning with Beck's (1976) cognitive model. Values clarification helped students focus on meaningful goals, reducing the salience of self-critical thoughts. The group-based ACT setting, which emphasized non-judgmental acceptance, fostered a positive self-concept and reduced feelings of shame. Compared to CBT, ACT's integration of acceptance and mindfulness produced deeper reductions in negative automatic thoughts. Students reported increased self-compassion and reduced self-blame, which contributed to decreased self-harm behaviors and improved social relationships.

In conclusion, Acceptance and Commitment Therapy had a significant positive effect on improving cognitive flexibility, reducing rumination, and decreasing negative automatic thoughts in students engaging in self-harm. By teaching acceptance, cognitive defusion, mindfulness, values clarification, and committed action, ACT enabled students to adopt adaptive cognitive and emotional strategies, interrupt ruminative cycles, and reframe negative self-evaluations. From a neuroscientific perspective, ACT enhanced the activity of brain regions such as the dlPFC, vlPFC, and insula, improving cognitive and emotional processing. From a psychological perspective, the group-based setting and emphasis on acceptance and values-driven action reduced emotional distress, increased psychological flexibility, and improved social functioning. These findings highlight ACT's potential as an effective intervention for students engaging in self-harm in educational settings, particularly in resource-limited areas like Kermanshah, where its structured and group-based approach is highly feasible.

This study had several limitations that restrict the generalizability of its findings. First, the population was limited to high school students in Kermanshah, which may tie the results to specific local conditions due to limited psychological resources. Second, the small sample size (40 participants) may have reduced the statistical power of the findings. Third, the lack of long-term follow-up (beyond three months) prevented the evaluation of the intervention's sustained

effects. Fourth, the failure to control for confounding variables such as family dynamics, academic stress, social support, or prior trauma may have influenced the results. Fifth, the lack of gender-specific analysis limited insights into gender differences in response to ACT. Sixth, the focus on high school students limited the generalizability to other age groups. Future research should include larger and more diverse populations across different cities to enhance generalizability. Examining ACT's effectiveness in other age groups and genders could broaden its applicability. Employing mixed-methods designs to explore students' experiences and factors influencing ACT's effectiveness is recommended. Long-term follow-up (beyond six months) is essential to assess the sustainability of effects. Investigating mediating variables such as self-esteem, resilience, and social support could clarify the mechanisms of ACT's effects. Analyzing cultural factors, such as stigma in small cities like Kermanshah, and gender differences could provide valuable insights. Using neuroimaging to examine neural changes resulting from ACT is also recommended.

Practically, ACT programs should be implemented as regular workshops in Kermanshah schools to provide students engaging in self-harm with access to psychological interventions. Establishing school-based counseling centers for early identification and intervention is essential. Training teachers and counselors to recognize self-harm and provide support can enhance intervention effectiveness. Awareness programs for parents and communities to reduce mental health stigma are recommended. Collaboration with local health centers and non-profits to train ACT specialists in Kermanshah could improve access. Developing online ACT programs for resource-limited areas could facilitate intervention delivery. Incorporating psychological education into school curricula could prevent self-harm and promote mental health.

Declarations

Author Contributions

Contributions all authors contributed actively to the conception, design, and execution of the research.

Data Availability Statement

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

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Ethical considerations

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Informed consent was obtained from all participants prior to their involvement in the study.

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Conflict of interest

The authors declare that there are no conflicts of interest regarding the publication of this research.

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