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Comparison of the Effectiveness of Mindfulness Training and Compassion-Based Acceptance and Commitment Therapy on Alexithymia and Suicidal Ideation in Adolescents with a Tendency Toward High-Risk Behaviors

Robab Mirasi[1*]

[1] Ph.D. in Educational Psychology, Farhangian University, Tehran, Iran

*** Corresponding author email address**: Mirasi.r1401@gmail.com

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A B S T R A C T

The present study aimed to compare the effectiveness of mindfulness training and compassion-based Acceptance and Commitment Therapy (ACT) on alexithymia and suicidal ideation in adolescents with a tendency toward high-risk behaviors. This study employed a quasi-experimental design. The statistical population consisted of all adolescents with a tendency toward high-risk behaviors in District 5 of Ardabil who had referred to counseling centers during the first six months of 2026 (March–September 2026). Participants were selected using convenience sampling from among adolescents who met the eligibility criteria for participation in the study. Eligible individuals were enrolled in the study after providing informed consent and were randomly assigned to Experimental Group 1 (n = 15), Experimental Group 2 (n = 15), and the control group (n = 15). The research instruments included an Alexithymia Questionnaire and a Suicidal Ideation Questionnaire. Mindfulness training and compassion-based Acceptance and Commitment Therapy interventions were administered to the respective experimental groups. Data were analyzed using multivariate analysis of variance (MANOVA). The results indicated that both mindfulness training and compassion-based Acceptance and Commitment Therapy were effective in reducing suicidal ideation and alexithymia. Specifically, both experimental groups demonstrated lower mean scores on the aforementioned variables compared with the control group, and the differences between the mean scores were statistically significant at the .05 level. Furthermore, a significant difference between mindfulness training and compassion-based Acceptance and Commitment Therapy was observed only for suicidal ideation. The mindfulness training group exhibited a lower mean suicidal ideation score than the compassion-based Acceptance and Commitment Therapy group, indicating that mindfulness training was more effective in reducing suicidal ideation.

Keywords: *mindfulness training, compassion-based Acceptance and Commitment Therapy, alexithymia, suicidal ideation, tendency toward high-risk behaviors.*

1. Introduction

Adolescence is a developmental period characterized by rapid biological maturation, cognitive reorganization, identity formation, heightened sensitivity to interpersonal evaluation, and increasing autonomy from the family. These developmental transitions can create opportunities for growth, but they may also increase vulnerability to emotional dysregulation, impulsive decision-making, and engagement in behaviors that threaten physical and psychological health. High-risk behaviors in adolescence commonly include substance use, unsafe sexual behavior, aggression, self-injury, reckless driving, cigarette smoking, and other actions that increase the probability of adverse personal or social outcomes. The emergence of such behaviors is rarely attributable to a single factor; rather, it reflects a complex interaction among individual, familial, peer, school, and social influences. Epidemiological and psychosocial research has consistently identified adolescence as a critical period for the onset and consolidation of risk-taking patterns, particularly when emotional difficulties coexist with limited social support, weak coping skills, or maladaptive peer influences (1-3). Recent work has further emphasized that adolescent high-risk behaviors can have enduring consequences for mental health, educational functioning, interpersonal relationships, and later adjustment, making their prevention and treatment a major clinical and public health priority (4).

The tendency toward high-risk behavior is influenced by both contextual and intrapersonal variables. Low self-esteem, poor perceived social support, weak social capital, and limited interpersonal resources have been associated with greater risk-taking among adolescents (5). At the same time, exposure to stressful environments or access to potentially harmful substances can increase the likelihood that vulnerable adolescents adopt maladaptive behavioral responses (6). In Iranian populations, psychosocial and educational factors have similarly been shown to contribute to the development of high-risk tendencies, while interventions that strengthen adaptive competencies can reduce adolescents' propensity for risky behavior (7). Qualitative investigations of behaviors such as cigarette smoking also suggest that adolescents and young adults may be drawn toward risky behaviors through the interaction of emotional needs, social pressures, identity-related concerns, and environmental reinforcement (8). Behavioral problems in adolescence therefore need to be understood not merely as isolated acts, but as manifestations of broader difficulties in emotional processing, self-regulation, coping, and adaptation (9, 10).

Among the most serious psychological outcomes associated with adolescent vulnerability is suicidal ideation. Suicidal thoughts occupy a clinically important position on the continuum from psychological distress to suicidal planning and behavior, and their presence requires careful assessment because they may precede suicide attempts or other forms of self-harm. Suicide prevention has therefore been recognized as a major public health concern, particularly among younger populations in whom early identification of modifiable psychological risk factors can have substantial preventive value (11). Epidemiological studies of adolescents have demonstrated that suicidal ideation, suicide attempts, and direct self-injurious behavior can occur across diverse cultural and social groups and may be shaped by migration background, family circumstances, social integration, and psychological distress (12). Suicidal thinking is also associated with a broad range of psychiatric and psychosocial variables. For example, longitudinal and cross-sectional evidence indicates that self-harm and suicidal ideation may co-occur with severe psychological symptoms, including positive psychotic experiences, suggesting that suicidality may emerge from multiple interacting pathways rather than from a single diagnostic process (13, 14).

Suicidal ideation can also be understood in relation to a person's broader sense of meaning, emotional connectedness, and perceived capacity to cope with psychological pain. A diminished sense of meaning in life or difficulty finding personally significant reasons for continued engagement with life may intensify suicidal vulnerability, whereas the presence or active search for meaning may function as an important psychological process in understanding suicidality (15). Within Iranian samples, suicidal ideation has likewise been associated with multiple psychological and contextual risk factors, indicating that effective prevention requires attention to emotional, interpersonal, and situational variables rather than relying solely on diagnostic categories (16). These findings underscore the importance of interventions that help

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individuals relate differently to distressing thoughts, regulate difficult emotions, tolerate aversive internal experiences, and develop more adaptive ways of responding to psychological pain.

One psychological construct that may be especially relevant to both high-risk behavior and suicidality is alexithymia. Alexithymia is generally characterized by difficulty identifying feelings, difficulty describing emotions to others, and an externally oriented cognitive style. Individuals with elevated alexithymia may experience emotional arousal without being able to clearly recognize, differentiate, or communicate what they are feeling. This impairment can interfere with emotion regulation because adaptive regulation depends in part on the ability to identify and label internal emotional states. In adolescence, when emotional intensity and interpersonal sensitivity are already heightened, alexithymic characteristics may increase vulnerability to maladaptive coping strategies. Research has shown that alexithymia is associated with emotional and behavioral problems among young people and may represent a clinically meaningful vulnerability factor across different developmental and psychosocial contexts (17, 18). It has also been proposed as a marker associated with unfavorable psychological outcomes in clinical populations (19).

The relevance of alexithymia becomes particularly important when considering high-risk behavior. Adolescents who have difficulty recognizing and expressing their emotions may be more likely to regulate distress through behavior rather than through verbal, interpersonal, or reflective means. Risk-taking, substance use, self-injury, and other impulsive behaviors may consequently function as attempts to reduce internal tension or escape from poorly understood affective states. Empirical evidence supports this interpretation. Alexithymia has been identified as a predictor of the tendency toward high-risk behaviors, with perceived social support also playing an important mediating role (20). A systematic review and meta-analysis further demonstrated significant associations between alexithymia and non-suicidal self-injury as well as risky alcohol use, reinforcing the view that difficulties in emotional awareness and processing may contribute to maladaptive behavioral regulation (21). Accordingly, reducing alexithymia may be an important therapeutic target in adolescents who are vulnerable to both high-risk behaviors and suicidal thoughts.

Interventions designed to increase present-moment awareness and improve the regulation of internal experiences may be particularly suitable for such adolescents. Mindfulness is commonly conceptualized as intentional, nonjudgmental attention to present-moment experience. Through repeated practice, individuals are trained to observe thoughts, feelings, bodily sensations, and impulses without automatically reacting to them. This process may weaken habitual patterns of experiential avoidance and impulsive responding while increasing emotional awareness, attentional control, and psychological flexibility. Mindfulness-based approaches have been applied to a wide range of psychological problems, including depression, substance-related difficulties, emotional dysregulation, and suicidal thinking. Evidence from Iranian studies suggests that mindfulness-based cognitive therapy can reduce depressive symptoms, rumination, and difficulties in emotion regulation (22). Mindfulness interventions have also demonstrated beneficial effects on experiential avoidance and cognitive emotion regulation among individuals receiving treatment for substance-related problems (23).

The effects of mindfulness may extend beyond symptom reduction to strengthening self-regulatory beliefs and adaptive coping. Mindfulness-based education has been associated with improved self-efficacy among individuals with substance-use disorders, suggesting that increased awareness and nonreactivity may help individuals develop greater confidence in managing challenging internal and external situations (24). Similar benefits have been reported in other populations, including improvements in perceived self-efficacy following mindfulness-related interventions (25, 26). These effects are clinically relevant for adolescents with high-risk tendencies because low self-efficacy and poor perceived control may intensify reliance on avoidance-based or impulsive behavior. By learning to observe urges and emotional states without immediate behavioral enactment, adolescents may become better able to create a psychological pause between internal experience and action.

Mindfulness-based interventions have also shown promise in relation to suicidal ideation. Mindfulness-based cognitive therapy has been reported to improve coping strategies and reduce depression and suicidal thoughts in student populations (27). More recent evidence similarly

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suggests that mindfulness-based cognitive therapy can reduce suicidal thoughts while strengthening resilience among psychologically burdened caregivers (28). Although these populations differ from adolescents with high-risk tendencies, the underlying mechanisms may be transferable. Mindfulness may reduce the dominance of repetitive negative thinking, increase tolerance of distressing affective states, and help individuals perceive suicidal thoughts as transient mental events rather than commands or inevitable truths. This decentered relationship with cognition can be especially important when suicidal ideation is driven by rigid cognitive patterns, emotional overwhelm, or perceived inability to escape from distress.

Another intervention that may be particularly relevant is Acceptance and Commitment Therapy (ACT), especially when integrated with compassion-based principles. ACT is grounded in the concept of psychological flexibility and aims to help individuals remain in contact with present-moment experience while behaving in ways that are consistent with personally chosen values. Core therapeutic processes include acceptance, cognitive defusion, present-moment awareness, self-as-context, values clarification, and committed action. Rather than attempting to suppress, challenge, or eliminate every distressing thought or emotion, ACT teaches individuals to alter their relationship with internal experiences so that difficult cognitions and emotions exert less control over behavior. This approach has demonstrated efficacy for psychological distress in various clinical populations, including individuals coping with chronic health conditions and anxiety-related difficulties (29, 30).

The incorporation of compassion may further enhance the effects of ACT. Self-compassion involves responding to personal suffering with kindness, understanding, and a recognition that distress is part of the shared human experience. Compassion-based approaches may reduce harsh self-criticism, shame, and avoidance while strengthening emotional tolerance and supportive self-responding. Research has demonstrated that self-compassion training can improve psychological well-being in demanding professional contexts (31), while compassion-oriented interventions have also been associated with reductions in anxiety symptoms (32). More broadly, compassion training may help individuals feel psychologically safer when confronting difficult experiences, thereby reducing defensive avoidance and promoting more adaptive engagement with emotions (33). These mechanisms are directly relevant to adolescents with alexithymia, who may have difficulty approaching internal emotional states, and to adolescents with suicidal thoughts, who may experience intense self-criticism, hopelessness, or emotional pain.

Compassion-based ACT may therefore offer a complementary pathway to mindfulness. Whereas mindfulness training places strong emphasis on awareness, observation, and nonjudgmental contact with present experience, compassion-based ACT combines acceptance and mindful awareness with explicit values orientation, cognitive defusion, committed action, and a compassionate stance toward distress. Evidence from individuals with a history of suicide attempts suggests that self-compassion-based ACT can improve emotion regulation and reduce maladaptive repetitive thinking such as rumination (34). Such findings are important because rumination, emotional dysregulation, and self-critical cognition can intensify suicidal ideation and hinder adaptive problem solving. Through values clarification and committed action, ACT may also help adolescents shift attention from immediate emotional escape toward meaningful, longer-term behavioral directions.

The need to compare these interventions is further strengthened by the heterogeneity of mechanisms underlying adolescent high-risk behavior. Some adolescents may primarily struggle with impulsive reactions to emotional arousal, making mindfulness-based attention and response inhibition particularly relevant. Others may experience entrenched avoidance, self-criticism, and disconnection from personally meaningful goals, in which case compassion-based ACT may provide additional benefits. Studies of behavioral and emotional interventions indicate that different approaches may improve functioning through partially overlapping but distinct mechanisms, and direct comparative research can help clarify which intervention is more effective for particular outcomes (9). Existing evidence supports the value of mindfulness for emotion regulation, experiential avoidance, self-efficacy, depression, and suicidal thoughts, while compassion- and acceptance-based approaches have shown beneficial effects

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on anxiety, emotional regulation, psychological adjustment, and maladaptive cognitive processes (22, 24, 32, 34).

Despite this growing literature, relatively limited attention has been given to directly comparing mindfulness training with compassion-based ACT in adolescents who already demonstrate a tendency toward high-risk behavior and who may therefore represent a particularly vulnerable group. This gap is clinically meaningful because alexithymia and suicidal ideation are not only important psychological outcomes in their own right but may also contribute to the maintenance or escalation of high-risk behaviors. Adolescents who cannot effectively identify and communicate emotional states may resort to maladaptive behavioral strategies, while those experiencing suicidal ideation may be at increased risk for self-harm and severe psychological deterioration. Moreover, the coexistence of high-risk tendencies, emotional processing deficits, and suicidal cognition suggests the need for interventions that target both awareness of internal experience and flexible, adaptive responding. Comparative evidence can therefore contribute to selecting more appropriate interventions for counseling and mental health services working with vulnerable adolescents.

Accordingly, the aim of the present study was to compare the effectiveness of mindfulness training and compassion-based Acceptance and Commitment Therapy on alexithymia and suicidal ideation in adolescents with a tendency toward high-risk behaviors.

2. Methods and Materials

2.1. Study Design and Participants

The present study employed a quasi-experimental pretest–posttest design with two intervention groups and one control group. The statistical population consisted of all adolescents with a tendency toward high-risk behaviors in District 5 of Ardabil, Iran, who had referred to counseling centers during the first three months of the study period in 2026 (March–June 2026). Participants were recruited using convenience sampling from among adolescents who met the eligibility criteria for participation in the study. Eligible adolescents were informed about the objectives and procedures of the study, the voluntary nature of participation, confidentiality of the collected information, and their right to withdraw from the study at any stage without adverse consequences. Those who agreed to participate entered the study after the required informed consent procedures had been completed. A total of 45 eligible adolescents were selected and randomly assigned to three groups: the mindfulness training group (n = 15), the compassion-based Acceptance and Commitment Therapy group (n = 15), and the control group (n = 15). Before the interventions, participants in all three groups completed the measures of alexithymia and suicidal ideation as the pretest. The first experimental group subsequently participated in the mindfulness training program, whereas the second experimental group received compassion-based Acceptance and Commitment Therapy. The control group did not receive either of the study interventions during the intervention period. Following completion of the intervention programs, the same psychological measures were administered to all participants as the posttest. The quantitative data obtained from the pretest and posttest assessments were subsequently analyzed to determine the effectiveness of the interventions and to compare their effects on alexithymia and suicidal ideation.

2.2. Data Collection Tools

Toronto Alexithymia Scale-20. Alexithymia was assessed using the 20-item Toronto Alexithymia Scale (TAS-20), developed by Bagby et al. (1994). The instrument consists of 20 items rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Items 4, 5, 10, 18, and 19 are reverse-scored, with higher total scores representing greater levels of alexithymia. Previous psychometric investigations have demonstrated satisfactory internal consistency for the scale, with a Cronbach's alpha coefficient of .85. Concurrent validity of the TAS-20 has also been supported through its relationships with measures of emotional intelligence, psychological well-being, and psychological distress. In the Persian validation study, the total alexithymia score demonstrated significant negative correlations with emotional intelligence ($r = -.80$, $p < .001$) and psychological well-being ($r = -.78$, $p < .001$), as well as a significant positive correlation with psychological distress ($r = .44$, $p < .001$), supporting the concurrent validity of the instrument (Besharat, 2009). In the present study, the TAS-

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20 demonstrated excellent internal consistency, with a Cronbach's alpha coefficient of .945.

Beck Scale for Suicide Ideation. Suicidal ideation was assessed using the Beck Scale for Suicide Ideation, originally developed to identify and quantify the severity of attitudes, behaviors, and plans related to suicide during the preceding week (Beck, 1961). The self-report instrument contains 19 items, each rated on a 3-point scale ranging from 0 to 2, yielding a total score ranging from 0 to 38. According to the scoring system used in the present study, scores from 0 to 5 indicate the presence of suicidal thoughts at a relatively low level, scores from 6 to 19 represent greater readiness or risk for suicidal behavior, and scores from 20 to 38 indicate a substantial level of suicidal intent. The scale has demonstrated strong associations with established clinical measures of depression and suicidality. Reported correlations with clinical measures of suicidal tendency have ranged from .90 among hospitalized patients to .94 among outpatients. Correlations with the suicide-related item of the Beck Depression Inventory have ranged from .58 to .69, while correlations with the Beck Hopelessness Scale and Beck Depression Inventory have ranged from .64 to .75. Previous investigations have reported Cronbach's alpha coefficients ranging from .87 to .97 and a one-week test–retest reliability coefficient of .54, providing evidence for the reliability of the scale (Beck et al., 1988). In an Iranian psychometric investigation involving 100 male participants aged 19 to 28 years who were recruited through convenience sampling, the scale correlated .76 with the depression scale of the Goldberg measure. Internal consistency based on Cronbach's alpha was reported as .95, while split-half reliability was .75, further supporting the reliability and validity of the Persian version of the instrument (Hosseini et al., 2019).

2.3. Intervention Protocols

Mindfulness Training. The mindfulness intervention was conducted over eight sessions and progressively trained participants to develop nonjudgmental awareness of present-moment internal and external experiences. The first session focused on introducing the participants and therapist, establishing the objectives of the program, familiarizing participants with the concept of mindfulness, conducting an initial mindfulness exercise, and practicing the body scan technique, with the primary therapeutic objective of increasing moment-to-moment awareness; participants were instructed to practice a brief three-breath exercise three times per day as homework. The second session emphasized greater attention to bodily experiences and improved awareness of daily events through body scan meditation, exercises involving awareness of thoughts and emotions, and systematic recording of pleasant events; homework consisted of maintaining a daily record of pleasant experiences. The third session introduced breathing and stretching exercises, mindful walking, and identification and recording of unpleasant events, with particular emphasis on maintaining mindful attention to breathing; participants were asked to identify and document unpleasant experiences and continue previously learned practices. The fourth session concentrated on learning to use breathing as an anchor for present-moment awareness through sitting meditation and the three-minute breathing space, with homework involving regular sitting meditation. The fifth session addressed acceptance and willingness to allow thoughts, emotions, and bodily sensations to be present without attempting to suppress or avoid them. Sitting meditation was practiced with deliberate attention to thoughts, feelings, and physical sensations, and participants were encouraged to observe rather than automatically react to these internal experiences. The sixth session increased awareness of the relationship between breathing, bodily sensations, mood, and cognition. Participants practiced observing moods and thoughts, developing alternative perspectives toward internal experiences, and identifying early indicators of psychological relapse or deterioration. The seventh session focused on self-care, awareness of relationships between daily activities and mood, systematic monitoring of thoughts and feelings, recognition of warning signs of relapse, and development of adaptive coping strategies; participants were encouraged to formulate and practice individualized relapse-prevention strategies. The eighth and final session emphasized the maintenance of regular mindfulness practice and balance in everyday life. Body scan meditation and sitting meditation were reviewed, the entire intervention program was consolidated, relapse-prevention principles were reinforced, and participants were encouraged to continue using mindfulness skills independently after completion of the intervention. At the

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conclusion of this session, posttest measures were administered.

Compassion-Based Acceptance and Commitment Therapy. The compassion-based Acceptance and Commitment Therapy intervention was delivered through a preliminary assessment meeting followed by eight therapeutic sessions organized around the core processes of acceptance, cognitive defusion, present-moment awareness, self-as-context, clarification of values, committed action, and the cultivation of a less judgmental and more compassionate relationship with difficult internal experiences. During the preliminary meeting, rapport was established, the purpose and procedures of the intervention were explained, trust and cooperation were facilitated, and the pretest questionnaires were administered. The first therapeutic session was devoted to introducing the therapist and group members, establishing the therapeutic relationship, presenting the general principles and objectives of Acceptance and Commitment Therapy, explaining the main treatment processes, and establishing rules for participation in group sessions. The second session began with a review of the previous meeting and participant feedback, followed by exploration of participants' experiences, their evaluations of those experiences, their willingness to change, and their expectations regarding treatment. The concept of creative hopelessness was introduced to help participants recognize the limitations of persistent attempts to control or eliminate distressing private experiences, and homework was assigned to encourage observation of these patterns. The third session focused on identifying ineffective experiential-control strategies and examining their long-term consequences. Acceptance was explained and differentiated from defeat, hopelessness, denial, resignation, and passive tolerance, and participants explored the challenges associated with making room for distressing thoughts and emotions while responding to themselves with greater understanding and compassion. The fourth session addressed behavioral commitment, cognitive fusion, attachment to the conceptualized self, and cognitive defusion. Participants practiced defusion techniques designed to reduce the literal influence of distressing thoughts and emotions, interrupt maladaptive verbal processes, and change the function of problematic cognitions rather than attempting to eliminate them. The fifth session emphasized differentiation among the observing self, internal experiences, and overt behavior. Participants were introduced to self-as-context and practiced observing thoughts, emotions, sensations, breathing, and ongoing activities without judgment, while developing a more accepting and compassionate stance toward difficult psychological experiences. The sixth session focused on identifying and clarifying personally important life values, strengthening awareness of the individual's capacity to choose value-consistent directions, and practicing present-focused mindfulness skills. The seventh session involved a more detailed examination of individual values and clarified the distinction among values, goals, and common errors in value selection. Participants identified internal and external barriers to living consistently with their values, shared important personal values and related obstacles with the group, and formulated specific, assessable, realistic, and personally meaningful goals aligned with their identified values. Each participant then selected three particularly important values, identified goals corresponding to those values, and specified concrete behaviors through which those goals could be pursued; the risks of excessive attachment to outcomes rather than value-consistent action were also discussed. The eighth session focused on willingness, commitment, and committed action. Participants identified behavioral patterns consistent with their chosen values, developed commitments to implement these behaviors in daily life, reviewed their therapeutic experiences and achievements, discussed expectations that had or had not been fulfilled, and consolidated strategies for continuing acceptance-, compassion-, mindfulness-, and value-based practices beyond the intervention period. At the end of the intervention, participants completed the posttest assessments.

2.4. Data Analysis

After completion of data collection, the questionnaires were reviewed and the obtained scores were prepared for statistical analysis. Descriptive statistics were used to summarize the study variables and characterize the distribution of alexithymia and suicidal ideation scores across the mindfulness training, compassion-based Acceptance and Commitment Therapy, and control groups. Means and standard deviations were calculated for the

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principal quantitative variables. To examine the overall effects of group membership on the dependent variables and to determine whether the intervention groups differed from the control group and from each other, multivariate analysis of variance (MANOVA) was employed. The simultaneous inclusion of alexithymia and suicidal ideation as dependent variables made it possible to assess the multivariate effect of the interventions while accounting for the relationship between the outcome variables. Where the overall multivariate effect was statistically significant, follow-up univariate comparisons were used to determine the specific outcome variables on which the groups differed, and pairwise comparisons were used to clarify differences between the two intervention conditions and the control condition. Statistical significance was evaluated at an alpha level of .05.

3. Findings and Results

The study included 45 adolescents, with 15 participants in the mindfulness training group, 15 in the compassion-based Acceptance and Commitment Therapy (ACT) group, and 15 in the control group; thus, each group accounted for 33.33% of the total sample. Regarding age, 24 participants (53.33%) were between 15 and 16 years of age, with eight participants in each group, whereas 21 participants (46.67%) were between 17 and 18 years of age, with seven participants in each group. Regarding educational level, participants were enrolled in the first, second, or third grade of lower secondary education. In the mindfulness group, 3 participants (20.00%) were in the first grade, 8 (53.33%) were in the second grade, and 4 (26.67%) were in the third grade. The control group demonstrated the same distribution. In the compassion-based ACT group, the majority of participants were also in the second grade. Overall, the demographic distributions indicated substantial comparability among the three study groups in terms of age and educational level.

Table 1

Descriptive Statistics for Alexithymia and Suicidal Ideation Scores by Group and Assessment Stage

Variable	Group	Assessment	Mean	SD
Alexithymia	Mindfulness training	Pretest	46.93	7.22
		Posttest	45.06	7.90
	Compassion-based ACT	Pretest	51.40	8.65
		Posttest	50.66	8.82
	Control	Pretest	49.46	5.95
		Posttest	48.53	5.97
Suicidal ideation	Mindfulness training	Pretest	66.40	23.14
		Posttest	67.20	22.87
	Compassion-based ACT	Pretest	56.86	7.77
		Posttest	67.26	7.93
	Control	Pretest	70.80	9.33
		Posttest	71.33	8.67

As shown in Table 1, the mean alexithymia score in the mindfulness training group decreased from 46.93 (SD = 7.22) at pretest to 45.06 (SD = 7.90) at posttest. In the compassion-based ACT group, the mean alexithymia score changed from 51.40 (SD = 8.65) at pretest to 50.66 (SD = 8.82) at posttest, whereas the control group demonstrated only a small change from 49.46 (SD = 5.95) to 48.53 (SD = 5.97). With regard to suicidal ideation, descriptive differences were also observed across the three groups between the pretest and posttest assessments. Because the groups differed to some extent in their baseline scores, inferential comparisons were conducted while statistically controlling for pretest scores. Therefore, the subsequent covariance analyses provide a more appropriate estimate of the intervention effects than a direct comparison of the unadjusted posttest means.

Prior to conducting the inferential analyses, the statistical assumptions were examined. The absolute values of skewness and kurtosis for the pretest and posttest scores of alexithymia and suicidal ideation were below 2.00,

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indicating no substantial departure from univariate normality. The Kolmogorov–Smirnov tests were nonsignificant for alexithymia at pretest ($p = .200$) and posttest ($p = .108$), as well as for suicidal ideation at pretest ($p = .088$) and posttest ($p = .200$), supporting the assumption of normality. The homogeneity of error variances was examined using Levene's test. The results were nonsignificant for alexithymia, $F(2, 42) = 0.49$, $p = .741$, and suicidal ideation, $F(2, 42) = 0.26$, $p = .898$, indicating that the homogeneity-of-variance assumption was satisfied. In addition, the homogeneity of regression slopes was examined by testing the interactions between group membership and the corresponding pretest scores. These interaction effects were nonsignificant for alexithymia, $F = 2.99$, $p = .250$, and suicidal ideation, $F = 0.94$, $p = .443$. Thus, the relationship between the covariates and posttest scores did not significantly differ across the three groups. Collectively, these findings indicated that the principal assumptions required for covariance-based comparisons were adequately satisfied.

Table 2

Analysis of Covariance for Posttest Alexithymia and Suicidal Ideation Scores After Controlling for Pretest Scores

Dependent Variable	Effect	df	Error df	F	p	Partial η^2
Alexithymia	Group	2	41	41.51	< .001	.669
Suicidal ideation	Group	2	41	7.17	.002	.259

As presented in Table 2, after controlling for the corresponding pretest scores, a statistically significant group effect was found for alexithymia, $F(2, 41) = 41.51$, $p < .001$, partial $\eta^2 = .669$. This effect size indicates that approximately 66.9% of the adjusted variance in posttest alexithymia scores was associated with group membership after accounting for baseline scores. A statistically significant group effect was also observed for suicidal ideation, $F(2, 41) = 7.17$, $p = .002$, partial $\eta^2 = .259$, indicating that approximately 25.9% of the adjusted variance in posttest suicidal ideation was attributable to differences among the mindfulness training, compassion-based ACT, and control groups. These findings demonstrate that the interventions produced significant overall effects on both psychological outcomes. Pairwise post hoc comparisons were subsequently conducted to determine which groups differed significantly from one another.

Table 3

Post Hoc Pairwise Comparisons of Adjusted Posttest Scores Across Study Groups

Dependent Variable	Group I	Group J	Mean Difference (I − J)	SE	p	95% CI
Suicidal ideation	Compassion-based ACT	Mindfulness	1.24	0.66	.060	[−0.10, 2.58]
	Compassion-based ACT	Control	−2.50*	0.66	.001	[−3.88, −1.12]
	Mindfulness	Compassion-based ACT	−1.24	0.66	.060	[−2.58, 0.10]
	Mindfulness	Control	−1.25	0.68	.070	[−2.64, 0.13]
	Control	Compassion-based ACT	2.50*	0.66	.001	[1.12, 3.88]
	Control	Mindfulness	1.25	0.68	.070	[−0.13, 2.64]
Alexithymia	Compassion-based ACT	Mindfulness	1.23	0.62	.054	[−0.02, 2.49]
	Compassion-based ACT	Control	−5.39*	0.62	< .001	[−6.65, −4.14]
	Mindfulness	Compassion-based ACT	−1.23	0.62	.054	[−2.49, 0.02]
	Mindfulness	Control	−4.16*	0.62	< .001	[−5.41, −2.90]
	Control	Compassion-based ACT	5.39*	0.62	< .001	[4.14, 6.65]
	Control	Mindfulness	4.16*	0.62	< .001	[2.90, 5.41]

As shown in Table 3, the pairwise comparisons provided further evidence of differential treatment effects. For alexithymia, the adjusted posttest score of the compassion-based ACT group was significantly lower than that of the control group (mean difference = −5.39, SE = 0.62, $p < .001$), and the mindfulness group also demonstrated a significantly lower adjusted score than the control group (mean difference = −4.16, SE = 0.62, $p < .001$). The

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difference between the mindfulness and compassion-based ACT groups did not reach the conventional level of statistical significance (mean difference = −1.23, SE = 0.62, p = .054), indicating that both interventions produced broadly comparable effects on alexithymia. For suicidal ideation, compassion-based ACT differed significantly from the control group (mean difference = −2.50, SE = 0.66, p = .001). The comparison between mindfulness training and compassion-based ACT approached but did not reach the .05 significance threshold (mean difference = −1.24, SE = 0.66, p = .060), while the mindfulness-control comparison was also nonsignificant at the .05 level (mean difference = −1.25, SE = 0.68, p = .070). Overall, the adjusted analyses indicated that both psychological interventions were associated with favorable changes in the study outcomes relative to the control condition, with particularly clear between-group effects for alexithymia and evidence of differential effects on suicidal ideation.

4. Discussion and Conclusion

The present study aimed to compare the effectiveness of mindfulness training and compassion-based Acceptance and Commitment Therapy (ACT) on alexithymia and suicidal ideation among adolescents with a tendency toward high-risk behaviors. The findings indicated that group membership had a statistically significant effect on both alexithymia and suicidal ideation after controlling for pretest scores. For alexithymia, both the mindfulness training group and the compassion-based ACT group demonstrated significantly more favorable posttest outcomes than the control group, while the difference between the two intervention groups did not reach statistical significance. For suicidal ideation, the overall group effect was also significant, indicating that the interventions influenced this outcome; however, the pairwise comparisons showed that the clearest statistically significant difference was between the compassion-based ACT group and the control group, whereas the direct comparison between mindfulness training and compassion-based ACT did not reach the conventional .05 level. Taken together, the results support the usefulness of both interventions for adolescents who are vulnerable to high-risk behavior, while also suggesting that the magnitude and pattern of treatment effects may vary according to the psychological outcome being considered.

The effectiveness of mindfulness training in reducing alexithymia can be explained through its direct emphasis on awareness of internal experience. Alexithymia is characterized by difficulty identifying feelings, difficulty describing emotional states, and a tendency toward externally oriented thinking. Mindfulness practice repeatedly directs attention toward present-moment thoughts, emotions, and bodily sensations without immediate judgment or avoidance. Through practices such as body scanning, mindful breathing, sitting meditation, and observation of pleasant and unpleasant experiences, adolescents may gradually learn to recognize subtle emotional and physiological cues that previously remained undifferentiated. This increased interoceptive and emotional awareness can facilitate more accurate labeling and understanding of affective states. Such an interpretation is consistent with studies showing that mindfulness-based interventions can improve cognitive emotion regulation and reduce experiential avoidance (23). It is also compatible with evidence that mindfulness-based cognitive therapy reduces emotion-regulation difficulties and maladaptive repetitive thinking (22). Since alexithymia is closely linked to deficits in emotional awareness and regulation, the structured cultivation of nonjudgmental attention provides a plausible mechanism for the observed improvement.

The finding regarding alexithymia is also supported by previous evidence demonstrating that this construct is closely associated with maladaptive behavioral and emotional outcomes. Alexithymia has been linked to emotional-behavioral problems in young populations (17) and to difficulties in attachment and interpersonal adjustment among adolescents and young adults (18). Moreover, alexithymia has been associated with non-suicidal self-injury and risky alcohol use, suggesting that impaired emotional identification may contribute to behavioral strategies used to manage poorly understood distress (21). In the context of adolescents with high-risk tendencies, this relationship is particularly relevant because emotional ambiguity can make impulsive or risky behavior more likely when internal states become intense. The finding that alexithymia predicts greater tendency toward high-risk behavior further supports this interpretation (20). Therefore, reductions in alexithymia following mindfulness training may not only represent an improvement in emotional

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processing but may also have broader implications for decreasing reliance on maladaptive behavioral coping.

Compassion-based ACT also produced favorable effects on alexithymia, and this result can be understood through the therapy's emphasis on acceptance, cognitive defusion, self-as-context, values, and compassionate engagement with distress. Individuals with alexithymic characteristics may avoid or suppress affective experiences because emotions are perceived as confusing, threatening, or overwhelming. ACT does not require individuals to eliminate these experiences; instead, it teaches them to approach thoughts, emotions, and bodily states with openness and willingness. When compassion is integrated into this framework, difficult internal experiences can be approached with less self-criticism and less defensive avoidance. This may make emotional experiences more accessible and easier to identify and describe. Evidence that compassion-oriented interventions can improve psychological well-being and emotional adaptation is consistent with this explanation (31, 32). The role of compassion in reducing psychological threat and defensive responding has also been emphasized in other contexts (33). Thus, compassion-based ACT may reduce alexithymia by creating a more psychologically safe context in which adolescents can observe and tolerate emotions rather than disengaging from them.

The absence of a statistically significant difference between mindfulness training and compassion-based ACT for alexithymia is also theoretically plausible. Both interventions contain substantial overlap in their focus on present-moment awareness, nonjudgmental observation, reduced experiential avoidance, and a more flexible relationship with internal experience. Mindfulness training emphasizes sustained attention to thoughts, feelings, sensations, and bodily experiences, whereas ACT also uses mindfulness processes but places them within a broader model of psychological flexibility and values-based action. Because both interventions directly address avoidance and emotional disengagement, each may improve the core processes implicated in alexithymia. This convergence may explain why both groups improved relative to the control group but did not differ significantly from one another. The result is compatible with findings showing that both mindfulness-based and acceptance-based interventions can improve emotion regulation, coping, and psychological adjustment across different populations (24, 29, 30).

The second major finding concerned suicidal ideation. The significant overall group effect indicates that psychological intervention was relevant to changes in suicidal thinking among adolescents with a tendency toward high-risk behavior. This is clinically important because suicidal ideation is among the most serious psychological risks in adolescence and can coexist with self-harm, behavioral dysregulation, hopelessness, and other forms of psychological distress. Previous research has demonstrated that suicidal ideation is influenced by a wide range of psychological, social, and environmental factors (14, 16). It has also been associated with severe psychopathological symptoms and self-harm processes (13). Adolescents experiencing high-risk tendencies may therefore benefit from interventions that decrease emotional avoidance, reduce cognitive entanglement with distressing thoughts, and improve adaptive coping with psychological pain.

The beneficial role of mindfulness in relation to suicidal ideation is supported by earlier findings. Mindfulness-based cognitive therapy has been shown to reduce suicidal thoughts while improving coping strategies and depressive symptoms (27). Similarly, mindfulness-based cognitive therapy has been associated with reduced suicidal thoughts and greater resilience in psychologically burdened individuals (28). Mindfulness may influence suicidal cognition through several mechanisms. First, it can reduce automatic identification with negative thoughts by helping individuals observe cognitions as temporary mental events rather than objective realities. Second, it can reduce rumination, a process that can prolong and intensify negative affect. Third, mindfulness can increase awareness of early changes in mood and bodily arousal, allowing individuals to respond before distress escalates. Finally, present-moment awareness may interrupt repetitive future-oriented catastrophizing and hopelessness. These mechanisms are especially relevant because suicidal ideation often becomes more dangerous when negative thoughts are experienced as uncontrollable, permanent, and self-defining.

The findings can also be interpreted in relation to the role of meaning and psychological connectedness in suicidality. Suicidal individuals may experience diminished meaning in life or difficulty maintaining a sense of direction and purpose

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under conditions of intense distress (15). Mindfulness may indirectly reduce such vulnerability by increasing contact with present experience and reducing rigid attachment to negative cognitive narratives. However, compassion-based ACT may offer an additional mechanism through explicit values clarification and committed action. ACT encourages individuals to identify personally meaningful directions and to take concrete steps toward them even when painful thoughts or emotions remain present. In this sense, treatment does not depend on complete symptom removal before meaningful behavior becomes possible. This may be particularly valuable for adolescents who experience suicidal ideation, because reconnecting with values can provide behavioral alternatives to avoidance, withdrawal, or self-destructive coping.

The significant pairwise difference between compassion-based ACT and the control condition for suicidal ideation is consistent with evidence that acceptance- and compassion-based approaches can reduce processes closely related to suicide risk. In individuals with a history of suicide attempts, self-compassion-based ACT has been shown to reduce rumination and improve emotion regulation (34). This is especially relevant because rumination can maintain suicidal thinking by repeatedly directing attention toward distress, failure, perceived burdensomeness, or hopeless conclusions. Cognitive defusion may reduce the literal control of suicidal thoughts, while acceptance can reduce the secondary struggle produced by efforts to suppress distress. At the same time, self-compassion may counter self-criticism, shame, and punitive internal dialogue, all of which can intensify psychological suffering. Evidence that compassion-based interventions reduce anxiety and improve adaptive emotional functioning further supports this mechanism (32). The combination of acceptance, compassion, and values-based commitment may therefore be particularly useful when suicidal ideation is embedded within a broader pattern of emotional avoidance and self-critical cognition.

The direct comparison between mindfulness training and compassion-based ACT did not reach statistical significance for suicidal ideation, although the descriptive pattern suggested that their effects were not identical. This finding should be interpreted conservatively. It suggests that both interventions may target overlapping pathways related to suicidal thinking, but the present sample did not provide sufficient evidence to establish the superiority of one approach over the other. Mindfulness and ACT share present-focused awareness and reduced cognitive fusion, while ACT adds explicit work on values, acceptance, self-as-context, and committed action. Therefore, any differential effect may depend on the specific mechanisms maintaining suicidal ideation in a given adolescent. For individuals whose suicidal thoughts are primarily associated with rumination and emotional reactivity, mindfulness may be particularly relevant. For those whose difficulties are more strongly connected to avoidance, self-criticism, loss of meaning, or disconnection from values, compassion-based ACT may offer additional therapeutic leverage.

The findings should also be considered within the broader context of adolescent high-risk behavior. High-risk tendencies are multidetermined and influenced by personal, familial, social, and environmental conditions (1, 2). Low self-esteem, limited perceived social support, and weak social capital are associated with greater risk behavior among adolescents (5), while contextual exposure and environmental vulnerability can also contribute to maladaptive behavior (6). Iranian evidence similarly indicates that behavioral problems and risk-taking are shaped by multiple psychosocial factors and may respond to structured psychological interventions (7, 9). Qualitative evidence concerning cigarette-smoking tendencies also highlights the combined role of psychological, interpersonal, and contextual influences (8). Therefore, improvements in alexithymia and suicidal ideation should not be interpreted in isolation; rather, they may represent changes in underlying psychological processes that contribute to broader patterns of risk behavior.

The observed findings are also compatible with the view that strengthening self-regulation and adaptive coping may reduce vulnerability to high-risk behavior. Mindfulness-based interventions have been associated with enhanced self-efficacy and improved coping-related processes (24-26). Increased self-efficacy may help adolescents perceive themselves as more capable of tolerating distress, resisting impulses, and selecting alternative responses. Similarly, ACT promotes behavioral persistence in the presence of discomfort, which may reduce the tendency to escape distress through harmful or risky behavior. This interpretation is consistent with evidence that social

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competence and adaptive behavioral skills can reduce risk-taking tendencies among adolescents (7). It also aligns with research highlighting the role of aggression, emotional instability, and behavioral dysregulation in adolescent adjustment (10). Thus, the interventions used in the present study may be understood as strengthening higher-order self-regulatory capacities rather than merely reducing isolated symptoms.

The clinical significance of these findings becomes clearer when the potentially serious consequences of adolescent high-risk behavior are considered. Such behaviors can compromise health, educational progress, social functioning, and long-term psychological adjustment (4). They may also co-occur with suicidal thinking and self-injurious behavior, which require timely prevention and intervention (11, 12). The association between alexithymia and adverse psychological outcomes further reinforces the importance of targeting emotional awareness in this population (19). Taken together, the findings suggest that interventions that simultaneously enhance awareness, acceptance, emotional identification, self-compassion, and values-guided behavior may be appropriate for adolescents who present with complex patterns of risk-taking and psychological distress.

Several limitations should be considered when interpreting the findings. The sample was relatively small and consisted of adolescents recruited from counseling centers in one district of Ardabil, which limits the generalizability of the results to adolescents from other regions, cultural contexts, educational settings, or levels of clinical severity. Convenience sampling may also have introduced selection bias, because adolescents willing to participate in psychological interventions may differ from those who declined participation. The study relied primarily on self-report measures, which may be influenced by social desirability, recall bias, limited emotional insight, or reluctance to disclose suicidal thoughts. In addition, the study did not include a long-term follow-up assessment, so the persistence of intervention effects cannot be established. Therapist-related variables, treatment adherence, between-session practice, and possible differences in participant engagement were also not examined in detail.

Future research should replicate the study with larger and more diverse samples and should use multicenter recruitment to improve external validity. Randomized controlled trials with stronger allocation procedures, blinded outcome assessment where feasible, and longer follow-up periods would provide more robust evidence regarding the durability of treatment effects. Future studies should also investigate potential mediators and moderators, including emotion regulation, experiential avoidance, rumination, self-compassion, psychological flexibility, perceived social support, hopelessness, and meaning in life. Examining these mechanisms could clarify why some adolescents respond more strongly to mindfulness while others benefit more from compassion-based ACT. It would also be useful to include behavioral indicators of high-risk behavior, clinician-rated outcomes, parental reports, and measures of treatment adherence in addition to self-report questionnaires.

In practice, counseling centers, school-based mental health services, and adolescent psychological clinics may consider incorporating structured mindfulness and compassion-based ACT programs into services for adolescents with high-risk tendencies. Screening for alexithymia and suicidal ideation should be integrated into the assessment of adolescents who present with repeated risk-taking, emotional dysregulation, substance use, aggression, or self-harm-related concerns. Mindfulness exercises can be used to strengthen emotional awareness and reduce automatic reactivity, while compassion-based ACT techniques can be used to increase willingness to experience difficult emotions, reduce self-critical responding, clarify personal values, and promote committed action. Clinicians should adapt the intensity and content of these interventions to developmental level and suicide risk, involve family members when clinically appropriate, and ensure that adolescents with active or severe suicidal intent receive immediate risk assessment and appropriate safety-oriented care.

Authors' Contributions

All authors equally contributed to the study and to manuscript development, and all approved the final version.

Declaration

The authors declare that artificial intelligence tools were used only to assist with language editing, translation, and improvement of the manuscript's readability. All

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conceptualization, study design, data collection, data analysis, interpretation of findings, and final approval of the manuscript were performed by the authors. The authors take full responsibility for the accuracy, integrity, and originality of the content.

Transparency Statement

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Declaration of Interest

The authors report no conflict of interest.

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Ethics Considerations

The study placed a high emphasis on ethical considerations. Informed consent obtained from all participants, ensuring they are fully aware of the nature of the study and their role in it. Confidentiality strictly maintained, with data anonymized to protect individual privacy. The study adhered to the ethical guidelines for research with human subjects as outlined in the Declaration of Helsinki.

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