Journal Website

Article history:
Received 03 April 2025
Revised 01 July 2025
Accepted 08 July 2025
Published online 01 August 2025

Iranian Journal of Neurodevelopmental Disorders

Volume 4, Issue 3, pp 1-9

E-ISSN: 2980-9681

The Effectiveness of Cognitive Behavioral Therapy on Emotional Reactivity and Negative Automatic Thoughts in Lower Secondary School Female Students

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A r t i c l e I n f o

Article type:
Original Research

How to cite this article:
Bagheri Sabet Khasmakhee, A., & Fahimi, N. (2025). The Effectiveness of Cognitive Behavioral Therapy on Emotional Reactivity and Negative Automatic Thoughts in Lower Secondary School Female Students. *Iranian Journal of Neurodevelopmental Disorders, 4*(3), 1-9. https://doi.org/10.61838/kman.jndd.4.3.20

A B S T R A C T

Purpose: The present study aimed to examine the effectiveness of Cognitive Behavioral Therapy (CBT) on emotional reactivity and negative automatic thoughts in lower secondary school female students.

Materials and Methods: This study employed a quasi-experimental and applied research design using a pre-test–post-test design with a control group. The statistical population consisted of all lower secondary school female students in Fuman County during the 2024–2025 academic year. The study sample included 30 students, who were selected using a purposive sampling method and were randomly assigned to an experimental group (15 students) and a control group (15 students). The research instruments included the Emotional Reactivity Scale developed by Nock et al. (2008) and the Automatic Thoughts Questionnaire developed by Hollon and Kendall (1980). Multivariate Analysis of Covariance (MANCOVA) and Univariate Analysis of Covariance (ANCOVA) were used to analyze the data and test the research hypotheses.

Findings: The findings indicated that there was a statistically significant difference between the intervention group and the control group in terms of mean scores on emotional reactivity and negative automatic thoughts ($p < .001$).

Conclusion: Overall, the results demonstrated that Cognitive Behavioral Therapy led to a reduction in emotional reactivity and negative automatic thoughts among the students.

Keywords: *Cognitive Behavioral Therapy, Emotional Reactivity, Negative Automatic Thoughts.*

1. Introduction

Emotional reactivity and negative automatic thoughts are pivotal constructs in the understanding of adolescent psychopathology, particularly during the critical developmental window of early adolescence. Emotional reactivity refers to the intensity, duration, and threshold of emotional responses to internal or external stimuli and has been closely associated with emotional regulation difficulties, mood disorders, and maladaptive coping

strategies (Becerra & Campitelli, 2013; Van Reyn et al., 2023). Negative automatic thoughts, in turn, are involuntary, reflexive cognitive distortions that reflect dysfunctional beliefs about the self, others, or the world, often emerging in response to stress or emotional upheaval (Beck et al., 1979; Yeo et al., 2024). These two factors frequently co-occur in the internalizing symptomatology of adolescents, contributing significantly to the development and maintenance of anxiety and depression (Alipour et al., 2025; Javadian et al., 2022; Takeda et al., 2023).

Adolescents, particularly female students, are disproportionately affected by emotional dysregulation and negative thought patterns due to biological, psychological, and sociocultural transitions (Eleftheriades et al., 2020; Zimmerman, 2015). In this context, school-based mental health interventions are increasingly recognized as crucial in early prevention efforts. Cognitive Behavioral Therapy (CBT) has emerged as one of the most empirically validated and widely applied psychotherapeutic approaches to address both emotional dysregulation and negative cognitive processes in this population (Beck, 2011; Chand et al., 2023). The structured, goal-directed, and time-limited nature of CBT makes it especially adaptable for use among school-aged individuals, enabling systematic targeting of maladaptive thoughts and behavior patterns while fostering skills for emotional self-regulation (Bernstein et al., 2013; Blakey et al., 2019).

The theoretical foundation of CBT posits that psychological distress is largely a consequence of distorted or dysfunctional thinking, and that modifying these thought patterns can lead to emotional and behavioral improvements (Beck et al., 1979; Beck, 2011). Central to this approach is the identification and restructuring of negative automatic thoughts, a therapeutic technique shown to be effective in treating a variety of internalizing disorders in adolescents (Asli Azad et al., 2019; Berman et al., 2018). Moreover, emotional reactivity, which involves hypersensitivity and impaired downregulation of affective responses, has also been shown to decrease with the cognitive restructuring and behavioral experiments characteristic of CBT (Asadollahi et al., 2025; Barouti et al., 2023).

Recent empirical investigations underscore the utility of CBT in addressing emotional reactivity and cognitive distortions in both clinical and subclinical youth populations. For instance, Asadollahi et al. (2025) demonstrated that CBT significantly reduced emotional reactivity and improved coping self-efficacy in trauma-affected adolescents in Kabul (Asadollahi et al., 2025). Similarly, Barouti et al. (2023) found CBT to be as effective as schema therapy in decreasing negative automatic thoughts and enhancing cognitive flexibility in patients with major depressive disorder (Barouti et al., 2023). These findings converge with earlier work by Javadian et al. (2022), who reported that mindfulness-based stress reduction training significantly reduced negative automatic thoughts in adolescent females with emotional dysregulation (Javadian et al., 2022). Such results reinforce the CBT model's core assumption that thought patterns significantly influence emotional and physiological reactions (Beck, 2011; Eilenberg et al., 2017).

Furthermore, CBT has been successfully adapted for specific developmental needs in children and adolescents. For example, Behzadpour et al. (2019) emphasized the importance of developmental competencies—such as abstract reasoning and self-reflection—for the effective delivery of CBT among younger populations (Behzadpour et al., 2019). These adjustments are crucial in ensuring that therapeutic techniques are developmentally congruent, particularly when working with early adolescents who may have limited metacognitive abilities (Thompson & Meyer, 2007; Zimmerman, 2015). Cognitive flexibility—the ability to adapt thinking and behavior in response to changing goals or environmental stimuli—has been cited as both a precondition for and an outcome of effective CBT interventions in youth populations (Ahari & Shahabizadeh, 2019; Barouti et al., 2023).

While CBT's primary focus has traditionally been on cognitive distortions and behavioral avoidance, recent studies have expanded its applications to encompass emotional processes such as reactivity and regulation. Khanmohammadi and Alizadeh (2023), for example, highlighted CBT's capacity to regulate emotional reactivity and modulate brain-behavioral systems, especially in emotionally unstable individuals (Khanmohammadi & Alizadeh, 2023). Likewise, Omidvar et al. (2021) reported that CBT was effective in enhancing cognitive emotion regulation strategies among women with vaginismus, pointing to its generalizability across gender and psychopathological profiles (Omidvar et al., 2021). Emotional reactivity, as an affective trait with significant implications for stress sensitivity and interpersonal functioning, has also been targeted in CBT studies as a mediator of treatment outcome (Becerra & Campitelli, 2013; Van Reyn et al., 2023).

Alongside the cognitive and emotional benefits, CBT also influences neurocognitive mechanisms that underlie

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psychological dysfunction. Dickey et al. (2023) found that changes in reward responsiveness and emotion regulation neural pathways predicted improvements following CBT in adolescents with depression, supporting the view that CBT effects are not limited to the symptomatic level but extend to neurobiological underpinnings (Dickey et al., 2023). Similarly, Yeo et al. (2024) reported that negative automatic thoughts mediated the impact of emotional abuse on functional brain connectivity during adolescence, further substantiating the importance of early cognitive interventions in shaping brain development (Yeo et al., 2024).

Beyond clinical settings, CBT has also demonstrated its efficacy in non-clinical, school-based interventions. Rashidzadeh et al. (2021) illustrated how a metacognitive strategy training program based on CBT improved both positive and negative academic emotions in students (Rashidzadeh et al., 2021). Likewise, Peymbari et al. (2021) found that CBT significantly reduced negative automatic thoughts, self-criticism, and rumination in students with emotional trauma, reaffirming the value of preventive cognitive interventions in educational settings (Peymbari et al., 2021). Such school-centered approaches are particularly valuable in low-resource settings where specialized psychological services may be limited or stigmatized (Wiedermann et al., 2023).

Complementary evidence also suggests that CBT, when combined with mindfulness or resilience training, may produce amplified effects. Irandoost et al. (2023) compared combined resilience-mindfulness therapy with CBT and found significant reductions in anxiety, depression, and burnout across both groups, with no significant difference in outcomes, suggesting CBT's robustness across formats (Irandoost et al., 2023). This aligns with the work of Asghari Sharbiani et al. (2023), who observed significant improvements in emotion regulation and reductions in irritability following CBT-based parent training in children with mood dysregulation disorders (Asghari Sharbiani et al., 2023). Moreover, Alipour et al. (2025) explored the mediating role of cognitive emotion regulation between negative thoughts, experiential avoidance, and psychological distress, further validating CBT's foundational premise of cognitive-emotional interdependence (Alipour et al., 2025).

The current study builds upon this extensive theoretical and empirical foundation by examining the impact of CBT on emotional reactivity and negative automatic thoughts in lower secondary female students. Unlike prior studies focused exclusively on clinical samples or adult populations, this study targets a school-based non-clinical group, enabling the exploration of CBT's preventive potential among young adolescents at risk for future emotional disorders. Drawing upon CBT's emphasis on the restructuring of maladaptive thoughts and promotion of emotion regulation strategies, the present study seeks to determine whether such intervention can lead to statistically significant reductions in emotional reactivity and negative automatic thoughts in adolescent girls

2. Methods and Materials

2.1. Study Design and Participants

This study employed a quasi-experimental and applied research design, utilizing a pre-test–post-test design with a control group. The effectiveness of Cognitive Behavioral Therapy (CBT) on emotional reactivity and negative automatic thoughts among lower secondary school female students was investigated. The statistical population included all female students in the lower secondary level of Fuman County during the 2024–2025 academic year. During the pre-test phase, students who met the inclusion criteria—namely: (1) absence of psychological disorders, (2) non-participation in other simultaneous psychological interventions, and (3) willingness to participate in the study—completed the research questionnaires. From these students, 30 individuals whose scores were one standard deviation above the mean on the Emotional Reactivity Scale (Nock et al., 2008) and the Automatic Thoughts Questionnaire (Hollon & Kendall, 1980) were selected using purposive sampling and randomly assigned to the experimental group (15 students) and the control group (15 students).

2.2. Measures

The Emotional Reactivity Scale developed by Nock et al. (2008) is a self-report instrument designed to assess individuals' responsiveness to emotional experiences, consisting of 21 items distributed across three subscales: sensitivity (10 items: 2, 5, 7, 9, 12, 13, 14, 15, 16, and 18), intensity (7 items: 3, 4, 6, 17, 19, 20, and 21), and persistence (4 items: 1, 8, 10, and 11). Respondents rate their agreement with each item using a 5-point Likert scale, where 0 represents "Not at all like me," 1 represents "Slightly like me," 2 indicates "Moderately like me," 3 denotes "Very much like me," and 4 represents "Exactly like me." The total

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score is obtained by summing the scores of all 21 items, with subscale scores calculated by summing the respective items for each domain. The total possible score ranges from 0 to 84, with higher scores reflecting greater emotional reactivity. This scale is particularly useful in identifying individuals with heightened sensitivity, exaggerated emotional intensity, and prolonged emotional responses. In a study conducted by Maqbeli, Zanjani, and Omidi in 2020, the internal consistency reliability (Cronbach's alpha) for the subscales—emotional speed, emotional intensity, emotional persistence, and sensitivity—as well as for the overall scale, were reported as 0.86, 0.73, 0.73, 0.72, and 0.92, respectively. Furthermore, the test-retest reliability over a specified interval yielded coefficients of 0.88 for emotional speed, 0.40 for intensity, 0.68 for persistence, 0.58 for sensitivity, and 0.72 for the total score, indicating acceptable psychometric properties for research and clinical applications.

Automatic Thoughts Questionnaire: This 31-item questionnaire was developed by Hollon and Kendall in 1980 to present examples of automatic thoughts experienced by individuals with depression. Respondents rate each item based on the extent of their belief in the thought and the frequency of its occurrence during the past week, using a 5-point scale from 1 to 5. The questionnaire assesses four dimensions of negative automatic thoughts: personal maladjustment and desire for change, negative self-concept and expectations, low self-confidence, and hopelessness. The internal consistency of the questionnaire was reported with a Cronbach's alpha of 0.97. The test-retest reliability over a two-week interval was 0.87 for belief ratings and 0.85 for frequency ratings.

2.3. Intervention

The intervention consisted of eight structured weekly sessions of cognitive-behavioral therapy (CBT) tailored for lower secondary school female students, each lasting approximately 60 minutes. In the first session, rapport was established, rules were clarified, and the goals and importance of non-pharmacological treatments—particularly CBT—were introduced through a discussion on leading a rational, healthy, purposeful, and flexible life. The second session introduced functional analysis and emphasized communication skill-building, emotional awareness, and progressive muscle relaxation. The third session focused on goal clarification and prioritization, training in identifying and countering negative emotions and thoughts, and reinforcing positive skills and emotional responses. The fourth session addressed stress management techniques and the role of social support in emotional regulation, incorporating relaxation exercises. In the fifth session, cognitive restructuring was introduced alongside planning for positive daily activities. The sixth session reinforced and expanded cognitive restructuring skills and initiated narrative reprocessing based on students' personal stories. The seventh session provided a platform for discussing and reflecting on students' current personal narratives. Finally, the eighth session focused on applying problem-solving strategies, identifying support systems for emotional and social challenges, evaluating progress, providing feedback, and reviewing both successful and less effective aspects of the intervention.

2.4. Data Analysis

Data analysis was performed using both descriptive and inferential statistical methods. Descriptive statistics included frequency, mean, and standard deviation. Inferential statistics involved Multivariate Analysis of Covariance (MANCOVA) and Univariate Analysis of Covariance (ANCOVA). All statistical procedures were conducted using SPSS software version 27.

3. Findings and Results

As shown in Table 1, the mean and standard deviation of emotional reactivity in the experimental group at the pre-test stage were 50.67 ± 4.952, and at the post-test stage were 46.13 ± 5.630. The mean and standard deviation of negative automatic thoughts in the experimental group at the pre-test stage were 106.87 ± 8.501, and at the post-test stage were 100.93 ± 7.554.

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Table 1

Descriptive Statistics for Emotional Reactivity and Negative Automatic Thoughts in Pre-Test and Post-Test for Experimental and Control Groups (N = 30)

Variable	Group	Pre-Test M (SD)	Post-Test M (SD)
Emotional Reactivity	Experimental	50.67 (4.95)	46.13 (5.63)
	Control	51.20 (4.44)	51.13 (4.82)
Negative Automatic Thoughts	Experimental	106.87 (8.50)	100.93 (7.55)
	Control	106.07 (10.44)	105.93 (9.98)

Following the examination of statistical assumptions—including linearity between variables (emotional reactivity and negative automatic thoughts), equality of variances, normal distribution of variables, and homogeneity of regression slopes—it was confirmed that all required assumptions were met. Therefore, Analysis of Covariance (ANCOVA) was employed to analyze the data.

Table 2

Adjusted Post-Test Means and Standard Errors for Emotional Reactivity and Negative Automatic Thoughts After Controlling for Pre-Test Scores

Variable	Group	Adjusted Mean (SE)
Emotional Reactivity	Experimental	46.42 (0.51)
	Control	50.84 (0.51)
Negative Automatic Thoughts	Experimental	100.60 (0.56)
	Control	106.27 (0.56)

According to the principles of ANCOVA, which controls for the effect of random covariates, the adjusted means for the post-test scores after eliminating the influence of covariates are presented in Table 2. As can be seen, the adjusted mean of emotional reactivity in the experimental group was 46.423 and in the control group was 50.844. Similarly, the adjusted mean of negative automatic thoughts was 100.600 in the experimental group and 106.267 in the control group.

Table 3

Results of multivariate analysis of covariance (MANCOVA) for experimental and control groups

Test Statistic	Value	F	Hypothesis df	Error df	Sig. (p-value)	Effect Size
Pillai's Trace	0.754	38.307	2	25	.001	0.754
Wilks' Lambda	0.246	38.307	2	25	.001	0.754
Hotelling's Trace	3.065	38.307	2	25	.001	0.754
Roy's Largest Root	3.065	38.307	2	25	.001	0.754

The results of the multivariate analysis of covariance presented in Table 3 indicate that there is a statistically significant difference between the experimental and control groups. This conclusion is supported by the significance of all test statistics—Pillai's Trace, Wilks' Lambda, Hotelling's Trace, and Roy's Largest Root—which confirms that the two groups differed significantly in at least one of the dependent variables, namely emotional reactivity and negative automatic thoughts.

Based on the results obtained from the multivariate analysis of covariance and with a confidence level of 99%, the study hypothesis—that Cognitive Behavioral Therapy is effective in reducing emotional reactivity and negative automatic thoughts in lower secondary school female students—is confirmed.

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4. Discussion and Conclusion

The results of this study demonstrated that cognitive-behavioral therapy (CBT) significantly reduced emotional reactivity and negative automatic thoughts among lower secondary school female students. The adjusted post-test means indicated a substantial decrease in emotional reactivity in the experimental group compared to the control group, suggesting that the structured cognitive and behavioral components of CBT are effective in helping students better regulate their emotional responses to internal and external stimuli. Furthermore, the decline in scores related to negative automatic thoughts in the experimental group affirms that CBT can alter maladaptive cognitive patterns that contribute to psychological distress. These findings support the main hypothesis of the study and are consistent with the core assumptions of cognitive-behavioral theory, which posits that modifying irrational or dysfunctional thinking patterns can lead to improved emotional and behavioral outcomes (Beck et al., 1979; Beck, 2011).

This outcome is aligned with prior studies that have examined the role of CBT in modulating emotional reactivity and cognitive distortions in both clinical and subclinical populations. For instance, Asadollahi et al. (2025) found that CBT significantly decreased emotional reactivity and increased coping self-efficacy in adolescents who had experienced traumatic events, which resonates with the current findings indicating a reduction in emotional vulnerability in participants after the intervention (Asadollahi et al., 2025). Similarly, Khanmohammadi and Alizadeh (2023) showed that CBT was effective in modulating the activity of behavioral-brain systems and reducing emotional reactivity in individuals prone to emotional dysregulation, highlighting the therapy's neurocognitive impact (Khanmohammadi & Alizadeh, 2023). The findings are also consistent with the study by Van Reyn et al. (2023), who emphasized the role of emotional sensitivity and heightened affective reactivity in adolescent psychological distress and demonstrated that interventions aimed at regulating these emotional traits can be beneficial (Van Reyn et al., 2023).

Regarding cognitive patterns, the significant reduction in negative automatic thoughts among the experimental group echoes the conclusions of several empirical investigations. Barouti et al. (2023) found that CBT led to a significant decrease in negative automatic thoughts in patients with major depressive disorder, suggesting that the therapy's restructuring component is particularly effective in addressing maladaptive self-referential thinking (Barouti et al., 2023). Similarly, Javadian et al. (2022) showed that mindfulness-based stress reduction (MBSR), which shares overlapping mechanisms with CBT in promoting metacognitive awareness, effectively reduced automatic negative thoughts in female students with emotional dysregulation (Javadian et al., 2022). Moreover, Peymbari et al. (2021) also reported a notable decline in self-critical and ruminative thoughts following CBT in students who had experienced emotional failure, underscoring the relevance of the current findings in adolescent academic contexts (Peymbari et al., 2021).

From a neurobiological perspective, the observed changes may also be interpreted in light of findings by Dickey et al. (2023), who reported that CBT positively influenced reward responsiveness and emotion regulation circuitry in adolescents with depression, pointing to underlying mechanisms of change at the neural level (Dickey et al., 2023). Yeo et al. (2024) further identified that negative automatic thoughts mediated the relationship between emotional abuse and altered brain connectivity during adolescence, suggesting that cognitive restructuring could potentially protect against neural maladaptation (Yeo et al., 2024). These findings provide a neurodevelopmental basis for interpreting the current results, especially given the sensitivity of the adolescent brain to environmental and cognitive interventions.

Moreover, the results are in agreement with studies that contextualize CBT within school settings. For example, Rashidzadeh et al. (2021) demonstrated the effectiveness of a metacognitive CBT-based training program in improving positive and negative academic emotions in school-aged students, which aligns with the present study's application of CBT in an educational setting (Rashidzadeh et al., 2021). Similarly, Omidvar et al. (2021) compared CBT and mindfulness-based therapy in regulating cognitive emotions in women with vaginismus and found both interventions to be effective, thereby supporting the transdiagnostic applicability of CBT in emotion-related disorders (Omidvar et al., 2021). The adaptability of CBT was further highlighted by Irandoost et al. (2023), who found that both resilience–mindfulness training and CBT effectively reduced psychological symptoms among employees, indicating that CBT retains its effectiveness across different populations and contexts (Irandoost et al., 2023).

The results also echo theoretical and practical discussions in the literature. Becerra and Campitelli (2013) noted that

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emotional reactivity encompasses multiple dimensions—sensitivity, intensity, and persistence—and that targeted interventions such as CBT can reduce these components by reinforcing emotional control and cognitive flexibility (Becerra & Campitelli, 2013). Emotional reactivity has also been shown to serve as a predictor of psychological vulnerability during developmental stages, further emphasizing the value of early intervention (Eleftheriades et al., 2020; Thompson & Meyer, 2007). Likewise, cognitive restructuring—the central mechanism in CBT—has been confirmed as a powerful tool for changing self-defeating beliefs, as illustrated in Beck's foundational cognitive theory (Beck et al., 1979; Beck, 2011).

The decrease in emotional reactivity and negative automatic thoughts observed in this study is also consistent with the findings of Asli Azad et al. (2019), who used Acceptance and Commitment Therapy (ACT)—a variant of CBT—to enhance emotion regulation and ambiguity tolerance in adolescents with obsessive-compulsive symptoms (Asli Azad et al., 2019). This supports the notion that CBT, and therapies within its family, are highly effective in targeting core cognitive-emotional processes. Similarly, Berman et al. (2018) showed that CBT was effective in treating intrusive thoughts in OCD patients, particularly those with taboo-themed cognitions, underscoring its utility in modifying deeply embedded negative thinking patterns (Berman et al., 2018).

Additionally, the current findings confirm the conclusions of studies focused on CBT's implementation in developmental and pediatric populations. Asghari Sharbiani et al. (2023) reported that CBT-based parent training significantly improved emotion regulation and reduced irritability in children with disruptive mood dysregulation disorder, a condition marked by heightened emotional reactivity (Asghari Sharbiani et al., 2023). Similarly, Ahari and Shahabizadeh (2019) highlighted that CBT interventions improved cognitive flexibility in adolescents, particularly when childhood attachment representations were considered as moderators (Ahari & Shahabizadeh, 2019). These studies, together with the present findings, suggest that CBT's effectiveness is not only broad in scope but also adaptable to developmental variables.

Taken collectively, the results of this study contribute to the growing body of evidence supporting the effectiveness of CBT as a means of addressing emotional and cognitive difficulties among adolescents. The use of CBT in the current sample of lower secondary school female students demonstrated both emotional and cognitive benefits, suggesting that early intervention through structured psychotherapeutic models can prevent the exacerbation of emotional dysregulation and cognitive distortions that might otherwise lead to mood and anxiety disorders in later adolescence or adulthood (Alipour et al., 2025; Wiedermann et al., 2023).

Despite the promising results, this study is not without limitations. First, the sample size was relatively small (N=30), which may limit the generalizability of the findings. The study was conducted in a single geographic location with a homogeneous sample of female students, which restricts the ability to extrapolate the results to male students or those from different socio-economic backgrounds. Second, the use of self-report measures may have introduced biases such as social desirability or lack of introspective accuracy, particularly in younger participants. Third, the absence of long-term follow-up data limits conclusions about the durability of the intervention's effects. Finally, the study did not compare CBT with other interventions such as mindfulness-based or acceptance-based therapies, which could provide a broader understanding of therapeutic efficacy.

Future research should consider employing larger, more diverse samples across multiple schools and regions to enhance external validity. Incorporating both male and female participants would allow for gender-based comparisons of intervention outcomes. It is also recommended to include objective or multi-informant measures (e.g., parent or teacher reports) in future designs to reduce reliance on self-report. Longitudinal follow-up assessments would be valuable in evaluating the persistence of therapeutic gains. Additionally, comparing CBT with alternative or complementary approaches such as mindfulness-based cognitive therapy (MBCT), ACT, or narrative therapy may provide insight into which techniques are most effective for specific subgroups or symptom profiles. Neurocognitive measures could also be integrated to explore brain-based changes associated with therapy.

Educational institutions and school counseling services are encouraged to incorporate CBT-based programs targeting emotional reactivity and negative thought patterns into their mental health curriculum. School psychologists and counselors should receive training in CBT protocols appropriate for adolescents, ensuring that interventions are developmentally tailored. Group-based CBT sessions may be particularly efficient in terms of cost and scalability. Preventive applications of CBT in early adolescence could reduce the burden of mental health disorders later in life by

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equipping students with the cognitive and emotional skills necessary to navigate developmental challenges. Integration of CBT modules into general health or life skills courses could further normalize mental health education and reduce stigma associated with psychological support services.

Authors' Contributions

All authors significantly contributed to this study.

Declaration

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

Transparency Statement

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

Acknowledgments

We hereby thank all individuals for participating and cooperating us in this study.

Declaration of Interest

The authors report no conflict of interest.

Funding

According to the authors, this article has no financial support.

Ethical Considerations

In this study, to observe ethical considerations, participants were informed about the goals and importance of the research before the start of the study and participated in the research with informed consent.

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E-ISSN: 2980-9681