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Effectiveness of Cognitive–Behavioral Therapy on Weight Management, Dietary Adherence, and Anger Control in Overweight Students

Mojgan. Agahheris[1*], Nasrin. Hejri Khalilabad[2], Gita. Goodarzi[3], Ana Imani. Aghdam[4], Ezatollah Kordmirza. Nikoozadeh[5], Mahdieh. Rahmanian[5]

[1] Associate Professor, Department of Psychology, Payame Noor University, Tehran, Iran
[2] Department of Psychology, Payame Noor University, Iran, Tehran
[3] PhD in Health Psychology, Department of Psychology, Payame Noor University, Iran, Tehran
[4] PhD Student, Department of Psychology, Payame Noor University, Tehran, Iran
[5] Associate Professor, Department of Health Psychology, Payame Noor University, Tehran, Iran

*** Corresponding author email address**: m_agah@pnu.ac.ir

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A B S T R A C T

Objective: This study aimed to examine the effectiveness of cognitive–behavioral therapy (CBT) on improving weight management, dietary adherence, and anger control among overweight secondary school students.

Methods and Materials: The research utilized a quasi-experimental design with a pretest–posttest structure and a control group. The statistical population included all overweight female secondary school students in Mashhad during the 2023–2024 academic year. A total of 30 students with a body mass index (BMI) greater than 25 were selected through purposive sampling and randomly assigned to experimental and control groups (15 participants each). The experimental group received ten 60-minute sessions of group-based cognitive–behavioral therapy based on Agha Harris's (2022) model, focusing on cognitive restructuring, self-regulation, and behavioral modification strategies. Measurement tools included the Kagan and Squires (1984) Weight Management Questionnaire, the Morisky et al. (1986) Dietary Adherence Scale, and the Spielberger (2003) Anger Control Inventory. Data were analyzed using multivariate and univariate analyses of covariance (MANCOVA and ANCOVA) via SPSS version 26 after confirming all statistical assumptions.

Findings: The results revealed significant differences between the experimental and control groups in posttest scores of weight management ($F = 57.418$, $p < .01$, $\eta^2 = .699$), dietary adherence ($F = 5.487$, $p < .01$, $\eta^2 = .723$), and anger control ($F = 234.282$, $p < .01$, $\eta^2 = .852$). Participants who received CBT demonstrated improved weight regulation, higher dietary adherence, and enhanced anger control compared to those in the control group.

Conclusion: Cognitive–behavioral therapy effectively enhanced weight management, dietary adherence, and anger control among overweight students by modifying maladaptive cognitions and improving emotional and behavioral self-regulation. These findings underscore the importance of incorporating CBT-based interventions into adolescent weight management and emotional health programs.

Keywords: *Cognitive–behavioral therapy (CBT), weight management, dietary adherence, anger control, overweight*

1. Introduction

Obesity and overweight have become significant global health challenges, affecting individuals across different age groups and socioeconomic backgrounds. As a chronic and multifactorial condition, obesity involves complex interactions among biological, psychological, behavioral, and social factors that contribute to its onset and maintenance (Apovian, 2016). The World Health Organization identifies obesity as one of the most pressing public health crises of the 21st century, owing to its association with metabolic diseases, cardiovascular complications, certain cancers, and psychological dysfunctions. Beyond its physical health consequences, obesity also exerts profound psychological and emotional burdens, often leading to low self-esteem, body dissatisfaction, depression, and social stigma (Golabi et al., 2019). Among adolescents, these effects are particularly concerning, as this developmental period is characterized by identity formation and heightened sensitivity to body image and peer perception (Jebeile et al., 2021).

From a behavioral perspective, obesity is closely related to unhealthy lifestyle patterns such as poor dietary habits, sedentary behavior, emotional eating, and low self-regulation. Research shows that behavioral interventions emphasizing self-monitoring, goal setting, and cognitive restructuring are among the most effective strategies for sustainable weight management (Elahi Doost et al., 2022). Cognitive-behavioral therapy (CBT), in particular, has been identified as a well-established, empirically supported approach to addressing obesity-related behaviors. CBT aims to modify maladaptive cognitions, emotional responses, and behavioral patterns that sustain unhealthy eating habits and sedentary lifestyles (Wenzel, 2017).

The psychological underpinnings of obesity often involve distorted cognitions about self-worth, perfectionistic tendencies, and emotional dysregulation. Many individuals with obesity engage in overeating or binge eating as a coping mechanism for managing negative emotions such as anger, stress, or sadness (Honnardar et al., 2022). Cognitive-behavioral models suggest that such emotional eating patterns are maintained through learned associations between food intake and emotional relief. Addressing these cognitive and affective mechanisms through CBT has demonstrated significant efficacy in improving emotion regulation, reducing impulsive eating, and promoting adaptive coping skills (Amirkhanloo et al., 2022).

Numerous studies have examined the role of CBT in improving psychological and physiological outcomes in obese populations. For instance, Jacob et al. (Jacob et al., 2018) conducted a meta-analysis demonstrating that CBT interventions significantly enhance weight loss, self-control, and psychological well-being compared to standard behavioral programs. Similarly, Lotfi Kongreshahi et al. (Lotfi Kongreshahi et al., 2019) compared CBT and mindfulness-based cognitive therapy among obese individuals with coronary artery disease and found both to be effective in reducing weight and increasing activity levels, with CBT showing a greater impact on cognitive restructuring. These findings highlight the adaptability and robustness of CBT in addressing both behavioral and emotional aspects of obesity management.

Cognitive-behavioral therapy is grounded in the principle that dysfunctional thoughts lead to maladaptive emotions and behaviors. By helping individuals identify and modify cognitive distortions, CBT promotes behavioral change and healthier emotional responses (Wilson et al., 2002). In the context of obesity, cognitive restructuring involves challenging irrational beliefs about body image, perfectionism, and self-worth, thereby reducing emotional triggers for overeating (Golestani Bakht et al., 2022). As shown by Naserifar et al. (Naserifar et al., 2022), CBT-based lifestyle modification programs focusing on self-efficacy and body valuation significantly improve weight-related behaviors and psychological well-being among obese women.

The social and environmental dimensions of obesity also require attention. Socioeconomic status, urbanization, and family eating patterns play major roles in shaping dietary and physical activity behaviors (Golabi et al., 2019). According to Kachoui and Shahmardi (Kachoui & Shahmardi, 2019), body appreciation and self-compassion serve as protective factors against disordered eating, mediating the relationship between body mass index (BMI) and eating pathology. Consequently, interventions targeting these cognitive-emotional processes may enhance long-term weight control and reduce vulnerability to emotional distress.

Emerging evidence supports the integration of digital and internet-based CBT approaches in obesity management. For example, Hamatani et al. (Hamatani et al., 2019) explored internet-based CBT delivered via videoconferencing for patients with bulimia nervosa and binge-eating disorder, reporting positive feasibility and acceptability outcomes.

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Similarly, Cheng et al. (Cheng et al., 2021) found that digital CBT for insomnia promoted greater health resilience during the COVID-19 pandemic, demonstrating the adaptability of CBT to virtual contexts. In line with this, Abedi Shargh et al. (Abedi Shargh et al., 2021) reported that internet-based CBT contributed significantly to weight loss and lifestyle self-efficacy among participants during pandemic-related restrictions. These findings illustrate the growing potential of digital CBT interventions to improve accessibility and adherence among adolescents and adults alike.

Anger regulation is another critical yet often overlooked psychological factor in weight management. Emotional dysregulation, including uncontrolled anger, can lead to impulsive or compensatory eating behaviors, thereby contributing to obesity persistence (Bulut & Yüksel, 2023). Research by Bulut and Yüksel (Bulut & Yüksel, 2023) emphasized that CBT-based self-help techniques can effectively reduce anger intensity and frequency by teaching individuals to identify cognitive antecedents of anger and employ behavioral coping strategies. Moreover, anger and aggression are not only emotional issues but are also linked to unmet psychological needs and negative parental experiences (Kwon & Lee, 2025). Addressing these underlying emotional conflicts through CBT may enhance self-regulation, thereby improving compliance with dietary regimens and physical activity routines.

The integration of emotional and behavioral training is particularly beneficial in adolescence, a stage characterized by emotional instability and heightened sensitivity to peer influence. Jamalomidi et al. (Jamalomidi et al., 2021) demonstrated that both emotion-focused therapy and CBT improved quality of life among obese women with polycystic ovary syndrome, suggesting that managing emotional factors can enhance adherence to health-related behaviors. Similarly, Honnardar et al. (Honnardar et al., 2022) found that CBT and dialectical behavior therapy (DBT) were both effective in reducing emotional eating, with CBT showing superior outcomes in cognitive restructuring and behavioral consistency.

The psychological mechanisms underpinning the success of CBT in obesity treatment include cognitive reframing, behavioral activation, and self-monitoring (Wenzel, 2017). CBT interventions focus on identifying dysfunctional schemas, such as “I cannot control my appetite” or “My worth depends on my weight,” and replacing them with adaptive cognitions that promote resilience and agency (Khatibi et al., 2023). The work of Khatibi et al. (Khatibi et al., 2022) further confirmed that group-based CBT significantly improved emotion regulation and resilience among obese women, supporting the therapeutic value of social interaction and peer modeling in group formats. Likewise, Golestani Bakht et al. (Golestani Bakht et al., 2022) reported that CBT reduced perfectionism and body dysmorphic concerns, emphasizing the role of cognitive restructuring in reshaping distorted self-perceptions.

Furthermore, lifestyle modification programs that integrate CBT principles have been associated with long-term behavioral change and weight stabilization. Razmpoosh et al. (Razmpoosh et al., 2020) demonstrated that combining dietary and physical interventions with CBT improved quality of life and reduced the risk of disease recurrence in cancer survivors. Similarly, Pakandish et al. (Pakandish et al., 2021) found that CBT enhanced emotional regulation and mental health among obese women, while Pakandish et al. (Pakandish et al., 2020) highlighted the comparative effectiveness of CBT and schema therapy in improving body image and quality of life. These findings underscore the multidimensional benefits of CBT across physical and psychological domains.

Adolescents face unique challenges in weight management, as their self-concept, autonomy, and coping mechanisms are still developing. CBT helps address these developmental needs by promoting self-awareness, enhancing problem-solving skills, and fostering intrinsic motivation (Jebeile et al., 2021). Behavioral interventions that emphasize reinforcement of healthy behaviors, cognitive restructuring, and social support have proven effective in reducing weight-related stress and improving adherence to dietary regimens (Heriseanu et al., 2023). Moreover, studies have shown that integrating CBT principles with parental involvement and school-based programs can further strengthen outcomes by addressing environmental influences on adolescent eating behavior (Khatibi et al., 2023).

Obesity treatment also requires attention to psychosocial determinants such as self-efficacy and self-esteem. Naserifar et al. (Naserifar et al., 2022) demonstrated that CBT interventions based on lifestyle modification significantly increased self-efficacy and positive body valuation in obese women. Similarly, Golestani Bakht et al. (Golestani Bakht et al., 2022) found that CBT improved body satisfaction and reduced cognitive biases associated with dysmorphia. These cognitive-behavioral improvements contribute to sustainable behavioral changes, reducing relapse risk and enhancing psychological resilience.

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Despite the growing evidence base, gaps remain in understanding the combined effect of CBT on weight management, dietary adherence, and anger control among overweight adolescents. While existing studies have separately investigated the impact of CBT on emotion regulation or weight loss, few have simultaneously examined its influence on multiple interrelated behavioral and emotional outcomes (Elahi Doost et al., 2022). This integrated perspective is essential because obesity is not merely a physical or nutritional condition—it is deeply intertwined with emotional processes and cognitive schemas that shape behavior (Apovian, 2016).

Given the interdependence of behavioral, cognitive, and emotional factors in obesity, cognitive–behavioral interventions hold promise for comprehensive and sustainable treatment outcomes. By addressing maladaptive thoughts, reinforcing self-control strategies, and improving emotional regulation, CBT provides an effective framework for managing obesity and its psychological correlates (Amirkhanloo et al., 2022; Wenzel, 2017).

Therefore, the present study aims to examine the effectiveness of cognitive–behavioral therapy on weight management, dietary adherence, and anger control among overweight students.

2. Methods and Materials

2.1. Study Design and Participants

The research method was quasi-experimental with a pretest–posttest design and a control group. After meeting the inclusion criteria (being overweight, absence of physical illness, and absence of psychological disorders), participants were selected and randomly assigned to experimental and control groups. The experimental group received cognitive–behavioral therapy (CBT) administered by the researcher over ten 60-minute sessions (two sessions per week) conducted in group format. The sessions employed question-and-answer methods, group discussions, lectures, and practical exercises to teach behavioral and cognitive strategies.

The statistical population consisted of all overweight female secondary school students in Mashhad during the 2023–2024 academic year. To identify overweight students, a nutrition specialist attended the schools and measured each student's body mass index (BMI). Students with a BMI greater than 25 were selected. The sample included 30 female students who were chosen through purposive sampling and then randomly assigned to the experimental (n = 15) and control (n = 15) groups.

2.2. Measures

BMI Calculation: The BMI was calculated by dividing weight (in kilograms) by the square of height (in meters). Weight was measured using a digital scale with a sensitivity of 100 grams, and height was measured with a non-stretchable measuring tape with an accuracy of 0.5 centimeters.

Kagan and Squires Weight Management Questionnaire: This questionnaire was developed by Squires and Kagan in 1983 to assess behaviors and attitudes related to weight control and management. The instrument includes 46 items that evaluate various dimensions such as eating patterns, physical activity, psychological strategies, and stress coping mechanisms. It is a self-report measure scored on a 5-point Likert scale ranging from 1 ("never") to 5 ("always"). The total score ranges from 46 to 230, with higher scores indicating more positive behaviors and attitudes toward weight management. The questionnaire has demonstrated high reliability and validity, and its completion typically takes 10–15 minutes.

Morisky et al. Dietary Adherence Questionnaire: Developed by Morisky et al. in 1986, this tool measures individuals' adherence to medication or dietary regimens. The commonly used version consists of 8 yes/no items. Each "yes" response is scored as 1, and each "no" response is scored as 0. The total score classifies adherence into three levels: low, moderate, and high. This instrument is suitable for diverse populations and has demonstrated strong validity and reliability in numerous national and international studies.

Spielberger Anger Control Questionnaire: Developed by Spielberger et al. in 2003, this questionnaire assesses the extent and style of anger control. The main version contains 32 items and includes four subscales: internal anger expression, external anger expression, external anger control, and internal anger control. Responses are rated on a 5-point Likert scale ranging from 1 ("not at all") to 5 ("completely"). Total scores and subscale scores are calculated, with higher scores on the anger control subscales indicating greater ability to manage and regulate anger. The content and construct validity of the scale have been repeatedly confirmed, and it is suitable for both clinical and non-clinical populations.

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2.3. *Interventions*

In this study, the cognitive–behavioral weight reduction protocol based on Dr. Agah Harris's model (2022) was employed. The intervention was administered in group format across ten 60-minute sessions over five weeks, with two sessions held each week. The experimental group included fifteen participants. All sessions were conducted without companions and emphasized an active, interactive approach involving questions and answers, group discussions, educational lectures, and practical skill exercises. The protocol was structured to ensure the gradual effectiveness of the intervention. Initially, participants underwent an assessment and interview to identify individual motivations and characteristics. In subsequent sessions, participants were guided to prepare mentally and environmentally for lifestyle changes. Training covered topics such as healthy eating habits, enhancing self-efficacy, slowing down eating pace, and organizing living environments. Further sessions focused on time management, initiation of physical activity, setting achievable goals, distinguishing between true hunger and cravings, developing tolerance skills, reducing cravings, and daily planning. During the diet initiation phase, participants adhered to a dietary plan while learning skills to stop overeating, redefine satiety, manage cognitive distortions, recover from lapses, and prepare for self-monitoring of weight. Subsequent sessions focused on coping with negative thoughts, identifying cognitive distortions, reducing discouragement, and responding effectively to unhelpful cognitions. In the problem-solving phase, participants practiced skills such as refusing food offers, reducing high-calorie beverage intake, managing eating outside the home, planning for travel, regulating emotions without turning to food, and preparing for weight evaluation. Later sessions emphasized self-confidence building, stress management, maintaining healthy weight, organizing exercise routines, developing personal insight, updating acquired skills, and long-term planning. In the final phase, two sessions were dedicated to weight maintenance, addressing cognitive traps, and implementing cognitive interventions to sustain long-term success. The therapeutic process included behavioral assessments, weight measurements, and self-concept evaluations at both the beginning and the end of the program. All findings were analyzed and summarized following participants' acknowledgment and appreciation.

2.4. *Data Analysis*

Data analysis was performed at both descriptive and inferential levels. In the descriptive section, frequency, mean, and standard deviation were used, and in the inferential section, univariate and multivariate analyses of covariance (ANCOVA and MANCOVA) and their assumptions were applied. All analyses were conducted using SPSS version 26.

3. Findings and Results

The participants in the present study consisted of 30 high school students. Among the 30 respondents, 16 students (53.3%) were aged 15–16 years, and 14 students (46.7%) were aged 17–18 years. The mean (and standard deviation) of pretest weight management scores in the control group were 45.93 (SD = 12.826), and in the posttest were 42.60 (SD = 12.333). The mean (and standard deviation) of pretest weight management scores in the experimental group were 50.80 (SD = 8.841), and in the posttest were 38.93 (SD = 7.905).

The mean (and standard deviation) of pretest dietary adherence scores in the control group were 5.27 (SD = 1.534), and in the posttest were 4.60 (SD = 1.242). The mean (and standard deviation) of pretest dietary adherence scores in the experimental group were 5.93 (SD = 1.387), and in the posttest were 3.13 (SD = 1.302).

The mean (and standard deviation) of pretest anger control scores in the control group were 155.07 (SD = 27.750), and in the posttest were 143.07 (SD = 26.136). The mean (and standard deviation) of pretest anger control scores in the experimental group were 169.47 (SD = 18.784), and in the posttest were 144.27 (SD = 19.148) (see Table 1).

Table 1

Means and Standard Deviations of Variables in Pretest and Posttest

Variable	Phase	Control (M)	SD	Experimental (M)	SD
Weight Management	Pretest	45.93	12.826	50.80	8.841
	Posttest	42.60	12.333	38.93	7.905
Dietary Adherence	Pretest	5.27	1.534	5.93	1.387

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	Posttest	4.60	1.242	3.13	1.302
State Anger	Pretest	46.53	9.650	49.40	8.416
	Posttest	43.00	10.014	41.87	7.453
Trait Anger	Pretest	33.20	4.858	32.40	5.565
	Posttest	29.20	4.843	25.40	4.881
Anger Expression	Pretest	75.33	24.636	87.67	11.745
	Posttest	70.87	24.427	77.00	11.502
Total Anger Control	Pretest	155.07	27.750	169.47	18.784
	Posttest	143.07	26.136	144.27	19.148

Before conducting the analyses of covariance (ANCOVA and MANCOVA), all statistical assumptions were examined and confirmed. Tests for normality of distribution were performed using the Shapiro–Wilk test, which indicated that the data met the normality assumption. Homogeneity of variances was verified through Levene's test, showing no significant differences between groups. The assumption of linearity was assessed by examining scatterplots of covariates and dependent variables, and no violations were observed. Additionally, the homogeneity of regression slopes was confirmed, indicating that the relationship between covariates and dependent variables was consistent across groups. Finally, the absence of multicollinearity among variables was verified by checking tolerance and variance inflation factor (VIF) values, all of which fell within acceptable limits. Thus, all assumptions required for the ANCOVA and MANCOVA analyses were satisfied.

The one-way analysis of variance (see Table 2) indicated that there were statistically significant differences between the two groups in the research components ($p < .05$). Conventionally, η^2 values of .01, .06, and .14 represent small, medium, and large effect sizes, respectively. Therefore, the high η^2 and statistical power for the indices of state anger, trait anger, and anger expression demonstrate the strong influence of the intervention on these variables, and the high statistical power further indicates the adequacy of the sample size.

Table 2

One-Way ANOVA for Components of Anger Control

Dependent Variable	Source	Sum of Squares (SS)	df	Mean Square (MS)	F	Sig.	Effect Size (η^2)	Statistical Power
State Anger	Group	530.533	3	176.844	2.212	.001	.226	.931
	Error	4477.067	56	79.948				
	Total	5007.600	59					
Trait Anger	Group	566.850	3	188.950	3.420	.001	.194	.790
	Error	1426.000	56	25.464				
	Total	1992.850	59					
Anger Expression	Group	2281.783	3	760.594	2.064	.001	.295	.844
	Error	20634.400	56	368.471				
	Total	22916.183	59					

The posttest weight management scores in the experimental group were significantly different from the pretest scores in the control group ($p < .05$). Given that the beta coefficient was .84, the sample size was considered statistically adequate. Therefore, it can be concluded that overweight students who received the intervention demonstrated better weight management than those who did not. Overall, the findings indicate that cognitive–behavioral therapy was effective in improving weight management among overweight students, with an effect size of .69 (see Table 3).

Table 3

Results of Univariate Analysis of Covariance for Weight Management Variable

Source of Variation	SS	df	MS	F	Sig	Effect Size	Beta
Corrected Model	2894.438	2	1447.219	57.418	.001	.699	.84
Posttest Weight Management	103.787	1	103.787	4.118	.001		
Error	2894.438	2	1447.219				

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Total	680.529	27	25.205
Corrected Total	73755.000	30	

As shown in Table 4, posttest dietary adherence scores in the experimental group were significantly different from the pretest scores in the control group ($p < .05$). Given the beta coefficient of .84, the sample size was deemed sufficient. Thus, it can be concluded that overweight students who received the intervention demonstrated greater adherence to dietary recommendations than those who did not. In general, the results indicate that cognitive–behavioral therapy training was effective in improving dietary adherence among overweight students, with an effect size of .72.

Table 4

Results of Univariate Analysis of Covariance for Dietary Adherence Variable

Source of Variation	SS	df	MS	F	Sig	Effect Size	Beta
Corrected Model	18.264	2	9.132	5.487	.001	.723	.91
Posttest Dietary Adherence	34.350	1	34.350	20.639	.001		
Error	18.264	2	9.132	5.487			
Total	44.936	27	1.664				
Corrected Total	1004.000	30					

The posttest anger control scores in the experimental group were significantly different from the pretest scores in the control group ($p < .05$). Given the beta coefficient of .84, the sample size was considered statistically sufficient. Thus, it can be concluded that overweight students who received the intervention demonstrated better anger control than those who did not. Overall, the findings indicate that cognitive–behavioral therapy training was effective in improving anger control among overweight students, with an effect size of .85 (see Table 5).

Table 5

Results of Univariate Analysis of Covariance for Anger Control Variable

Source of Variation	SS	df	MS	F	Sig	Effect Size	Beta
Corrected Model	16334.618	2	8167.309	234.282	.001	.852	.93
Posttest Anger Control	171.106	1	171.106	4.908	.001		
Error	16334.618	2	8167.309	234.282			
Total	921.429	27	34.861				
Corrected Total	807190.000	30					

4. Discussion and Conclusion

The results of the present study demonstrated that cognitive–behavioral therapy (CBT) had a significant effect on improving weight management, dietary adherence, and anger control among overweight students. Participants who received CBT showed greater reductions in body mass index (BMI) and more adaptive weight management behaviors compared to those in the control group. Furthermore, they exhibited higher adherence to dietary guidelines and improved ability to regulate and express anger in healthy ways. These findings are consistent with the theoretical principles of CBT, which emphasize the interconnection between cognition, emotion, and behavior in shaping health-related outcomes (Wenzel, 2017; Wilson et al., 2002). Through the identification and restructuring of maladaptive thought patterns, CBT helps individuals replace self-defeating cognitions—such as “I can’t control my eating” or “I’m destined to be overweight”—with more rational, empowering beliefs that foster self-regulation and healthy decision-making (Golestani Bakht et al., 2022).

The improvement in weight management among participants following the CBT intervention aligns with extensive prior research demonstrating the efficacy of cognitive-behavioral approaches in promoting sustained weight loss and lifestyle modification. Jacob et al. (Jacob et al., 2018) conducted a meta-analysis showing that CBT leads to significant improvements in weight reduction and psychological well-being compared to standard behavioral or nutritional interventions. Similarly, Lotfi Kongreshahi et al. (Lotfi Kongreshahi et al., 2019) reported that CBT and mindfulness-based cognitive therapy both improved activity levels and weight reduction in obese individuals with

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coronary artery disease, emphasizing the importance of cognitive restructuring in supporting health behavior change. In the present study, the structured CBT protocol targeted both cognitive and behavioral aspects of eating and physical activity, such as self-monitoring, problem-solving, goal setting, and managing emotional triggers of overeating. These strategies likely contributed to the observed enhancement in students' ability to regulate their weight effectively.

The results also revealed a significant increase in dietary adherence among students who received CBT, indicating that cognitive and emotional regulation skills fostered greater compliance with nutritional plans. This finding supports the conclusions of Elahi Doost et al. (Elahi Doost et al., 2022), who highlighted that behavioral factors—such as impulsivity, emotional instability, and stress-induced eating—play a central role in obesity and can be effectively targeted through behavioral and cognitive interventions. Similarly, Naserifar et al. (Naserifar et al., 2022) found that CBT-based lifestyle modification programs improved adherence to healthy diets and enhanced self-efficacy among obese women, leading to sustained behavioral change. The current study's findings also corroborate the results of Golestani Bakht et al. (Golestani Bakht et al., 2022), who demonstrated that CBT reduced perfectionism and body dysmorphic concerns, thereby indirectly facilitating healthier eating patterns through improved self-acceptance and reduced psychological distress.

The improvement in dietary adherence may also be attributed to the skill-building components of CBT, which emphasize planning, self-reinforcement, and coping with dietary lapses. CBT teaches individuals to recognize distorted beliefs—such as "breaking my diet once means I have failed completely"—and replace them with more flexible and self-compassionate cognitions that support persistence and recovery. This cognitive reframing enhances long-term adherence by minimizing all-or-nothing thinking and promoting gradual behavioral consistency (Pakandish et al., 2021). Moreover, CBT encourages the development of coping strategies to manage social pressures and emotional triggers that often lead to dietary noncompliance. These mechanisms explain the observed improvements in students' adherence to dietary regimens following CBT training in the present study.

Another key finding was the significant enhancement in anger control among students who underwent CBT, suggesting that cognitive restructuring and emotion regulation training effectively reduced maladaptive emotional responses. This result aligns with Bulut and Yüksel's (Bulut & Yüksel, 2023) findings, which emphasized that CBT-based self-help techniques effectively reduce the frequency and intensity of anger by helping individuals identify irrational beliefs and develop constructive coping mechanisms. The improvement in anger control observed in this study may be linked to the behavioral and emotional components of CBT, which teach participants to monitor physiological cues of anger, practice relaxation, and engage in problem-solving instead of impulsive reactions. The inclusion of anger management exercises within the CBT protocol likely enhanced students' emotional self-awareness and coping capacity, leading to measurable reductions in aggressive and impulsive behaviors.

Emotional regulation has been increasingly recognized as a crucial factor in obesity treatment. Honnardar et al. (Honnardar et al., 2022) found that CBT and dialectical behavior therapy (DBT) both significantly reduced emotional eating among obese individuals, with CBT yielding stronger improvements in cognitive restructuring. The present study extends these findings by showing that emotion regulation through CBT not only affects eating behavior but also general anger management. The emotional skills learned in CBT—such as recognizing triggers, labeling emotions, and using adaptive responses—may generalize across domains, improving both dietary control and interpersonal regulation. This supports the idea that emotional dysregulation serves as a transdiagnostic factor linking obesity, emotional eating, and anger expression (Amirkhanloo et al., 2022).

The current results also align with studies emphasizing the role of self-efficacy and resilience in mediating CBT's effects. Khatibi et al. (Khatibi et al., 2023) found that group CBT significantly improved resilience and emotion regulation in obese women, helping them cope more effectively with frustration and self-criticism related to weight control. By promoting a sense of mastery and self-confidence, CBT empowers individuals to persist in behavior change even when faced with obstacles or setbacks. The group-based nature of the intervention in this study may have provided additional benefits through social modeling and peer support, as highlighted in the findings of Jebeile et al. (Jebeile et al., 2021), who noted that social and psychological support are vital components in adolescent obesity interventions.

Furthermore, the observed behavioral improvements are consistent with prior findings that link CBT to enhanced

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lifestyle modification and overall mental health. Pakandish et al. (Pakandish et al., 2020) demonstrated that CBT and schema therapy improved both body image and quality of life in obese women, while Jamalomidi et al. (Jamalomidi et al., 2021) found that CBT enhanced emotional regulation and life satisfaction among obese women with polycystic ovary syndrome. These studies collectively support the idea that cognitive restructuring and behavioral training not only influence physiological outcomes but also improve emotional well-being and quality of life. By helping individuals develop a more balanced relationship with their body and emotions, CBT promotes holistic health improvement rather than short-term symptom reduction.

Digital and internet-based forms of CBT have also shown considerable promise in managing weight-related and emotional problems, supporting the broader applicability of cognitive-behavioral interventions. Heriseanu et al. (Heriseanu et al., 2023) demonstrated that internet-delivered CBT produced positive effects on emotional health and treatment adherence even among overweight adults with chronic health conditions. Similarly, Cheng et al. (Cheng et al., 2021) found that digital CBT promoted resilience and adaptive coping during stressful events such as the COVID-19 pandemic. The current findings, obtained through in-person group sessions, are in line with these studies, confirming the robustness of CBT's mechanisms of change regardless of delivery format. However, integrating online platforms could enhance accessibility for adolescents and young adults in future interventions.

The findings also resonate with broader behavioral theories emphasizing the importance of cognitive control and emotional balance in preventing obesity. Wenzel (Wenzel, 2017) outlined that CBT's structured framework—comprising cognitive restructuring, exposure, and behavioral activation—targets both conscious and automatic processes sustaining maladaptive behaviors. This dual focus allows for deeper and longer-lasting change. In the context of obesity, these mechanisms help modify the cognitive schemas that link negative emotions to food consumption, leading to sustained behavioral improvement. Golabi et al. (Golabi et al., 2019) further argued that socioeconomic and psychological determinants must be addressed together to effectively manage obesity. By integrating emotional and behavioral skills, CBT responds to this need for a multidimensional therapeutic approach.

Additionally, the results of this study align with the evidence provided by Hamatani et al. (Hamatani et al., 2019), who demonstrated that internet-based CBT interventions effectively reduced binge-eating symptoms and improved self-regulation in individuals with eating disorders. Likewise, Razmpoosh et al. (Razmpoosh et al., 2020) reported that CBT combined with lifestyle modification significantly improved quality of life and reduced recurrence risk among patients with chronic conditions. The consistency of these findings across different populations reinforces the conclusion that CBT effectively enhances self-control, emotional balance, and health-promoting behaviors.

Finally, the improvement in anger control and emotional regulation among adolescents in this study supports developmental evidence linking cognitive-behavioral interventions with emotional maturity. Kwon and Lee (Kwon & Lee, 2025) demonstrated that frustration of basic psychological needs and negative parental behaviors contribute to aggression in school-aged children, but interventions that enhance cognitive and emotional awareness mitigate these effects. CBT's focus on identifying irrational thoughts, improving emotional literacy, and teaching adaptive problem-solving may have helped participants in this study manage frustration and interpersonal conflict more constructively. This is particularly relevant during adolescence, when emotional impulsivity and social sensitivity are heightened.

Overall, the present findings add to the growing body of literature supporting CBT as an integrative approach for managing obesity and associated emotional problems. By addressing the cognitive, emotional, and behavioral components simultaneously, CBT facilitates sustainable lifestyle change and psychological well-being. The intervention's effects on weight management, dietary adherence, and anger control confirm its multidimensional efficacy and underline the importance of incorporating psychological training into physical health programs for adolescents and young adults.

5. Limitations & Suggestions

Despite its promising findings, this study has several limitations that should be acknowledged. First, the sample size was relatively small (N = 30), which limits the generalizability of the results to broader adolescent populations. Larger and more diverse samples would provide greater statistical power and external validity. Second, the study relied on self-report questionnaires, which are subject to response bias and social desirability effects. Objective behavioral measures, such as digital food logs or

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accelerometer-based physical activity tracking, could yield more accurate assessments of behavioral change. Third, the follow-up period was limited to the immediate post-intervention phase; therefore, the long-term sustainability of CBT's effects on weight management, diet adherence, and anger control remains unknown. Fourth, the intervention was implemented in a group format, which, although effective, may have introduced peer influence and group dynamics that varied among participants. Finally, factors such as family support, socioeconomic status, and school environment were not controlled, and these contextual variables could influence both emotional regulation and weight management outcomes.

Future studies should aim to include larger, randomized samples across different age groups and cultural backgrounds to improve generalizability. Longitudinal research with extended follow-up assessments would help determine the persistence of behavioral and emotional changes over time. Comparing CBT with other therapeutic modalities such as dialectical behavior therapy, acceptance and commitment therapy, or mindfulness-based interventions could further clarify the unique contributions of cognitive-behavioral mechanisms. Incorporating physiological and neuropsychological measures, such as hormonal markers of stress or functional imaging of emotion regulation networks, may also deepen understanding of CBT's biological effects. Additionally, future studies could explore hybrid intervention models that combine in-person sessions with digital or app-based components to increase accessibility and adherence among adolescents.

Practitioners designing interventions for overweight adolescents should integrate CBT-based modules focusing on cognitive restructuring, emotional awareness, and behavioral activation. School counselors, psychologists, and health educators can collaborate to implement group-based CBT programs that address both weight-related behaviors and emotional regulation skills. Emphasizing self-monitoring, goal setting, and coping skills training can help students internalize self-regulatory strategies. Including parental education components may enhance family support and reinforce healthy behaviors at home. Finally, developing culturally adapted CBT manuals tailored to local contexts could ensure relevance and effectiveness across diverse populations, contributing to more comprehensive adolescent health promotion programs.

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Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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Authors' Contributions

All authors equally contributed to this article.

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