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Original Article

Associations between Mindfulness, Social Anxiety, Depression, Self-efficacy, and Physical Activity Participation among Obese Teenage Girls

Ali Khanzad[1], MSc; Sheida Ranjbari[2], PhD; Amir Dana[3]*, PhD; Shaghayegh Hashemi Motlagh[4], PhD

[1]Master of Educational Technology, Islamic Azad University, Neka Branch, Mazandaran, Iran
[2]Department of Physical Education, Urmia Branch, Islamic Azad University, Urmia, Iran
[3]Department of Physical Education and Sport Sciences, Tabriz Branch, Islamic Azad University, Tabriz, Iran
[4]Department of Physical Education ،Maragheh Branch, Islamic Azad University, Maragheh, Iran

*Corresponding author: Amir Dana, PhD; Department of Physical Education and Sport Sciences, Tabriz Branch, Islamic Azad University, Tabriz, Iran. **Tel:** +98 9116356581; **Email:** amirdana@iaut.ac.ir

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Abstract

Background: The relationship between mindfulness and the repercussions of obesity, particularly in girls, has received limited attention. Consequently, the current research aimed to explore the correlation between mindfulness and social anxiety, depression, self-efficacy, and physical activity (PA) participation in obese teenage girls.

Methods: The research was a descriptive-correlational study conducted from October 2022 to May 2023 in Tehran, Iran. The statistical population for this study comprised obese teenage girls aged 13 to 15 attending their first secondary school. The study sample consisted of 384 obese teenage girls selected through convenience sampling. Standard instruments were employed to assess mindfulness, social anxiety, depression, self-efficacy, and PA participation. Data analysis was performed using the Pearson correlation test and ANOVA, facilitated by SPSS version 26.

Results: The results indicated that, on average, participants engaged in 13.01±3.02 minutes of moderate-to-vigorous physical activity (MVPA) daily. Furthermore, teenage girls exhibited relatively high levels of social anxiety (mean=39.79±8.85) and depression (mean=9.55±2.67). Moreover, there were significant correlations between mindfulness and reduced levels of social anxiety and depression (both P<0.001). Finally, significant associations were observed between mindfulness, higher self-efficacy, and increased PA (P<0.001).

Conclusions: These findings suggested a link between mindfulness and reducing the adverse consequences of obesity in teenage girls. In this regard, reinforcing mindfulness practices can prove an effective way for reducing anxiety and depression. Such practices may encompass meditation, mindful breathing, mindful observation, attention to the surrounding environment, heightened awareness, and mindful listening.

Keywords: Obesity, Mindfulness, Exercise, Mental Health, Adolescent

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1. Introduction

Obesity is a medical condition characterized by excessive body weight due to various physiological factors that surpass typical levels; it also entails severe overweight or obesity (1, 2). Body mass index (BMI) is a reliable indicator for diagnosing obesity based on height, age, and sex. Obesity results from multiple factors, including genetics, hormonal imbalances, metabolic processes, and behavioral patterns. Inadequate physical activity (PA) and unfavorable nutritional conditions are recognized as the primary contributors to excess weight gain (3). Obesity is a prevalent health concern and a significant contributing factor to numerous chronic illnesses (4). Conditions such as Type 2 diabetes, a high prevalence of cardiovascular diseases, an increase in the incidence of various cancers, and the emergence of several mental health disorders are linked to obesity (5). Notably, there is a global surge in overweight and obesity among children, as evidenced by numerous studies (3-5). The prevalence of obesity and overweight worldwide has tripled over the past decades, reaching 17.5% among teenagers aged 12 to 19 years (6).

Psychologically, obesity in teenagers is associated with depression, social anxiety, low self-efficacy, and diminished self-confidence, leading to frustration (5, 7). Some evidence suggested that obesity can trigger mental health problems such as depression (7-9). Studies demonstrated an increasing prevalence of anxiety in obese children (10, 11). Additionally, apart from anxiety, weight gain and obesity can be risk factors for depression (8, 10, 11). Moreover, obesity may be linked to

reduced mobility and unhealthy dietary habits in teenagers, with long-lasting effects that persist into adulthood (11). In this context, several studies indicated that teenagers exhibit reduced interest in participating in PA and do not meet international guidelines related to health-oriented PA engagement (12, 13).

Furthermore, research indicated that girls engage in lower levels of PA compared to boys. This disparity in activity levels may hinder girls from reaping the numerous health benefits associated with regular PA, including a reduced risk of chronic illnesses, prolonged life expectancy, improved physical and mental well-being, and ultimately, enhanced overall quality of life (14, 15). Consequently, developing effective strategies to increase PA participation among girls is imperative.

Although studies investigated the positive effects of factors such as social support, access to sports facilities, and school climate on mitigating the negative consequences of obesity in teenagers (16), other factors warrant consideration. One of these factors that has received less attention in previous studies is mindfulness. Mindfulness involves a heightened awareness of present experiences in a non-judgmental or evaluative manner (17). It promotes emotional equilibrium by refraining from passing judgment and enhancing awareness of mental and physical sensations, facilitating real-time perception and acceptance of emotions and bodily experiences. Mindfulness activates brain regions associated with attention, memory, and empathy, ultimately leading to improved psychosocial functioning (18).

Studies demonstrated that increased mindfulness levels are associated with higher self-efficacy, positive emotions, a reduced likelihood of fatigue, and increased PA participation (19). Furthermore, mindfulness has been proved to be effective in reducing depression and rumination. Some research also indicated that mindfulness-based training positively reduces obesity across different age groups (18-20). These findings underscored the potential impact of mindfulness on the outcomes of obesity. However, as previously mentioned, the relationship between mindfulness and the consequences of obesity, particularly in girls, has received limited attention. There has been a growing interest in mindfulness in recent years, and mounting evidence suggests its utility in clinical settings, particularly in healthcare. Nevertheless, there has been minimal investigation into the effectiveness of mindfulness in improving health-related aspects among obese teenage girls. Therefore, the objective of this research was to examine the association between mindfulness and social anxiety, depression, self-efficacy, and PA participation among obese teenage girls.

2. Methods

2.1. Design and Participants

The current research was a descriptive-correlational study conducted from October 2022 to May 2023 in Tehran, Iran, specifically in districts 1, 2, 5, and 22. The statistical population for this study consisted of obese teenage girls between the ages of 13 and 15 attending their first secondary school.

To determine the required sample size for this correlational study (n=20), 319 participants were selected. Subsequently, for the current investigation, 384 obese teenage girls with a mean age of 13.86±0.58 years were chosen using purposive sampling. Twenty-four schools were randomly selected after obtaining coordination with educational institutions. Afterward, contact information provided by the schools was used to reach out to the parents of the eligible participants. Following a detailed explanation of the research's objectives and upon obtaining parental consent for their children's participation, parents were requested to have their children complete the questionnaires independently or with the assistance of an examiner, based on their preference.

Following the guidelines set forth by WHO (21), individuals with a BMI exceeding 29.0 kg/m^2 were classified as obese. In this study, BMI was also employed as a measure of obesity. To this end, the researchers accurately measured the height and weight of the volunteers. Subsequently, they calculated the BMI using the standard formula: weight (kg) divided by height (m^2). Individuals with a BMI exceeding 29.0 kg/m^2 were selected as subjects and included in the study phase. The criteria for inclusion in the study were as follows: 1) being a female student in the first secondary school, 2) having a BMI greater than 29.0, 3) voluntary participation in the study, and 4) not having any physical disabilities. Exclusion criteria comprised:

1) failure to complete the PA protocol, 2) incomplete questionnaire responses, and 3) a lack of willingness to continue participating in the study. It should be noted that 423 teenagers participated in the study; however, 39 were excluded due to the mentioned criteria. All parents and students provided written consent, and the study protocol was approved with the code of IR.IAU.TNB.REC.1401.059.

2.2. Measuring Tools

The Mindful Attention Awareness Scale (MAAS) was employed to gauge mindfulness (22). The MAAS is a 15-item scale designed to assess consciousness and concentration on occurrences and encounters in everyday life. The questions are rated on a scale of 1 (almost always) to 6 (rarely). The overall score ranges from 15 to 90, with a higher score indicating a greater level of mindfulness. In the current study, the validity of this scale was confirmed by ten experts (CVI=0.90, CVR=0.96). Additionally, the Cronbach's alpha coefficient was 0.90.

The Short Form of the Social Anxiety Scale for Adolescents (SA-A-SF) was utilized to measure social anxiety (23). The SA-A-SF is a self-administered scale suitable for teenagers aged 13 to 18. It comprises 12 items rated on a scale from 1 (Strongly disagree) to 5 (Strongly agree). The total score ranges from 12 to 60, with a higher score indicating more significant social anxiety. In the current study, the validity of this scale was verified by ten experts (CVI=0.89, CVR=0.82). Moreover, the Cronbach's alpha coefficient was 0.94.

The Depression, Anxiety, Stress Scale-21 (DASS-21) (24) was employed to assess depression, this subscale consists of seven items, scored from "did not apply to me at all" to "applied to me very much, or most of the time." The total score ranges from zero to 21, with a higher score indicating a greater level of depression. Within this subscale, scores in the range of 0-4 indicate a normal condition, 5-6 indicate mild depression, 7-10 indicate moderate depression, 11-13 indicate severe depression, and 14+ indicate incredibly severe depression. In the current study, the validity of this scale was affirmed by ten experts (CVI=0.90, CVR=0.90). Furthermore, the Cronbach's alpha coefficient was 0.92.

The General Self-efficacy Questionnaire (GSE-17) was employed to measure self-efficacy (25), this questionnaire comprises 17 questions rated from completely agree (5) to disagree (1). The total score ranges from 17 to 85, with a higher score indicating greater self-efficacy. In the current study, the validity of this scale was validated by ten experts (CVI=0.88, CVR=0.90). Additionally, the Cronbach's alpha coefficient was 0.92.

A modern accelerometer with high validity and reliability (26) assessed PA. The device was attached to the right thigh for seven days, except during sleep, bathing, or other activities that might potentially damage the device. The accelerometer measures various intensities of PA, including light, moderate, and vigorous PA.

2.3. Data Analysis

Using SPSS version 26, descriptive statistics, including the mean and SD, were calculated to summarize the data. The data were also presented in the forms of numbers (n) and percentage (%). Based on the Kolmogorov-Smirnov tests, the data were found to be normally distributed (all $P>0.05$). Furthermore, the Pearson correlation test was employed to investigate the relationships among research variables. Finally, to determine whether different classes of obesity, including obesity class 1 (i.e., 29<BMI>35), obesity class 2 (i.e., 35<BMI>40), and obesity class 3 (i.e., BMI>40), affect social anxiety, depression, self-efficacy, and PA, a one-way analysis of variance (ANOVA) with a Tukey test as a post hoc analysis was conducted. The significance level was set at $P<0.05$.

3. Results

3.1. Demographic Characteristics

The study included 384 obese teenage girls with an age range of 13 to 15 years. The average age of the sample was 13.86±0.58 years. The data revealed that the average BMI of the entire sample was 32.69±2.25. In total, 239 girls (62%) had a BMI between 29 and 35 kg/m^2 (i.e., obesity Class 1), 112 girls (29%) had a BMI between 35 and 40 kg/m^2 (i.e., Class 2), and 33 girls (9%) had a BMI higher than 40 kg/m^2 (i.e., Class 3).

3.2. Mindfulness

Table 1 presents the mean and standard deviation (SD) of mindfulness scores for the participants. The

Table 1: Mean and standard deviation of mindfulness, social anxiety, depression and self-efficacy across different classes of obesity

	Whole Sample	Obesity Class 1	Obesity Class 2	Obesity Class 3	ANOVA	Comparison
Mindfulness	49.46±9.69	56.28±8.67	45.10±6.93	40.28±4.47	F=25.29 P<0.001	Class 1 vs. 2=> P<0.001 Class 1 vs. 3=> P<0.001 Class 2 vs. 3=> P<0.001
Social anxiety	39.79±8.85	34.20±5.17	42.36±7.66	46.92±4.91	F=15.67 P<0.001	Class 1 vs. 2=> P<0.001 Class 1 vs. 3=> P<0.001 Class 2 vs. 3=> P<0.001
Depression	9.55±2.67	7.29±1.08	10.29±1.22	10.21±1.54	F=36.58 P<0.001	Class 1 vs. 2=> P<0.001 Class 1 vs. 3=> P<0.001 Class 2 vs. 3=> P=0.239
Self-efficacy	40.64±9.93	49.28±6.84	39.41±6.07	34.22±7.50	F=22.14 P<0.001	Class 1 vs. 2=> P<0.001 Class 1 vs. 3=> P<0.001 Class 2 vs. 3=> P<0.001

data showed that the mean score for the entire sample was 49.46±9.69, indicating that the participants had moderate levels of mindfulness on average. Concerning different BMI levels, the data revealed that the average mindfulness score for Class 1 was 56.28±8.67. For Class 2, it was 45.10±6.93, and for Class 3, it was 40.28±4.47. The results indicated significant differences between different BMI levels ($F_{(2,383)}$=25.29, P<0.001). Specifically, participants with lower levels of BMI reported significantly higher mindfulness than those with higher levels of BMI (*P<0.001*). Additionally, participants in Class 2 reported significantly higher mindfulness compared to those in Class 3 (P<0.001).

3.3. Social Anxiety

Table 1 displays the participants' mean and standard deviation (SD) of social anxiety scores. The data showed that the mean score for the entire sample was 39.79±8.85, indicating that the participants experienced relatively high levels of social anxiety on average. Regarding different BMI levels, the data revealed that the average social anxiety score for Class 1 was 34.20±5.17; for Class 2: 42.36±7.66; and for Class 3: 46.92±4.91. The results demonstrated significant differences between different BMI levels ($F_{(2,383)=}$15.67, P<0.001). Specifically, participants in Class 1 reported significantly lower social anxiety compared to those in Class 2 and 3 (both P<0.001). Furthermore, participants in Class 2 reported significantly lower social anxiety compared to those in Class 3 (P<0.001).

3.4. Depression

Table 1 presents the mean and standard deviation (SD) of depression scores among the participants. The data revealed that the mean score for the entire sample was 9.55±2.67, indicating a prevalence of high depression levels. Specifically, the data showed that 60 participants (15%) exhibited a normal condition, 35 participants (9%) experienced mild depression, 245 participants (64%) displayed moderate depression, 46 participants (12%) manifested severe depression, and only two participants exhibited extremely severe depression (<1%). Consequently, it can be inferred that 324 participants (84%) were afflicted by some form of depression, whether mild, moderate, severe, or extremely severe.

When considering various BMI categories, the data indicated that the average depression score for the Class 1 was 7.29±1.08, while it was 10.29±1.22 for the Class 2. Finally, the Class 3 exhibited an average depression score of 10.21±1.54. These findings revealed significant disparities in depression levels among different BMI categories ($F_{(2,383)=}$36.58, P<0.001). Specifically, participants in the Class 1 reported significantly lower depression levels compared to those in the Class 2 and 3 (both P<0.001). However, there was no significant difference between the participants in Class 2 and 3 (P=0.239).

3.5. Self-efficacy

Table 1 displays the participants' mean and standard deviation (SD) of self-efficacy scores. The data demonstrated that the mean score for the entire sample was 40.64±9.93, indicating moderate levels of self-efficacy. Regarding various BMI categories, the data indicated that the average self-efficacy score for the Class 1 was 49.28±6.84, whereas it was 39.41±6.07 for the Class 2. Finally, the Class 3 exhibited an average self-efficacy score

Table 2: Mean and Standard Deviation (SD) of physical activity pattern across different classes of obesity

	Whole Sample	Obesity Class 1	Obesity Class 2	Obesity Class 3	ANOVA	Comparison
Sedentary time (minute/day)	569.20±205.61	550.33±158.65	672.93±182.09	593.54±158.65	F=12.38 P<0.001	Class 1 vs. 2=> P<0.001 Class 1 vs. 3=> P<0.001 Class 2 vs. 3=> P<0.001
Light PA (minute/day)	112.65±19.58	116.38±25.09	110.57±14.44	102.87±12.29	F=15.67 P<0.001	Class 1 vs. 2=> P<0.001 Class 1 vs. 3=> P<0.001 Class 2 vs. 3=> P<0.001
MPA (minutes/day)	10.34±3.66	13.23±4.17	9.55±2.30	5.94±2.72	F=15.40 P<0.001	Class 1 vs. 2=> P<0.001 Class 1 vs. 3=> P<0.001 Class 2 vs. 3=> P<0.001
VPA (minutes/day)	2.67±2.45	3.84±1.48	1.56±1.27	0.98±0.85	F=9.60 P<0.001	Class 1 vs. 2=> P<0.001 Class 1 vs. 3=> P<0.001 Class 2 vs. 3=> P<0.001
MVPA (minutes/day)	13.01±3.02	16.89±3.41	10.83±2.28	6.13±1.87	F=8.07 P<0.001	Class 1 vs. 2=> P<0.001 Class 1 vs. 3=> P<0.001 Class 2 vs. 3=> P<0.001

PA: Physical Activity; MPA: Moderate physical activity; VPA: Vigorous physical activity; MVPA: Moderate-to-Vigorous Physical Activity

Table 3: The correlations between mindfulness, social anxiety, depression, self-efficacy and physical activity

	1	2	3	4	5	6	7
1. Mindfulness	-						
2. Social anxiety	r=–0.562 P<0.001	-					
3. Depression	r=–0.635 P<0.001	r=0.476 P<0.001	-				
4. Self-efficacy	r=0.471 P<0.001	r=–0.297 P<0.001	r=–0.390 P<0.001	-			
5. Sedentary	r=–0.394 P<0.001	r=0.555 P<0.001	r=0.234 P<0.001	r=–0.409 P<0.001	-		
6. Light PA	r=0.409 P<0.001	r=–0.691 P<0.001	r=–0.382 P<0.001	r=0.304 P<0.001	r=0.037 P=0.452	-	
7. MVPA	r=0.516 P<0.001	r=–0.470 P<0.001	r=–0.273 P<0.001	r=0.412 P<0.001	r=0.008 P=0.867	r=0.019 P=0.687	-

PA: Physical Activity; MVPA: Moderate-to-Vigorous Physical Activity

of 34.22±7.50. These results highlighted significant discrepancies in self-efficacy levels across different BMI categories ($F_{(2,383)=}$22.14, P<0.001). Specifically, the Class 1 participants reported significantly higher self-efficacy levels than those in the Class 2 and 3 (P<0.001). Additionally, participants in the Class 2 reported significantly higher self-efficacy levels than those in the Class 3 (P<0.001).

3.6. Physical Activity

Table 2 presents the mean and standard deviation (SD) of the PA pattern. As shown, the sample averaged 569.20 minutes of sedentary activity per day. Participants engaged in an average of 112.65 minutes of light PA per day, 10.34 minutes of MPA per day, and 2.67 minutes of VPA per day. Consequently, the total amount of MVPA was 13.01 minutes per day. These results indicated that the sample falls well below the guidelines set by the WHO (15).

Furthermore, significant differences were observed in sedentary time, light PA, moderate physical activity (MPA), vigorous physical activity (VPA), and moderate-to-vigorous physical activity (MVPA) across different BMI categories (Table 2). Specifically, participants with lower BMI demonstrated significantly less sedentary time and engaged in lighter PA, MPA, VPA, and MVPA than those with higher levels of BMI (all P<0.001).

3.7. Correlation Results

Table 3 illustrates the relationships between mindfulness and social anxiety, depression, self-efficacy, as well as PA patterns (i.e., sedentary time, light PA, and MVPA). As indicated,

significant positive associations were observed between mindfulness and self-efficacy, light PA, and MVPA (all P<0.001). Conversely, mindfulness exhibited an inverse and significant relationship with social anxiety and depression (all P<0.001). Notably, positive associations were found between light PA and MVPA with self-efficacy, while they displayed an inverse and significant correlation with social anxiety and depression (all P<0.001). Lastly, sedentary time exhibited positive associations with social anxiety and depression, while it showed an inverse and significant relationship with self-efficacy (all P<0.001).

4. Discussion

The relationship between mindfulness and the consequences of obesity, especially in girls, has rarely been addressed. Therefore, the current research aimed to investigate the correlation between mindfulness and social anxiety, depression, self-efficacy, and PA among obese teenage girls. Concerning mindfulness, the sample exhibited moderately elevated levels of mindfulness. Additionally, researchers observed that participants with higher levels of mindfulness had significantly lower BMI, in alignment with previous studies by Ersöz and colleagues (18), Cotter and co-workers (27), and Loucks and colleagues (28), which also found significant associations between mindfulness and obesity. These findings suggested that teenagers with higher levels of mindfulness tend to exhibit lower obesity rates, likely due to their adoption of healthier eating behaviors and lifestyles.

Regarding social anxiety, the sample displayed relatively high levels of social anxiety. Furthermore, individuals with lower BMIs reported significantly lower levels of social anxiety, while those with higher levels of mindfulness exhibited significantly lower social anxiety. These findings indicated that social anxiety can be considered a negative consequence of obesity in teenage girls, and they were consistent with the work of Alonso-Caraballo and colleagues (7) and also Amiri and Behnezhad (29), who demonstrated a significant association between mindfulness and anxiety symptoms. These studies underscored the importance of approaching experiences without judgment and promoting complete acceptance, as failure may lead to unfavorable consequences.

In terms of depression, the sample exhibited relatively high levels of depression. It can be stated that 324 participants (84%) in the study suffered from depression. This finding suggested that depression can be considered a negative consequence of obesity in teenage girls. Moreover, it was found that mindfulness was significantly and inversely associated with depression among obese teenage girls, consistent with the findings of Sedighi and co-workers (17), who also reported significant relationships between mindfulness and depression. Taken together, these findings indicated that mindfulness can be considered a factor in reducing depression in obese girls. To interpret these results, it can be suggested that mindful individuals may frequently avoid negative interpretations of stressful factors when faced with stressors (15, 18). Furthermore, these individuals may reflexively approach stressful events by viewing each stressor as something novel, thus avoiding the psychological inflexibility associated with higher depression (18).

Regarding self-efficacy, the sample exhibited moderately elevated levels of self-efficacy, implying that reduced self-efficacy can result from obesity in teenage girls. However, individuals with higher levels of mindfulness reported significantly higher self-efficacy. These findings aligned with Rostami and co-workers (30), who observed that mindfulness significantly impacts self-efficacy. Collectively, these findings indicated that mindfulness can be considered a factor in increasing self-efficacy in obese girls. To analyze these findings further, it can be concluded that mindfulness is associated with a sense of empowerment and assurance. Individuals with heightened mindfulness will likely enhance their ability to regulate their thoughts and emotions, bolstering their self-efficacy (22, 31).

Finally, regarding PA, the sample spent an average of 13.01 minutes daily engaged in MVPA. The results indicated that the sample fell below the WHO guidelines regarding the WHO recommendations (15).

Given these results and the importance of regular participation in health-oriented PA for teenagers, it can be stated that increasing PA in obese teenage girls is necessary to improve their health. Additionally, mindfulness was significantly and directly associated with PA among obese teenage girls. These findings were consistent with the studies

conducted by Abdi and colleagues (12), Sheikh and co-workers (13), and Baniasadi and colleagues (15), which demonstrated significant effects of PA on health-related components in children and teenagers. In combination, these findings indicated that mindfulness can be considered a factor in increasing PA in obese girls. To further analyze these findings, it can be concluded that individuals with higher dispositional mindfulness, or those who develop it, may possess a more remarkable ability to translate their intentions for PA into actual behavior. They may also exhibit an intrinsic motivation to participate in PA, be more accepting of negative sensations that may arise during exercise (such as fatigue), and derive enjoyment from the exercise experience (26). This is especially significant for individuals who are overweight or obese, as they often harbor negative attitudes towards PA and find exercise uncomfortable.

4.1. Limitations

This study presented several strengths and limitations. One strength lied in the objective measurement of PA, which provides accurate data on the amount and intensity of PA. Furthermore, focusing on overweight adolescent girls contributes to a better understanding of obesity within this demographic characteristic. However, caution is necessary when extrapolating these findings to other populations, as the study exclusively involved teenage girls. Additionally, using non-random sampling techniques introduces the potential for inherent weaknesses in the outcomes. Moreover, self-report measures may introduce recall bias and imprecise responses, potentially impacting the conclusions.

5. Conclusion

Due to the significant implications of obesity among teenagers, the objective of the investigation was to explore the correlation between mindfulness and various factors, including social anxiety, depression, self-efficacy, and PA participation in obese teenage girls. The research findings underscored the prominence of anxiety and depression as consequential psychological outcomes of obesity in teenage girls. Furthermore, from a physiological standpoint, obesity contributes to a reduction in PA levels among obese girls, which in turn can precipitate adverse ramifications for their future health.

These findings emphasized the imperative need for implementing strategies aimed at mitigating obesity within the teenage girl population. Consequently, one promising approach to ameliorate the detrimental effects of obesity in teenage girls involves the cultivation of mindfulness. In this context, bolstering mindfulness practices can prove efficacious. Such practices may encompass meditation, mindful breathing, observant mindfulness, heightened awareness of surroundings, or mindful listening.

Ethical Approval

The Ethics Review Board of the university approved the present study with the code of IR.IAU.TNB.REC.1401.059. Also, written informed consent was obtained from the participants.

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We are grateful to all participants who attended in this study.

Authors' Contribution

Ali Khanzad: Substantial contributions to the conception and design of the work, acquisition, analysis, and interpretation of data for the work, drafting the work. Sheida Ranjbari: Contributions to the design of the work, drafting the work and reviewing it critically for important intellectual content. Amir Dana: Contributions to the design of the work, drafting the work and reviewing it critically for important intellectual content. Shaghayegh Hashemi Motlagh: Acquisition, analysis, and interpretation of data for the work, drafting the work.

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References

1. Vekic J, Zeljkovic A, Stefanovic A, Jelic-Ivanovic Z, Spasojevic-Kalimanovska V. Obesity and Dyslipidemia. Metabolism. 2019;92:71–81. doi: 10.1016/j.metabol.2018.11.005. PubMed PMID: 30447223.
2. Pygeyre M, Meyre D. Monogenetic Obesity. In Freemark SM, Robert C, Atkins V, editors. Pediatric Obesity: Etiology, Pathogenesis and Treatment (Contemporary Endocrinology). 2nd ed. Springer International Publishing:

Bern, Switzerland; 2018. p. 135–152.
3. Morinis J, Maguire J, Khovratovich M, McCrindle BW, Parkin PC, Birken CS. Paediatric obesity research in early childhood and the primary care setting: the TARGet Kids! research network. Int J Environ Res Public Health. 2012;9(4):1343-54. doi: 10.3390/ijerph9041343. PubMed PMID: 22690197; PubMed Central PMCID: PMC3366615.
4. Yousefi R, Mottaghi A, Saidpour A. Spirulina Platensis Effectively Ameliorates Anthropometric Measurements and Obesity-Related Metabolic Disorders in Obese or Overweight Healthy Individuals: A Randomized Controlled Trial. Complement Ther Med. 2018;40:106–112. doi: 10.1016/j.ctim.2018.08.003. PubMed PMID: 30219433.
5. WHO. Report of the Commission on Ending Childhood Obesity; 2016. Available from: http://www.who.int/end-childhood-obesity/en/.
6. Lau DCW, Douketis JD, Morrison KM, Hramiak IM, Sharma AM, Ur E, et al. 2006 Canadian clinical practice guidelines on the management and prevention of obesity in adults and children [summary]. CMAJ. 2007;176(8):S1-13. doi: 10.1503/cmaj.061409. PubMed PMID: 17420481; PubMed Central PMCID: PMC1839777.
7. Alonso-Caraballo Y, Hodgson KJ, Morgan SA, Ferrario CR, Vollbrecht PJ. Enhanced anxiety-like behavior emerges with weight gain in male and female obesity-susceptible rats. Behav Brain Res. 2019;360:81-93. doi: 10.1016/j.bbr.2018.12.002. PubMed PMID: 30521928; PubMed Central PMCID: PMC6462400.
8. Amiri S, Behnezhad S. Obesity and anxiety symptoms: a systematic review and meta-analysis. Neuropsychiatr. 2019;33(2):72-89. doi: 10.1007/s40211-019-0302-9. PubMed PMID: 30778841.
9. Blasco BV, García-Jiménez J, Bodoano I, Gutiérrez-Rojas L. Obesity and Depression: Its Prevalence and Influence as a Prognostic Factor: A Systematic Review. Psychiatry Investig. 2020;17(8):715-724. doi: 10.30773/pi.2020.0099. PubMed PMID: 32777922; PubMed Central PMCID: PMC7449839.
10. Sagar R, Gupta T. Psychological aspects of obesity in children and adolescents. Indian J Pediatr. 2018;85(7):554–559. doi: 10.1007/s12098-017-2539-2. PubMed PMID: 29150753.
11. Mühlig Y, Antel J, Föcker M, Hebebrand J. Are bidirectional associations of obesity and depression already apparent in childhood and adolescence as based on high-quality studies? A systematic review. Obes Rev. 2016;17(3):235-49. doi: 10.1111/obr.12357. PubMed PMID: 26681065.
12. Abdi K, Hosseini FB, Chaharbaghi Z, Ghorbani S. Impact of Social Support on Wellbeing and Health-Related Quality of Life among Elderly Women: Mediating Role of Physical Activity. Women Health Bull. 2022;9(2):104-109. doi: 10.30476/whb.2022.94981.1174.
13. Sheikh M, Bay N, Ghorbani S, Esfahani nia A. Effects of Social Support and Physical Self-efficacy on Physical Activity of Adolescents. Int J Pediatr. 2022;10(4):15823-15834. doi: 10.22038/ijp.2022.62762.4793.
14. Sheikh M, Bay N, Ghorbani S, Esfahaninia A. Effects of Peers on Motivation and Physical Activity Behavior of Adolescent Students: An Investigation of Trans-Contextual Model. Int J School Health. 2021;8(1):47-54. doi: 10.30476/intjsh.2021.90210.1129.
15. Baniasadi T, Ranjbari S, Khajeaflaton Mofrad S, Dana A. Associations between device-measured physical activity and balance performance in children: Mediating role of motor self-efficacy. Biomed Human Kinetic. 2022;14(1):252-258. doi: 10.2478/bhk-2022-0031.
16. Chaharbaghi Z, Hosseini FB, Baniasadi T, Moradi L, Dana A. Impact of Physical Activity on Resilience among Teenage Girls during the COVID-19 Pandemic: a Mediation by Self-Esteem. Women Health Bull. 2022;9(2):80-85. doi: 10.30476/whb.2022.94451.1166.
17. Sedighi K, Saffarian Toosi M, Khadivi G. Effectiveness of Mindfulness based Cognitive Therapy on Anxiety and Depression of Divorce Women. RBS. 2021;19(1):149-160. doi: 10.52547/rbs.19.1.149. Persian.
18. Ersöz Alan B, Akdemir D, Cetin FC, Karahan S. Mindful eating, body weight, and psychological well–being in adolescence. Child Obes. 2022;18(4):246–253. doi: 10.1089/chi.2021.0121. PubMed PMID: 34788105.
19. Annameier SK, Kelly NR, Courville AB, Tanofsky-Kraff M, Yanovski JA, Shomaker LB. Mindfulness and laboratory eating behavior in adolescent girls at risk for type 2 diabetes. Appetite. 2018;125:48–56. doi: 10.1016/j.appet.2018.01.030. PubMed PMID: 29407527;

PubMed Central PMCID: PMC5878719.
20. Baniasadi T, Ranjbari S, Khajeaflatoon Mofrad S, Ghorbani S. Correlations Between Social Support and Physical Activity with Depression and Happiness in Elderly Women with Memory Impairment. Women Health Bull. 2023;10(3):165-172. doi: 10.30476/whb.2023.98614.1230.
21. Butte NF, Garza C, de Onis M: Evaluation of the feasibility of international growth standards for school-aged children and adolescents. J Nutr. 2007;137(1):153-7. doi: 10.1093/jn/137.1.153. PubMed PMID: 17182818.
22. Brown KW, Ryan RM, Creswell JD. Addressing fundamental questions about mindfulness. Psychological Inquiry. 2007;18(4):272-81. doi: 10.1080/10478400701703344.
23. La Greca AM, López N. Social anxiety among adolescents: Linkages with peer relations and friendships. J Abnorm Child Psychol. 1998;26:83-94. doi: 10.1023/a:1022684520514. PubMed PMID: 9634131.
24. Lovibond SH, Lovibond PF. Manual for the Depression Anxiety & Stress Scales. 2nd Ed. Sydney: Psychology Foundation; 1995.
25. Schwarzer R, Jerusalem M. Generalized Self-Efficacy scale. In Weinman J, Wright S, Johnston M. Measures in health psychology: A user's portfolio. Causal and control beliefs. Windsor, UK: NFER-NELSON; 1995.
26. Evenson KR, Catellier DJ, Gill K, Ondrak KS, McMurray RG. Calibration of two objective measures of physical activity for children. J Sports Sci. 2008;26(14):1557-65. doi: 10.1080/02640410802334196. PubMed PMID: 18949660.
27. Cotter EW, Hornack SE, Fotang JP, Pettit E, Mirza NM. A pilot open–label feasibility trial examining an adjunctive mindfulness intervention for adolescents with obesity. Pilot Feasibility Stud. 2020;6:79. doi: 10.1186/s40814-020-00621-1. PubMed PMID: 32518670; PubMed Central PMCID: PMC7275381.
28. Loucks EB, Britton WB, Howe CJ, Gutman R, Gilman SE, Brewer J, et al. Associations of dispositional mindfulness with obesity and central adiposity: the New England Family Study. Int J Behav Med. 2016;23(2):224–33. doi: 10.1007/s12529-015-9513-z. PubMed PMID: 26481650; PubMed Central PMCID: PMC4965799.
29. Amiri S, Behnezhad S. Obesity and anxiety symptoms: a systematic review and meta-analysis. Neuropsychiatr. 2019;33(2):72-89. doi: 10.1007/s40211-019-0302-9. PubMed PMID: 30778841.
30. Rostami A, Shariatnia K, Khajehvand Khoshli A. The relationship between self-efficacy and mind fullness with rumination among students of Islamic Azad University, Shahrood Branch. Medical Sciences. 2015;24(4):254-259. Persian.
31. Warren JM, Smith N, Ashwell M. A structured literature review on the role of mindfulness, mindful eating and intuitive eating in changing eating behaviours: effectiveness and associated potential mechanisms. Nutr Res Rev. 2017;30(2):272–283. doi: 10.1017/S0954422417000154. PubMed PMID: 28718396.