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Effects of a Yoga-Based Intervention on Self-Compassion, Depression and Loneliness in Obese Adolescents

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A B S T R A C T

Objective: The aim of this study was to examine the effects of a yoga-based intervention on self-compassion, depression and loneliness in obese adolescents.

Methods and Materials: A quasi-experimental design with a pretest-posttest framework was utilized in this research, which involved a sample of 58 male adolescents aged 15 to 17 who were classified as obese. The participants were split into two equal groups: an intervention group of 29 individuals who participated in an eight-week yoga program, and a control group of the same size. To evaluate the research variables, The Self-Compassion Scale, The Patient Health Questionnaire, and The DJGLS-6 were employed, and the data were subsequently analyzed using ANCOVA.

Findings: The analysis conducted at the conclusion of the intervention revealed significant differences among all groups regarding these parameters (P<0.001). These results indicate that the yoga intervention effectively improved self-compassion while simultaneously decreasing levels of depression and loneliness in obese male adolescents.

Conclusion: Yoga can be regarded as a valuable complementary strategy for alleviating certain psychological disorders in obese male adolescents. Given that young individuals typically enjoy engaging in physical activities like yoga, their participation can lead to significant benefits.

Keywords: *Obesity, Adolescent, Yoga, Mental Disorders, Exercise*

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1. Introduction

The World Health Organization (WHO) characterizes overweight and obesity as an abnormal or excessive accumulation of fat that poses health risks (1, 2). For both epidemiological research and clinical practice, straightforward anthropometric measurements are typically employed as screening instruments (3). Body Mass Index (BMI), calculated as weight divided by height squared (kg/m^2), serves as an indirect indicator of body fat in children and adolescents, necessitating comparison with population growth references that are sex- and age-adjusted (4-6). The WHO 2006 Growth Standard is widely endorsed for children aged 0 to 5 years, while in the United States, it is specifically recommended for those aged 0 to 2 years (7). For older children and adolescents, various growth references are utilized, including the WHO 2007 Growth Reference for individuals aged 5 to 19 years, where overweight is defined as a BMI at or above 1 standard deviation (SD) and obesity as a BMI at or above 2 SD from the median for age and sex (8-10). Additionally, the Centers for Disease Control and Prevention (CDC) Growth Reference is applied for those aged 2 to 20 years, categorizing overweight as being between the 85th and 95th percentiles and obesity as at or above the 95th percentile based on CDC growth charts (11, 12). In 2019, the World Obesity Federation projected that by 2025, approximately 206 million children and adolescents aged 5 to 19 would be affected by obesity, with this number expected to rise to 254 million by 2030 (13).

Obesity significantly heightens the likelihood of early puberty in children, menstrual irregularities in adolescent girls, and various sleep disorders, including obstructive sleep apnea (14). Furthermore, it is associated with an array of cardiovascular risk factors such as prediabetes, type 2 diabetes, elevated cholesterol levels, hypertension, non-alcoholic fatty liver disease, and metabolic syndrome (15, 16). Beyond physical health, children and adolescents grappling with obesity may also experience psychological challenges, including depression, anxiety, low self-esteem, negative body image, difficulties in peer relationships, and eating disorders. Individuals with higher body weight, such as those classified as overweight or obese, often face societal stigma and discrimination linked to their size (17). These negative experiences can lead to a variety of adverse psychological and physical health outcomes, including increased rates of depression, anxiety, disordered eating, physiological stress, and even higher mortality rates (18). Additionally, the stress associated with weight stigma can trigger psychological, behavioral, and physiological reactions that may promote further weight gain, creating a detrimental cycle in which stigma leads to increased body weight (19).

Yoga, with its roots deeply embedded in Eastern traditions, has served as a healing practice for over 5,000 years. In the last century, B. K. S. Iyengar played a pivotal role in introducing yoga to the Western world, making it more accessible to a broader audience (20). While many perceive yoga primarily as a means to enhance physical strength and flexibility, practitioners often recognize its deeper significance, particularly in relation to mental health (21). Exercise, including yoga, has been shown to positively influence neurotransmitter activity and lower cortisol levels, contributing to improved self-efficacy and self-esteem. Research highlights the role of physical activity in aiding recovery from trauma and mental health challenges, yet this study specifically examines how yoga fosters resilience and self-compassion in individuals recovering from sexual assault (22, 23). By promoting a stronger mind-body connection and enhancing emotional regulation, yoga extends its benefits well beyond mere physical fitness (24).

Research has established a connection between pranayama, the practice of breath control, and enhanced emotional regulation (25, 26). This technique not only aids individuals in recognizing negative thoughts as they arise but also facilitates a shift towards more positive thinking patterns (27). Furthermore, pranayama has been identified as an effective coping strategy, empowering individuals, particularly women, to become more attuned to their bodies and to exert greater control over their lives (28). In addition, it has been shown that yoga practices have been shown to mitigate autonomic sympathetic activation, reduce muscle tension, and lower blood pressure, while also enhancing neuroendocrine and hormonal functions (29, 30). These practices can alleviate physical symptoms and emotional distress, ultimately leading to an improved quality of life. The rhythmic nature of asana practice contributes to the development of the respiratory system, strengthens muscles and bones, and enhances balance, agility, and endurance, all of which help to soothe the nervous system's responses (27, 29).

Despite extensive research on the effects of yoga, there is a notable lack of studies focusing on its emotional benefits. Engaging in a trauma-sensitive yoga practice can enhance the connection to breath, which may help calm racing thoughts and feelings, thereby promoting relaxation. This approach not only strengthens the mind-body connection but

also aids individuals in reclaiming a sense of control and ownership over their bodies and experiences. This study was designed to extend the literature by including obese adolescents into the study. The aim of this study was to examine the effects of a yoga-based intervention on self-compassion, depression and loneliness in obese adolescents.

2. Methods and Materials

2.1 Study Design and Participants

A quasi-experimental design utilizing a pretest-posttest non-equivalent group approach was employed to involve participants in this study. The research focused on male adolescents aged 15 to 17 years with a BMI at or above the 95th percentile (over 30), specifically those enrolled in 9th to 11th grades at public middle and high schools. The sample consisted of 58 obese adolescents from four schools with similar socio-economic and cultural backgrounds, divided into an intervention group (n = 29) and a control group (n = 29). Inclusion criteria mandated that participants be between 15 and 17 years old, possess a BMI of 30 or higher, and not have any acute neurological or psychological disorders. Additionally, conditions contributing to obesity, such as endocrine or hormonal disorders, were grounds for exclusion. Participants were also required to avoid medications that could lead to weight gain, and those who did not cooperate during testing or missed yoga sessions were excluded from the study.

The research initiative began with essential collaboration from the Education Department, which facilitated the necessary permissions for advancement. A briefing session was then held to communicate the research objectives, methodologies, and the intervention process to students and their parents. Following this, written consent was obtained from the parents. The experimental group participated in an eight-week yoga training program, consisting of two sessions per week, each lasting 40 minutes. Each session included a 5-minute warm-up, a 30-minute training segment, and a 5-minute cool-down, all conducted by two certified yoga instructors. The intervention consisted of sessions that integrated respiratory, postural, relaxation, and concentration training, with breathing exercises and poses practiced consistently throughout. A tranquil and comfortable room, kept at a temperature of 25 ± 2°C, was designated for these yoga sessions. The program included respiratory training focusing on specific oral and nasal passages, postural training involving flexibility exercises such as stretching and various movements executed in different positions, relaxation training aimed at enhancing body awareness through muscle tension and release, and concentration training utilizing the Trataka method, which involves focusing on a specific word or shape and visualizing it with closed eyes before transferring the image onto paper. Participants were assessed for self-compassion, depression, and loneliness both one day before the intervention and after its completion, while the control group did not receive any additional interventions.

2.2 Measures

Self-compassion: The Self-Compassion Scale (SCS) (31) is a 26-item self-assessment tool designed to evaluate levels of self-compassion. Participants respond to statements such as "I'm kind to myself when I'm experiencing suffering" using a Likert scale that ranges from 1 (almost never) to 5 (almost always). A higher total score reflects greater self-compassion. In this study, the validity of this instrument has been confirmed by eight experts, yielding a Content Validity Index (CVI) of 0.94 and a Content Validity Ratio (CVR) of 0.94. The results of this study demonstrated strong reliability for the SCS, as indicated by a Cronbach's alpha coefficient of 0.92.

Depression: The nine-item Patient Health Questionnaire (PHQ-9) was utilized to assess major and subthreshold depression over the preceding two weeks (32). Participants evaluated various statements, such as "Trouble falling or staying asleep, or sleeping too much," using a four-point scale from 0 (not at all) to 3 (nearly every day). The total score for the PHQ-9 can range from 0 to 27, with higher scores reflecting more severe depressive symptoms. In this study, the validity of this instrument has been confirmed by eight experts, yielding a CVI of 0.92 and a CVR of 0.96. The instrument demonstrated strong reliability, indicated by a Cronbach's alpha of 0.93, while the internal consistency for the scale was also robust, with a Cronbach's alpha of 0.85.

Loneliness: The DJGLS-6 (33) was utilized to assess feelings of loneliness among participants. Respondents rated six statements, such as "I experience a general sense of emptiness," on a scale from 0 to 2, which were subsequently recoded into a binary format (0 or 1). The cumulative score can range from zero, indicating no loneliness, to six, reflecting extreme loneliness, with higher scores signifying greater levels of loneliness (Cronbach's alpha = 0.83). In this study, the validity of this instrument has been confirmed by eight experts, yielding a CVI of 0.90 and a CVR of 0.93. The

instrument exhibited strong reliability, as demonstrated by a Cronbach's alpha coefficient of 0.90.

2.3 Data Analysis

In this research, the variables were defined through the calculation of the mean and standard deviation (SD). To assess the differences between the two groups from pretest to posttest, analysis of covariance (ANCOVA) was employed. A significance level of 0.05 was set for all analyses, and the data were processed using SPSS version 27.

3. Results

The average ages of participants in the intervention and control groups were 15.96 ± 0.22 years and 15.94 ± 0.25 years, respectively, with no statistically significant differences found (P>0.05). Furthermore, initial evaluations indicated that the body mass index (BMI) for both groups was similar, again showing no significant differences (P>0.05) as detailed in Table 1.

Table 1. Comparison of the demographic data across groups

Variable	Intervention	Control	Comparison
Age (years)	15.96 ± 0.22	15.94 ± 0.25	P=0.950
Height (m)	1.69 ± 0.05	1.68 ± 0.04	P=0.967
Weight (kg)	79.63 ± 3.28	79.54 ± 3.74	P=0.910
BMI	31.90 ± 1.33	32.10 ± 1.35	P=0.847

Table 2 presents the mean and standard deviation for self-compassion, depression, and loneliness measured during both the pretest and posttest phases. The results indicate that the intervention group had a mean self-compassion score of 69.68, while the control group scored 70.53, suggesting a higher-average level of self-compassion among obese male adolescents. Furthermore, statistical analysis revealed no significant differences between the two groups in the pretest (P=0.894). In terms of depression, the intervention group's mean score was 17.68 compared to 17.59 for the control group, both indicating a higher-than-average level of depression, with no significant differences found in the pretest (P=0.847). For loneliness, the intervention group had a mean score of 4.15, while the control group scored 4.11, again reflecting a higher-than-average level of loneliness, with no significant differences observed in the pretest (P=0.905). These results suggest that both groups exhibited comparable baseline conditions across the assessed variables.

Table 2. Mean and SD of research variables in the pretest and posttest

	Intervention		Control	
	Pretest	Posttest	Pretest	Posttest
Self-compassion	69.68± 6.97	55.36 ± 4.47	70.53± 6.39	70.21 ± 6.52
Depression	17.68 ± 1.55	12.38 ± 0.95	17.59 ± 1.42	17.29 ± 0.60
Loneliness	4.15 ± 0.15	2.42 ± 0.23	4.11 ± 0.13	4.13 ± 0.17

Table 3 illustrates the effects of the intervention on self-compassion, depression, and loneliness. The analysis conducted at the conclusion of the intervention revealed significant differences among all groups regarding these parameters, with a p-value of less than 0.001. These results indicate that the yoga intervention effectively improved self-compassion while simultaneously decreasing levels of depression and loneliness in obese male adolescents.

Table 3. Comparison of pretest-posttest

	Sum of Squares	df	Mean Square	F	P	η^2
Self-compassion	2.615	1	1.25	22.471	<0.001	0.308
Depression	2.145	1	1.16	19.857	<0.001	0.258
Loneliness	1.986	1	1.05	14.859	<0.001	0.213

4. Discussion and Conclusion

This study aimed to investigate the impact of a yoga-based intervention on self-compassion, depression, and loneliness among obese adolescents. The results revealed significant differences across all groups regarding the measured variables, including self-compassion, depression, and loneliness. These outcomes suggest that the yoga-based intervention effectively enhanced self-compassion while reducing depression and loneliness in obese male adolescents. This supports existing literature (34-37) that highlights the numerous advantages of yoga interventions for this demographic.

To interpret these findings, it can be stated that yoga practice has been shown to diminish the activity of both the central and autonomic nervous systems in response to stress, leading to a notable reduction in sympathetic nervous system activity. This practice not only lowers stress and anxiety-related hormones but also enhances brain function and overall well-being (25, 27, 38). Psychologically, yoga facilitates adaptation by alleviating tension and calming the mind, which in turn fosters a sense of tranquility. Conscious breathing plays a crucial role in this process, as it mitigates anxiety and emotional distress by diminishing negative thought patterns such as judgment and worry (29, 39). Engaging in mindful breathing encourages qualities like observation and non-reactivity, allowing individuals to break free from automatic responses and gain better control over feelings of anxiety and fear, ultimately reducing aggressive tendencies through heightened awareness.

Yoga serves as a comprehensive approach to treatment, focusing on the underlying causes of various disorders. It posits that the mind plays a pivotal role in these conditions, striving to restore the body's internal equilibrium. This practice is often regarded as a valuable alternative in scenarios where conventional medical interventions fall short of providing complete solutions (26, 36, 40). The practice of yoga and mindfulness-based meditation enhances metacognitive awareness, enabling individuals to reinterpret their thoughts and emotions as fleeting experiences rather than absolute truths. This heightened awareness is believed to contribute to a decrease in repetitive negative thought patterns, which often lead to catastrophizing and other detrimental symptoms such as stress and ineffective coping strategies (38, 39). Consequently, this reduction in maladaptive thought processing can alleviate symptoms associated with obesity, ultimately improving overall quality of life.

The application of yoga techniques proves to be highly effective in the emotional regulation process. These cognitive strategies empower individuals to manage their emotions, preventing them from being overwhelmed by emotional intensity. Cognitive regulation involves the manipulation of information input and the evocation of emotions, allowing individuals to adopt a more adaptive mindset (34, 37). Those who consistently employ positive thinking strategies—such as focusing on positive events, planning effective interventions, and interpreting situations favorably—tend to exhibit greater resilience and are less susceptible to stress-related physical ailments (27, 28). By utilizing these adaptive strategies to diminish negative emotions, individuals enhance their cognitive and emotional functioning, thereby improving their problem-solving capabilities and fostering positive emotional experiences. Ultimately, individuals with robust physical and mental health strategically leverage positive emotions to achieve superior outcomes (38, 40).

Finally, yoga training cultivates a heightened awareness and concentration during the practice of asanas, leading to a profound stillness in the minds of practitioners. This focused attention on each body part fosters a sense of relaxation and detachment, both mentally and physically. With sessions lasting 90 minutes and occurring weekly, the benefits of this practice naturally extend into daily life (27, 29, 30). Consequently, individuals learn to apply this mindfulness to everyday situations, allowing them to draw upon previously acquired problem-solving strategies. This reflective approach enables them to respond more effectively to various challenges, ultimately enhancing their self-confidence and self-esteem while alleviating anxiety and stress (27, 38, 40).

This study encountered several limitations that should be acknowledged. Primarily, the research concentrated exclusively on male adolescents, which may restrict the applicability of the findings to female adolescents. Consequently, it is recommended that future research examine the impact of yoga training on self-compassion, depression, and loneliness among obese girls. Additionally, the lack of a follow-up assessment conducted over a longer period post-test limits the evaluation of the long-term effects of yoga training. Therefore, future studies should incorporate follow-up assessments with extended intervals beyond the initial post-test. Conversely, this study also demonstrated significant strengths, particularly in its

integration of yoga training, which highlighted a potential variable that could be combined with traditional exercise regimens to enhance the mental health of obese adolescents.

In summary, yoga can be regarded as a valuable complementary strategy for alleviating certain psychological disorders in obese male adolescents. Given that young individuals typically enjoy engaging in physical activities like yoga, their participation can lead to significant benefits. By integrating yoga into their routines, these adolescents may experience enhancements in both their physical and mental well-being, addressing challenges they often face. However, additional research is necessary to investigate this relationship in greater depth.

Authors' Contributions

All authors equally 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.

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

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

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