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The effect of exercise training videos on self-esteem of 7-10-year-old obese girls: A randomized controlled trial

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Abstract

Background Childhood obesity in girls is a well-known problem worldwide and can affect their self-esteem. Losing weight through physical activity and exercise can also have positive psychological consequences for children. Therefore, the present study aimed to investigate the effectiveness of exercise training videos on the self-esteem of obese girls aged 7 to 10.

Material & method This randomized controlled trial was conducted on 104 obese girls aged 7 to 10. Participants were randomly divided into two intervention groups ($n=52$) and one control group ($n=52$). The intervention program consisted of 8 weeks of exercise training, which was presented as educational videos and provided to the intervention group. Parents completed the self-esteem scale during both the pre-test and post-test phases. Data were analyzed using paired t-tests and analysis of covariance (ANCOVA).

Results The results showed a significant difference in mean self-esteem ($F=2264.73$, $p\leq 0.01$) scores between the control and intervention groups after the intervention. After 8 weeks of intervention, the results indicated body weight loss ($F=630.17$) and body mass index ($F=333.73$) in the experimental group ($p<0.01$).

Conclusion Implementing an exercise program through educational videos positively affected self-esteem, weight loss, and body mass index in obese girls. The exercise program developed in this study may benefit families, schools, and educational and therapeutic centers.

Keywords Physical exercise, Self-esteem, Obesity, Overweigh, Girls, Educational video

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Background

The prevalence of overweight and obesity is increasing at an alarming rate worldwide, especially among children and adolescents [1, 2]. Childhood obesity has changed markedly in recent years, showing various trends across regions and periods. According to statistics, over the past half-century, the prevalence of obesity among children and adolescents has increased from 0.7 to 5.6% [3]. By 2030, the global rate of childhood overweight and obesity is projected to reach 30%, with even higher rates of 58.3% in middle- and high-income countries [4].

Childhood obesity and overweight are significant public health concerns globally, with varying prevalence rates across different regions and ethnic groups. Among Asian-American children, approximately 26% are overweight or obese [5]. The prevalence of overweight/obesity among European preschool children has been reported to be 17.9% [6]. In the United States, 31% of children are either overweight or obese [7]. In Iran, which is facing expanding urbanization and industrialization, the prevalence of obesity in children is increasing. Statistical reports indicate that the prevalence of obesity in boys and girls under the age of ten is estimated at 13.1% and 9.8%, respectively [8].

Childhood obesity is an increasing global concern that significantly varies by ethnicity, socioeconomic status, and lifestyle factors. This complex issue can be influenced by genetic, behavioral, environmental, and socioeconomic factors [9]. Genetic predisposition can have a direct effect on obesity. Children of obese parents are more likely to be obese and overweight [10]. Poor diet (consumption of fast food and high-calorie foods) and a sedentary lifestyle are among the most critical risk factors for obesity in children [11]. Parents' lifestyle and parenting style [12], parents' level of education, and poor family economic conditions, limited access to healthy food and sports equipment are also among the socioeconomic factors associated with childhood obesity [10].

According to the results of some studies, girls suffer more from diseases related to overweight and obesity than boys [13, 14]. Girls also experience more psychological challenges than boys when it comes to issues related to obesity and body image [15]. Overweight and obesity, defined as excessively high body fat [3], are closely linked to emotional stress and psychological distress. High stress and chronic psychological and personality issues can cause obesity and overweight [16]. One of the psychological variables that obesity can negatively affect is self-esteem [17, 18]. Self-esteem is a type of self-evaluation. This concept expresses a person's perception of his capabilities, physical appearance and characteristics, and social skills [19].

Some psychological theories emphasize that physical exercise has an impact on improving children's psychological health and self-esteem. Affective-reflective theory (ART) emphasizes that the emotional valuation of physical activity impacts participation in exercise training and that exercise training can improve psychological health in an individual [20]. According to the exercise and self-esteem model (EXSEM), engaging in physical activity boosts self-efficacy and self-esteem, which enhance perceptions of exercise competence and physical acceptance. These enhancements contribute to a higher overall self-esteem [21]. Self-efficacy theory suggests that self-efficacy impacts behavioral engagement by influencing goal setting, persistence, and the ability to cope with obstacles. By increasing self-efficacy through physical activity, individuals can enhance their self-esteem [22].

The psychological mechanisms associated with obesity and low self-esteem are multifaceted and involve various emotional, cognitive, and behavioral factors. Among these mechanisms, we can mention body-related shame and guilt [23], internalized weight stigma [24], emotional distress, and coping mechanisms [25], dysfunctional eating behaviors [26], socioeconomic factors [27], self-efficacy, and illness perceptions [28], and negative body image [29].

Based on empirical evidence, obesity is associated with low levels of self-esteem [30], and people with obesity have a negative image of their body, which leads to a decrease in self-esteem [31–33]. Regular exercise and engagement in physical activity is an effective intervention in weight loss [34], promoting psychological health, and reducing negative emotions in children [35].

Based on evidence, there is a significant relationship between physical activity and increased self-esteem in children and adolescents [36]. Educational programs that aim to improve children's lifestyles through physical activities significantly enhance the self-esteem of obese children [37].

Today, many families do not have enough time to send their children to sports clubs due to their busy work schedules. Also, the cost of attending sports clubs, the distance of the club from the place of residence, and many other challenges can limit the ability of children to attend sports clubs. Therefore, using exercise training videos can be an effective strategy to overcome these limitations. Some studies have established the effectiveness of home exercise programs delivered via educational videos in improving psychological well-being. In this regard, evidence from a study suggests that home exercise programs accessible via video or online platforms have good potential to reduce anxiety among children and adolescents [38]. Another study found that physical activity using educational CDs significantly impacts weight loss and body mass index (BMI) in overweight children [39]. In addition, findings from another study showed that

exercise programs using active video games improve self-esteem and reduce children's BMI [40].

Systematic exercise programs can play an effective role in helping people lose weight [41]. Due to the necessity for additional research to better understand how exercise training impacts psychological factors in obese children, this study aimed to investigate the effects of exercise training, through educational videos, on the self-esteem of obese girls aged 7 to 10. Therefore, this study seeks to answer the following question:

1) Does an exercise program delivered via educational videos affect improving self-esteem in obese girls aged 7 to 10 years?

2) Does an exercise program delivered via educational videos result in weight loss and a decrease in body mass index (BMI) among obese girls aged 7 to 10 years?

Material and method

Design and participants

This Randomized Controlled Trial (RCT) study was conducted from October 2022 to January 2024. The study has been registered in the Iranian clinical trial database with the code IRCT20231103059944N1 (2023.11.08). This study followed the CONSORT guidelines for reporting randomized controlled trials (Fig. 1).

The study focused on obese female students aged 7 to 10 years who were attending elementary schools in Khorramabad, a city in western Iran. Using PASS Sample Size Software, a total of 104 students were purposefully selected and then randomly divided into two groups: a control group consisting of 52 participants and an intervention group with 52 participants. The sample size was calculated based on an alpha level of 0.05 and a statistical power of 80%.

Inclusion criteria for all participants were as follows: age between 7 and 10 years, BMI between 25 and 30, not following a special diet, not taking nutritional supplements, having both parents, not having parents with addiction, willingness to exercise, no obesity-related diseases, such as diabetes or Cushing's syndrome, no intellectual disabilities, no neuromuscular disorders or cerebral palsy, not taking any medications that induce obesity. Exclusion criteria included reluctance to participate in exercise, pain during exercise, academic failure, and inability to exercise.

Data collection tool

The data collection tool included a personal information form and a self-esteem questionnaire. The personal information form collected data on the child's age, the parents' ages, and their education levels.

Coopersmith self-esteem inventory (CSEI)

The Coopersmith Self-Esteem Inventory (CSEI) is a widely used tool for assessing self-esteem in children and adolescents. This scale has 58 items and 4 subscales for general self, social self with peers, home with parents, and school academic self. The score for each item is zero and one. The scale has 8 items for lie detection. The minimum and maximum scale scores are zero and 50. Respondents answer each question on a scale of "like me" or "unlike me." The validity and reliability indicators of the scale have been confirmed in previous studies [42–45]. In a study conducted by Zahedi et al., [46] the validity and reliability of the Persian version of this scale were confirmed among elementary school students in Iran. In the present study, the internal consistency coefficient of this questionnaire was calculated using Cronbach's alpha coefficient at 0.798.

Data gathering procedure

After obtaining approval and an ethics code, data collection commenced. First, a meeting was held with the students and their parents and the study objectives were explained to them. To maintain continuous communication between the researcher and the student's parents, two groups (control and intervention) were formed on the WhatsApp social network, and all parents (fathers or mothers) became members of this group. During the in-person session, parents completed a demographic information and self-esteem questionnaire. Before implementing the exercise protocol for the intervention group, anthropometric characteristics (height (m), weight, and BMI) were measured.

Height was measured using a Consumer Push Stadiometer, weight was measured using a beam balance, and body mass index (BMI) was calculated using the weight/height (2) formula. The previously mentioned characteristics were measured again 24 h after the final exercise session. After completing the intervention process, an electronic link to the questionnaire was sent to the parents of both groups, asking them to respond carefully to the questions.

Exercise training protocol

After developing an exercise program based on the opinion of a sports science specialist, educational videos were produced under the supervision of a sports science specialist. The exercise video was shared on the WhatsApp social network for parents of children in the intervention group. The exercise protocol includes 13 types of exercises and is 8 weeks long, with 3 sessions per week and each session consisting of 30 min of exercise (Table 1).

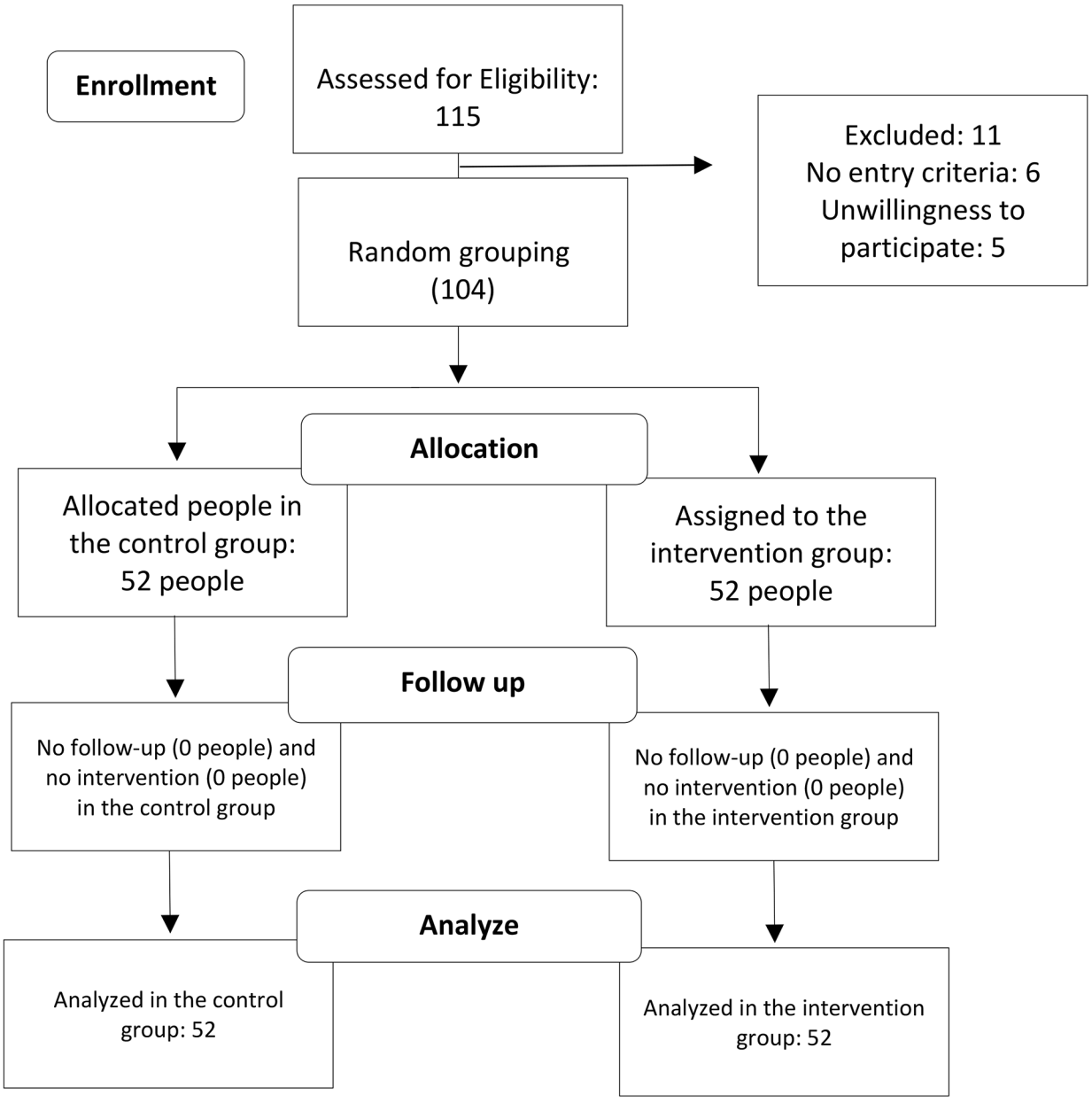

Fig. 1 Consort flowchart

Ethical considerations

The ethics committee of Lorestan University of Medical Sciences (IR.LUMS.REC.1401.196) approved. In this study, the basic principles of the Declaration of Helsinki regarding ethical requirements related to human experiments were observed. The researcher committed to keeping information related to the participants confidential and using it solely for research purposes. The study objectives were communicated to the parents of the children, and written consent was obtained from them.

Data analysis

The data of this study were analyzed at two levels descriptive statistics (frequency, percentage, mean, and standard deviation) and inferential statistics using SPSS version 26 software. The Shapiro-Wilk normality test indicated normal data distributions for the pre-test (Statistic = 0.978, $P > 0.05$) and post-test (Statistic = 0.976, $P > 0.05$) scores. Demographic characteristics between the two groups were compared using chi-square and independent t-tests. A paired t-test was used to compare mean self-esteem scores in the control and intervention groups before and after the intervention (pre-test and post-test). In

Table 1 Exercise program

Type of exercise	Movement duration	set number	Rest period	Duration of exercise
Step in place (hands on the waist)	30 s	3 sets	30 s	8 weeks and each week 3 sessions 30 min and each movement 3 sets with low pressure
Gam in situ (step to the side)	30 s	3 sets	After each set	
Rotation of the hands (shoulders)	10 times	3 sets	30 s	
Butterfly movement of the hands (raising and lowering the hands)	10 times	3 sets	After each set	
Raising and lowering the hands in front	10 times	3 sets	30 s	
Hands to the side and their quick movement (dragonfly movement)	10 times	3 sets	After each set	
Rocking	10 times	3 sets	30 s	
Crawling (cat)	30 s	3 sets	After each set	
Playing with fabric	10 times each leg	3 sets	30 s	
Single leg lee	10 times	3 sets	After Hearst	
Balloon game	10 times	3 sets	30 s	
Pair jump	10 times	3 sets	After each set	
Jump forward (frog)	10 times	3 sets	30 s	

Table 2 Comparison of demographic characteristics of children and their parents in the control and experimental groups

Variable		Mean ± SD		T-test	*P*-value
		Control	Intervention		
Child age		**9.03 ± 1.11**	**8.75 ± 1.27**	**1.18**	**0.119**
Height		**135.44 ± 2.40**	**135.23 ± 2.34**	**0.454**	**0.651**
Weight		**47.13 ± 2.62**	**46.73 ± 2.75**	**0.764**	**0.446**
Father age		**42.13 ± 5.07**	**41.75 ± 5.63**	**0.035**	**0.715**
Mother age		**37.09 ± 5.03**	**37.23 ± 5.47**	**0.130**	**0.411**
Variable		**Frequency (Percent)**		**Chi2**	**P-value**
		Control	**Intervention**		
Father-Education	**Elementary**	**2 (3.84)**	**0**	**8.014**	**0.056**
	Secondary	**2 (3.84)**	**13 (25.00)**		
	Diploma	**20 (38.46)**	**15 (28.84)**		
	Bachelor	**23 (44.23)**	**21 (40.38)**		
	Master	**4 (7.69)**	**3 (5.76)**		
	Ph.D.	**1 (5.76)**	**0**		
Mother-Education	**Elementary**	**7 (13.46)**	**6 (11.53)**	**3.458**	**0.489**
	Secondary	**0**	**11 (21.15)**		
	Diploma	**15 (28.84)**	**14 (26.92)**		
	Bachelor	**28 (53.84)**	**18 (34.61)**		
	Master	**2 (3.84)**	**3 (5.76)**		

addition, analysis of covariance (ANCOVA) was used to compare mean self-esteem scores between the groups.

Results

Table 2 presents the demographic characteristics of children and their parents, including age, height, weight, parent's age, and education level. Results from the t-test and chi-square tests indicated homogeneity in demographic characteristics between the two groups.

Table 3 presents the results of the statistical analysis of the self-esteem variable and its dimensions in both the control and intervention groups. The paired t-test indicated no significant difference ($t = 1.23$, $P = 0.502$) between the mean self-esteem scores of children in the control group at the pre-test (17.34 ± 4.30) and post-test (19.75 ± 1.61) stages. Also, no significant difference was found between the mean scores of self-esteem dimensions in the pre-test and post-test in children in the control group. In the intervention group, the average self-esteem score of children in the post-test phase (36.09 ± 3.37) was significantly ($t = 19.42$, $P < 0.01$) higher than in the pre-test phase (19.75 ± 1.61). The mean scores of all dimensions of self-esteem of children in the intervention group in the post-test were significantly higher than the pre-test (Table 3).

Analysis of covariance (ANCOVA) was used to compare self-esteem scores in the control and intervention groups. A statistically significant difference was found between the mean self-esteem score ($F = 2264.730$,

Table 3 Results of paired t-test and analysis of covariance (ANCOVA) to compare the control and intervention groups

Variable	Group	Pre-test	Post-test	Paired t-test		ANCOVA test		Partial eta squared
		Mean ± SD		t	P	F	P	
General self	Control	7.74 ± 2.65	8.57 ± 2.28	0.360	0.612	387.84	0.001	0.793
	Intervention	7.51 ± 2.91	14.51 ± 2.79	6.31	0.001			
Social self (peers)	Control	3.21 ± 0.956	3.73 ± 0.952	0.302	0.823	346.40	0.001	0.774
	Intervention	2.59 ± 0.664	6.71 ± 0.935	3.82	0.001			
Home (parents)	Control	2.94 ± 0.826	3.59 ± 0.822	0.436	0.488	757.88	0.001	0.882
	Intervention	3.13 ± 0.686	7.51 ± 0.753	4.31	0.001			
School (academic)	Control	3.34 ± 0.837	6.69 ± 1.61	0.297	0.433	733.32	0.001	0.879
	Intervention	3.17 ± 0.677	7.34 ± 0.764	3.95	0.001			
Self-esteem	Control	17.34 ± 4.30	19.75 ± 1.61	1.23	0.502	2264.73	0.001	0.957
	Intervention	16.42 ± 3.82	36.09 ± 3.37	19.42	0.001			

Table 4 Results of analysis of variance test (ANCOVA) to compare weight and BMI before and after intervention in both groups

Variable	Group	Pre-test	Post-test	Paired t-test		ANCOVA test		Partial eta squared
		Mean ± SD		t	P	F	P	
Body weight kg	Control	47.13 ± 2.62	47.09 ± 2.59	1.868	0.067	630.17	0.000	0.862
	Intervention	46.73 ± 2.75	44.61 ± 2.72	26.185	0.000			
Body mass index (BMI)	Control	25.65 ± 1.81	25.58 ± 1.77	1.703	0.095	333.73	0.000	0.768
	Intervention	25.54 ± 1.75	24.41 ± 1.73	24.709	0.000			

$P < 0.01$) in the experimental and control groups in the post-test phase (Table 3).

A significant difference was found between the children in the control and intervention groups in all dimensions of self-esteem, including general self (F = 387.84, $P < 0.01$), social self (346.40, $P < 0.01$), home (F = 757.88, $P < 0.01$), and school academic self (F = 733.32, $P < 0.01$). After the intervention, the scores of the children in the intervention group were higher than those of the children in the control group (Table 3).

The results in Table 4 demonstrate a significant difference between the control and experimental groups in weight and BMI. After performing exercise, the intervention group showed decreased weight (F = 630.17, $P < 0.01$) and BMI (F = 333.73, $P < 0.01$).

Discussion

This study aimed to investigate the effectiveness of exercise training on the self-esteem level of 7-10-year-old girls with obesity. In this study, two groups were formed: control and intervention. The intervention group underwent an 8-session exercise program delivered in the form of educational videos.

The results indicate that the 8-week exercise program, delivered through educational videos, positively impacted self-esteem levels in obese girls. Post-intervention self-esteem scores demonstrated a significant improvement, consistent with findings from previous studies. Evidence from a systematic review [38] Indicates that home-based exercise using educational videos significantly reduces anxiety levels and enhances children's psychological well-being. Additionally, a separate study found that cyber-cycling improves self-regulation in children [47]. Empirical evidence suggests that physical activity, based on home-based exercise programs, improves physical self-perception, which is often associated with increased self-esteem in children and adolescents [48]. In addition, reducing negative emotions such as anxiety, depression, and stress and improving mood in children are other benefits of doing exercise at home [35]. Yamaguchi et al., [38] also showed in a study that exercise training through educational videos and online platforms effectively reduces anxiety among children and adolescents. Khazaei et al., [49] also showed that 8 weeks of distance learning-based exercise training can improve body composition and quality of life in obese patients. Evidence from Fukui et al.'s [50] study also suggests that educational video-based interventions can improve students' physical and mental health.

Regular physical activity and exercise are associated with improved mental health in individuals. Exercise can improve happiness and mental well-being by releasing endorphins in the brain. A sense of accomplishment and competence are known to be two key components of self-esteem, and exercise has a significant effect on improving them. Nordstar et al. [51] conducted a cohort study that revealed a significant, positive correlation between perceived athletic competence and self-esteem, and between self-esteem and physical activity in girls. Also, according to evidence from another study, physical activity has a significant relationship with self-esteem, perceived physical fitness, and body image, and these factors play a very important role in improving self-esteem in individuals [52]. Exercise programs frequently enhance confidence

in physical abilities, which in turn boosts self-esteem. Empirical evidence indicates that structured interventions, such as multimodal training programs, can lead to increased self-esteem associated with mastering physical tasks and maintaining regular exercise engagement [53, 54].

In general, exercise training using educational videos can improve physiological, cognitive, and emotional processes. From a physiological perspective, exercise training modulates the release of neurotransmitters (such as serotonin and dopamine) and neurotrophic factors (such as Brain-derived neurotrophic factor), which are very important for mood regulation and neuroplasticity [55]. In the cognitive processes dimension, it has been shown that exercise increases cognitive functions such as memory, attention, and executive control processes in different age groups, including children [56]. In terms of emotional processes, exercise can also positively change mood and emotional states and help improve mental well-being [57].

After eight weeks of exercise training, girls in the intervention group showed significant decreases in both weight and BMI. A review of other studies also supports the findings of this study [58, 59]. Creating and implementing strategies to enhance motivation for exercise and promote healthy eating habits can significantly improve the psychological and physical health of girls [60]. Exercise can encourage girls to engage in regular physical activity by creating a positive body image. Therefore, exercise helps manage weight, and BMI, and build positive psychological beliefs in them [61].

Concerns about fitness exist in both sexes but are more prevalent in girls. Girls often experience low levels of self-esteem due to dissatisfaction with their bodies [62]. One study found a significant negative correlation between BMI and self-esteem in Asian children [63]. A study conducted in Australia revealed that overweight or obese children had lower self-esteem scores compared to their non-overweight peers [64]. Evidence from a longitudinal study of Canadian children suggests that childhood obesity can lead to low self-esteem later in life [65].

Regular physical activity and exercise by girls can improve their fitness and enhance the quality of their physical and mental health. Regular exercise should become part of girls' lifestyles from an early age. Using exercise videos is an effective solution to spread a culture of exercise at home and overcome the challenge of inactivity and obesity in children. Therefore, families should understand the importance of regular exercise for their children and encourage them to do exercises at home. In summary, educational videos—whether through structured programs or online platforms—can positively influence weight loss and psychological well-being by enhancing motivation, self-efficacy, and enjoyment of exercise.

This study faced some limitations. In this study, only obese girls aged 7 to 10 years were examined. which may limit the generalizability of the findings to boys and other age groups. It is recommended that future studies investigate the impact of video-based exercise training on self-esteem and weight loss in both genders. In the present study, the intervention protocol included low-intensity exercise. It is suggested that future studies design moderate- and high-intensity exercises. Also, examining the effectiveness of yoga and Pilates exercises could be considered. The instructional videos in this study were pre-recorded. we suggest that future studies investigate the effectiveness of exercise training using online platforms.

Since the exercise program was pre-planned, the children did not have a chance to choose. Future studies should allow participants to choose their preferred type of exercise. Self-esteem was assessed using a closed-ended questionnaire in the pre-test and post-test, which may have influenced parents' honesty in providing answers. Another limitation of the study was the lack of follow-up testing due to time and financial constraints. It is suggested that future studies consider conducting follow-up testing.

Conclusion

The implementation of an 8-week exercise program resulted in improved self-esteem levels and decreased weight and BMI in obese girls in the intervention group. Obesity in girls has psychological implications, with reduced self-esteem being one of the most devastating consequences, leading to negative psychological and physical impacts. Implementing the exercise program designed in the present study for weight management and loss in obese girls can be of interest to families and educational centers. The use of exercise training videos represents a viable option for home-based exercise programs to combat obesity in children.

Abbreviations

BMI	Body Mass Index
RCT	Randomized Controlled Trial
SPSS	Statistical Package for Social Sciences

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Author contributions

FSA and KK Designed the study and intervention process, FSA conducted data gathering and methodology, KK wrote the draft, and the Authors reviewed the final manuscript. All authors read and approved the final manuscript.

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Data availability

The data are available from the corresponding author upon request.

Declarations

Ethics approval and consent to participate
All experimental procedures were approved by the Ethics Committee at the Lorestan University of Medical Sciences (IR.LUMS.REC.1401.196).
The trial is registered in the Iranian Registry of Clinical Trials (IRCT20231103059944N1). Written informed consent was obtained from each child's parents.

Consent for publication
Not Applicable.

Competing interests
The authors declare no competing interests.

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