



## The Effect of School-Based Physical Activity on Body Composition and Body Mass Index as Indicators of Obesity

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### Keywords

Obesity  
Body Composition  
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### ABSTRACT

This study aimed to evaluate the effects of school-based physical activity application on body composition and body mass index, which is an indicator of obesity. 10-12 year old female students were included in the study. A total of 86 female students from different classes of a school participated in the study. Random intervention group (46 students) and control group (40 students) were assigned to the study. In order to improve the physical activity in the schools, high intensity exercise was applied to the intervention group in the school yard under the supervision of physical education teachers with SBPA implementation 3 days a week for 40 minutes. Paired Samples T-Test analysis was used for pre-test post-test results and ANOVA was used to examine the differences between groups in repeated measurements. Height and weight of the students were measured and body mass index (BMI) was calculated. School-based physical activity was used as an intervention to reduce obesity. Height and weight of the students were measured and body mass index (BMI) was calculated. Body fat percent (BFP) and body muscle percent (BMP) were evaluated using a bioimpedance analyzer at baseline and after intervention, taking into account the age and height of the students. School-based physical activity was used as an intervention to reduce obesity. As a result; It was found that a comprehensive school-based physical activity application reduced body fat percentage and BMI in obese girls, but these changes were not reflected in the body muscle percentage.

## 1. INTRODUCTION

Obesity is a major risk factor for many chronic diseases such as diabetes, cardiovascular diseases, cancer and osteoarthritis [1]. Adolescence is considered an important period of physical growth and many biological, behavioral and environmental factors can influence weight and body composition [2]. According to the literature, 35% of children move from a normal weight range during childhood to overweight in adolescence, and 62% of children with the highest body mass index (BMI) remain in this range when they become young adults [3]. Some researchers have suggested a relationship between high BMI values in childhood and high values in adulthood [4,5].

The increase in overweight and obese children is a global problem. Indeed, children's low levels of physical activity (PA), together with an increase in sedentary behaviors, have prompted

research on strategies and programs that can increase PA levels to mitigate the rise in obesity among children [6,7]. School settings offer many opportunities for PA intervention programs for young students. Children spend a significant proportion of their day at school, in situations potentially conducive to the development of healthy lifestyle habits. Therefore, school-related PA is seen as the main option for school-aged children to increase their recommended daily PA, using recess periods, physical education classes and lunch breaks [8,9]

This study aimed to evaluate the effects of school-based physical activity (SBPA) on body composition and body mass index, which are indicators of obesity.

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## 2. MATERIALS AND METHODS

### 2.1. Participants

This study was planned as a randomized, controlled, school-based study. It was carried out as a comprehensive school-based physical activity program involving 86 female students who were randomly selected and signed the consent form at Dervişler Secondary School in Yüreğir District of

Adana province. Students from different grades were randomly assigned as intervention and control groups. The study included 86 obese and overweight students. Inclusion criteria were age = 10-12 years; (BMI= Body Weight (kg) / Height<sup>2</sup> (m). Overweight- Obese with BMI  $\geq$  25). School-based physical activity practices were implemented by a Physical Education Teacher.

**Table 1.** 10-Week School-Based Physical Activity (SBPA) implementation procedure

Pre-Intervention Measurement	SBPA Implementation	Post-Intervention Measurement
Boy Weight Body Mass Index (BMI) Body Fat Percentage (BFP) Body Muscle Percentage (BMP)	3 x 40 min/week: SBPA Practices by the Physical Education Teacher  *Intervention time 10 Weeks	Boy Weight Body Mass Index (BMI) Body Fat Percentage (BFP) Body Muscle Percentage (BMP)

**Table 2.** 10-Week School-Based Physical Activity (SBPA) implementation program

Week 1	Movement games, dance and circular games
Week 2	Simplified forms of soccer, simple gymnastic exercises (jumping, skipping)
Week 3	Ball with equipment (dribbling, throwing, catching)
Week 4	Jump rope (jumping over), hoop (running, spinning, going inside)
Week 5	Active play, individual and group games and exercises with equipment (jump ropes, rings)
Week 6	Volleyballs, tennis and speed ladder, basketball games, ropes
Week 7	Age-appropriate games (soccer, volleyball, handball)
Week 8	Game-Based Skill Coordination Activities/Station Activities
Week 9	Aerobic Gymnastics-Dance Exercises
Week 10	Zumba, Children's yoga

### 2.2. Data Collection Tools

To determine the anthropometric characteristics of the students, their height and weight were measured and their body mass index (BMI) was calculated. Body fat percentage (BFP) and body muscle percentage (BMP) were assessed using a bioimpedance analyzer (Tanita 418-MA Japan) at baseline and after the intervention, taking into account the age and height of the students.

### 2.3. Statistical Analysis

All statistical analyses were performed with SPSS version 22.0. In this study, the results of descriptive statistics were presented as mean and standard deviation. Paired Samples T-Test analysis was used to analyze the pre-test post-test results before the groups and (ANOVA) was used to

examine the difference between the groups in repeated measurements. Significance level was accepted as  $p < 0.05$  in all tests.

## 3. RESULTS

The general descriptive characteristics of the control and intervention group students before the intervention are summarized in Table 3. There were no significant differences between the age, height, weight, BMI, BFP and BMP groups before the intervention. After ten weeks of intervention, BFP decreased in the intervention group compared to the control group (1.62% decrease in the intervention group and 0.45% increase in the control group,  $P < 0.01$ ). However, while weight and BMI decreased, BMP did not change significantly (Table 4).

**Table 3.** Pre-intervention anthropometric measurement results of control and intervention group students

Variables	Group	N	$\bar{X}$	Sd	p
Age (year)	Control Group	40	12.03	0.89	0.32
	Intervention Group	46	11.89	0.76	
Height (cm)	Control Group	40	155.65	7.13	0.19
	Intervention Group	46	156.75	7.02	
Weight (kg)	Control Group	40	55.64	10.24	0.79
	Intervention Group	46	54.78	10.86	
BMI	Control Group	40	27.84	2.84	0.28
	Intervention Group	46	27.13	3.21	
BFP (%)	Control Group	40	26.45	5.89	0.32
	Intervention Group	46	27.32	6.12	
BMP (%)	Control Group	40	29.17	2.27	0.34
	Intervention Group	46	29.41	2.35	

\*p<0.05; BMI= Body Mass Index; BFP(%)=Body Fat Percentage; BMP(%)=Body Muscle Percentage

**Table 4.** Differences between control and intervention group students' anthropometric measurements before and after intervention

Variables	Pre-Intervention		Post-Intervention		p
	N:40	N:46	N:40	N:46	
	Control Group	Intervention Group	Control Group	Intervention Group	
	$\bar{X}$	$\bar{X}$	$\bar{X}$	$\bar{X}$	
Height (cm)	155.65	156.75	157.05	156.20	0.23
Weight (kg)	55.64	54.78	57.12	52.35	0.02*
BMI	27.84	27.13	28.11	24.85	0.01*
BFP (%)	26.45	27.32	26.82	25.02	0.01*
BMP (%)	29.17	29.41	29.42	31.10	0.14

\*p<0.05; BMI= Body Mass Index; BFP(%)=Body Fat Percentage; BMP(%)=Body Muscle Percentage

#### 4. DISCUSSION

The approach to preventing and treating overweight in children and adolescents involves changes in lifestyle, including diet and physical activity, not only in relation to the child or adolescent but also in relation to the family and school and environment [10]. Regular PA during childhood and adolescence helps maintain a healthy body weight and is associated with the positive development of healthy musculoskeletal and cardiovascular systems as well as neuromuscular awareness [11]. Although PA of school-age children is mostly performed outside the school environment, it has been suggested that a comprehensive school-based physical activity intervention reduces body fat percentage and BMI in obese female students [12,13].

A study confirmed a positive relationship between SBPA practices and leisure time in overweight school-age children [14]. A study showed that early participation in physical activity was highly associated with prevention of BMI increase [15]. In addition, a 2-year intervention program combining physical activity with nutrition education has been suggested to be effective in reducing weight gain in non-obese students [16].

#### 5. CONCLUSION

In conclusion, in addition to physical education classes, there are other methods available to increase the level of physical activity at school. School-based PA in adaptive active environments can be said to play a vital role in

reducing overweight and obesity among students. However, it was concluded that SBPA interventions reduce overweight and obesity levels. A comprehensive school-based physical activity intervention was found to reduce body fat percentage and BMI in obese female students, but these changes were not reflected in body muscle percentage. SBPA practices, recess, club and sports activity programs, and active transportation policies that promote safe walking or cycling before and after school, and other forms of before- and after-school physical activity opportunities should support physical activity provided through physical education.

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### Conflict of Interest

No conflict of interest is declared by the authors. In addition, no financial support was received.

### Author Contributions

First author: all contribution

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