

The effect of aerobic exercise on changes in abdominal fat, arm fat, and abdominal circumference in overweight and obese students

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ABSTRACT

Overweight and obesity are medical conditions in which excess body fat, or adipose tissue, accumulates in the body to the extent that this fat accumulation can affect health, potentially reducing life expectancy. An individual can be defined as overweight if their BMI is 25-30 kg/m², and obese if their BMI exceeds 30 kg/m². However, the distribution of body fat especially in the mid-abdominal area has also been used to diagnose a patient as obese and currently waist circumference is believed to be a more accurate marker of obesity. Aerobic exercise is indispensable in the management of obesity, not just weight and fat loss, weight maintenance and fat reduction, and physical fitness in obesity. To find out whether aerobic exercise has an effect on changes in abdominal fat, arm fat and abdominal circumference of overweight and obese students. This study is a quasi-experimental study with pre and post test one group design with two measurements, before treatment after treatment. A total of 40 samples were recruited to participate in this study with predetermined inclusion and exclusion criteria. Aerobic exercise was given 2 times a week for 6 weeks. Belly fat and arm fat with a skinfold caliper and body composition monitor and belly circumference with a roll meter. Abdominal fat, arm fat and abdominal circumference decreased after giving aerobic exercise. Aerobic exercise is effective in reducing belly fat, arm fat and abdominal circumference of overweight and obese students.



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1. Introduction

Obesity has emerged as a major global public health problem and is a major contributor to the development of many non-communicable diseases [1]. Obesity is a complex condition that increases the risk of heart disease, diabetes mellitus, hypertension, and cancer [2- 4].

The prevalence of overweight by age standard increased from 26.5% in 1980 to 39.0% in 2015, an increase of almost 50% over the last 35 years. The prevalence of obesity also increased from 7% in 1980 to 12.5% in

2015, an increase of almost 80%. A similar trend also occurs in the Southeast Asia region; the prevalence of overweight increased from 10.9% in 1980 to 24.3% in 2015, and the prevalence of obesity increased from 1.7% in 1980 to 6.2% in 2015 [5].

While in Indonesia, there are 9.5% overweight (fat) and 4.0% obesity in children aged 16 to 18 years. The highest overweight prevalence was in Papua 13.5% and the lowest in Maluku was 4.4%, while the highest obesity prevalence was in DKI Jakarta at 8.3% and the lowest was in East Nusa Tenggara at 1.0%. For the province of South Sulawesi, the prevalence of overweight and obesity is 7.8% and obesity 2.7%, slightly lower than the national prevalence of overweight and obesity [6].

According to [7] “Obesity is a medical condition in which excess body fat, or adipose tissue, accumulates in the body to the extent that this fat accumulation can affect health, potentially reducing life expectancy”. An individual can be defined as overweight if their BMI is 25-30 kg/m², and obese if their BMI exceeds 30 kg/m². However, the distribution of body fat especially in the mid-abdominal region has also been used to diagnose a patient as obese and currently waist circumference is believed to be a more accurate marker of obesity.

Body mass index (BMI), which is calculated as weight in kg/height in m², is a simple tool for identifying overweight and obese adults. Obese people are those who have a BMI of more than 30 kg/m², while overweight people are those who have a BMI between 25 and 29.9 kg/m² [8].

Body mass index (BMI) is most often used to evaluate obesity [9], which studies have been shown to increase the risk of cardiovascular disease (CVD), such as coronary heart disease or stroke [10]. Although body fat distribution, which is associated with metabolic risk, is not well captured by BMI [10], [11]. Because BMI does not account for the cardiometabolic risk associated with abdominal obesity, BMI alone is insufficient to measure body fat distribution and determine cardiovascular disease risk in people with excess adiposity. [12]. Abdominal Obesity is linked to an increased risk of insulin resistance, type 2 diabetes, metabolic syndrome, CVDs, malignancies, chronic respiratory conditions, and all-cause mortality [13].

To measure abdominal obesity, three anthropometric proxies are often used: waist circumference, waist-height ratio, and waist-hip ratio. The determining factor in most studies on abdominal obesity is waist circumference [9]. Abdominal obesity was defined as waist circumference 85 cm in men and 80 cm in women; according to the diagnostic criteria for metabolic syndrome recommended by the Adult Care Panel of the National Cholesterol Education Program III, having more than one metabolic disorder (except waist circumference criteria) was defined as metabolically unhealthy [14].

According to [15] “Exercise is indispensable in the management of obesity, not just weight and fat loss, weight maintenance and fat reduction, and physical fitness in obesity”. Sport contributes to a person's mental and social health, a better quality of life. Exercise also has the potential to fight low-grade chronic inflammation associated with obesity. Light-intensity physical activity also benefits cardiometabolic health, apart from weight loss. Finally, physical fitness has a negative relationship with all-cause and cardiovascular mortality.

2. Material And Methods

2.1 Participants

A total of 40 adolescents classified as overweight and obese, aged 17-18 years were recruited from a public secondary school in Makassar. Participants were categorized as overweight if their BMI was 25-30 kg/m², and obese if their BMI was > 30 kg/m². This procedure was applied in this study. During the study, the participants maintained their normal level of physical activity (eg, physical education classes) with no additional physical activity after school. None of the obese individuals participated in any particular diet program with the aim of losing body mass.

2.2 Study Design

This study is a quasi-experimental study with a pre and post-test one group design approach with 2 measurements, before and after the intervention. The subjects of this study were overweight and obese high school students who were invited to be samples in this study. A total of 40 subjects met the inclusion and exclusion criteria and agreed to participate in this study. Inclusion criteria included high school students, overweight and obese, male or female. Exclusion criteria were high school students with a history of heart disease that was not indicated by physical exercise. In post-training, testing is performed within 48-72 hours after the last training session to ensure optimal recovery [16]. The research protocol was approved by the Makassar Health Polytechnic ethics commission.

2.3 Procedure

Pre- and post-training anthropometrics were recorded in a climate-controlled temperature setting by an experienced examiner for one day. The participants were barefoot and lightly clothed. Anthropometry such as height, body weight, Body Mass Index (BMI), and waist circumference. Height was determined with a wall-mounted stadiometer. Waist circumference was measured at the midpoint between the lower ribs and the iliac crest at the end of a normal expiration using a tape measure according to standard anthropometric protocols [17]. Body composition such as body fat is measured using a caliper.

2.4 Training Programs

Volunteers started exercising 3 days per week for 9 weeks at the same sports facility. All participants have the same overall training duration. All participants followed the same exercise, starting with a standard warm-up 5 minutes jogging, 5 minutes dynamic stretching, core training, and ending with a 5-minute cool down. The core exercise consisted of jogging for 45 minutes while maintaining a pulse rate of 120 – 150 beats per minute. The pulse is monitored with a heart rate monitor watch.

2.5 Statistical Analyses

Data is presented as means and standard deviation (SD) in the form of text, and tables. Normality was assessed and confirmed using the Kolmogorov-Smirnov test. The data were then analyzed using a paired sample t test.

3. Findings and Discussion

Table 1. Sample distribution based on body mass index level

Body mass index level	Pre test		Post test	
	n	%	n	%

a. Overweight	26	65,0	26	65,0
b. Obesitas grade 1	6	15,0	6	15,0
c. Obesitas grade 2	6	15,0	6	15,0
d. Obesitas grade 3	2	5,0	2	5,0
Total	40	100,0	40	100,0

Table 1 shows that the level of obesity in the sample in the study was the most overweight with 26 people (65.5%) and the least level 3 obesity with 2 people (5%).

Table 2. fat content of overweight and obese students before and after physical exercise

Fat content of overweight and obese students	n	Mean	SD	p-value
Belly fat before intervention	40	30,95	5,346	0,004*
Belly fat after intervention	40	27,10	4,076	
Arm fat before intervention	40	23,40	6,589	0,013*
Arm fat after intervention	40	30,95	5,346	

Information: *Paired sample t test

Based on table 2, it can be explained that the provision of aerobic exercise obtained a value for abdominal fat in the form of a pre-test of 30.95 ± 5.346 and a post-test of 27.10 ± 4.076 with paired t-test results obtained p value = 0.004 < 0.05. The value for arm fat in the form of pre-test was 23.40 ± 6.589 and post-test was 19.30 ± 5.813 with paired t-test results obtained p value = 0.013 < 0.05.

Table 3. Abdominal circumference of overweight and obese students before and after giving physical exercise

Abdominal circumference of overweight and obese students	n	Mean	SD	p-value
Abdominal circumference before intervention	40	94,15	7,162	0,001**
Abdominal circumference after intervention	40	86,57	14,599	

Information: ** wilcoxon

Aerobic exercise is one of the exercises to control excess weight, both for overweight and obesity categories by reducing belly fat, arm fat and abdominal circumference. Aerobic exercise is carried out systematically with gradually increasing intensity and uses energy derived from combustion using oxygen and requires oxygen without causing fatigue. Exercise is done with low intensity and a long time, which is about 30-60 minutes.

Overweight and obesity are caused by an imbalance between calories in and calories out, so that they are stored in the body in the form of fat. Giving aerobic exercise aims to increase metabolic processes so that the calories burned exceed the calories that enter through the food consumed.

When doing exercise, the body uses different energy sources depending on the intensity and duration of the exercise. In general, the source of energy used during exercise consists of Phosphochreatine (PCr), carbohydrates and fats. PCr is used for very short activities of about 1-10 seconds. Meanwhile, if the duration of exercise increases, fat will be the main source of energy. This happens because of hormones that result in changes in the use of carbohydrates into fat which is used as an energy source by the body during exercise. This change will occur if the duration of the exercise carried out lasts more than 20 minutes [18].

On the basis of the use of energy sources from fat if the exercise lasts more than 20 minutes, the aerobic

exercise given to overweight and obese high school children lasts 30-60 minutes with a frequency of 2 times a week for 6 weeks. This aerobic exercise causes a decrease in belly fat and arm fat. The decrease in belly fat also causes the waist circumference to shrink.

The results of this study are in line with research conducted by [19] who stated that aerobic exercise had an effect on reducing the fat levels of mothers in the Keke Club Study, Lubuklinggau City. This research is also in line with research conducted by [20] which stated that the provision of physical exercise reduced the abdominal circumference of female students of the nutrition science study program at Medan State University aged 19-21 years. This study is also in line with research conducted by [21] which states that aerobics and bicycle crunch have an effect on decreasing abdominal circumference.

4. Conclusion

Aerobic exercise is effective in reducing belly fat, arm fat and abdominal circumference of overweight and obese students

5. References

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