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## The effect of bodyweight workout intensity on decrease the body mass index (BMI) in college students

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### Abstract

Obesity in adolescents is very prone to occur due to consumption of fast food, sweet food/drink patterns, likes to play games without knowing the time, and low physical activity. Overnutrition in adolescents is characterized by relatively excessive body weight. The nutritional needs of adolescents are very important, for example, the needs of athletes, so an appropriate training model is needed. Physical activity can burn fat in the body, thereby increasing the body's metabolism. Bodyweight workout is a form of physical activity to maintain body weight. This study aimed to determine the effect of bodyweight workouts on reducing BMI. The study subjects used the Proportionate stratified random sampling technique by taking a sample of 35 male and female university students with a body mass index above 25. The research instrument uses body mass index (BMI) measurements. The data analysis technique used prerequisite tests for normality, homogeneity, and data analysis using SPSS 25. The decreased results were obtained from an average BMI of 27.411 to 25.086, 2.326 or 8.486%. This study concludes the importance of doing bodyweight workouts to reduce BMI in college students.

**Keywords:** bodyweight, workout, body mass index (BMI).

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**Authors contribution:** a – Preparing concepts; b – Formulating methods; c – Conducting research; d – Processing results; e – Interpretation and conclusions; f - Editing the final version

### INTRODUCTION

Adolescents are at high risk of experiencing excess nutrition, namely obesity because eating habits have changed, one of which is due to widespread globalization. Adolescents are one of the target groups at risk of experiencing overnutrition. Overnutrition in adolescents is characterized by relatively excessive body weight when compared to the age or height of adolescents of the same age as a result of excessive fat deposition in the

body's fatty tissue. Factors causing obesity include genetic, physiological, environmental, and socio-economic factors, including gender, family affluence, and level of education (Hamulka et al., 2018). Environmental factors are caused by eating sweets, consuming excessive carbohydrates every day, often skipping breakfast, irregular meal times, liking fried foods, always sleeping too late, and rarely doing physical activity. According to Andini et al., 2016 Rarely moving and little physical activity results in a decrease in body metabolism; fat in the body is burned, resulting in less energy, excess fat accumulation, and obesity. If parents consume a diet high in calories and avoid physical activity, children tend to adopt the same behaviour, causing an increase in body fat (Li et al., 2022). To prevent obesity, one must maintain a diet, rest, and do physical activity. Physical activity plays an important role in preventing becoming overweight and obese in childhood and adolescence and reducing the risk of obesity in adulthood (Hills et al., 2011). Workout is a type of physical activity that aims to maintain a healthy body (Fitriana & Darmawan, 2021). Workout is another word for physical exercise. Someone does physical exercise to improve or maintain body fitness (Cai et al., 2021; Wilson et al., 2021). Changing lifestyles makes the body fitter, from doing physical activity by walking, jogging, cycling and what is still in great demand by teenagers today is workout. Strength training is applied by athletes hitting their weight or using their body weight against gravity (Harrison et al., 2010). Bodyweight exercises include strength, body composition, endurance, speed, power flexibility, coordination, and balance (Ömer Zambak et al., 2020). This is important to speed up the organism because it increases athletes' endurance with various types of training. Increasing the muscle mass of athletes is done with bodyweight training (Yachsie et al., 2022). Exercise practice at home makes people creative by thinking about what and how to do it so they can always be challenged to think creatively, unlike in a fitness centre where tools and loads are already available (Wibowo et al., 2020).

In addition to physical activity, we are also advised to maintain a balanced diet. Providing unbalanced nutrition can cause a decrease in the quality of life in children, one of which is due to excessive food intake that causes children to suffer from obesity. To find out whether a child is obese or not, we can use body mass index (BMI) guidelines (De Onis et al., 2010). Balanced nutritional intake is also carried out by physical activity in the form of workout exercises, which is a form or model of exercise that can reduce body mass index (BMI). A bodyweight workout is one model/form of exercise that can be applied. Several things must be considered; exercise must use large muscles of the body intensively (continuously) for a relatively long duration. Good exercise is a type of cardio or aerobic exercise that can strengthen aerobics (H. Patel et al., 2017). Bodyweight workout treatment consisting of how many movements, namely: Jumping Air Squat, Lung Matrix (10 each leg), Jumping Step-Up (11 each leg), Squat gun - (each leg), L-Sit Pull-Ups, Tandem Grip Chin-Ups (or inverted bodyweight row with bottom grip), Push-Up one leg (each leg), Knee Lifting Dips, Bulgarian Split Squat 35 seconds.

The results of field observations show that students do not do enough physical activity, physical activity that is only done during lectures is not balanced with further exercise, and after finishing college, students tend to play with gadgets, fail to sleep, and have irregular eating patterns, which causes fat to accumulate in the body continuously and lead to obesity. This study aims to determine the effect of Bodyweight Workouts on reducing BMI.

## METHOD

This research design did not involve control variables, and the study sample was randomly selected from students in college. The research design used was a group pretest-posttest design, and experiments were carried out only on one group without a comparison group. Research design in the form of pictures as follows:

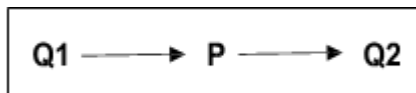


Figure 1. Research Design One Group Pretest Design

The subjects in this study were 35 male and female students whose body weight was above 70 kg. This research technique uses proportional stratified random sampling by taking representatives from various levels of students, which can be used on 35 students. The instruments in this study were obtained using BMI and anthropometric measurements using a weight scale (SECA) with serial number 201101-02651F, as confirmed in advance. The measurement is taken by a subject standing upright on the scale, and then the number shown on the scale is read as the result of the measurement (kg). Height is measured using an upright measuring instrument (mikrotoka) with a precision of 0.1 cm. The measurement was taken with the subject standing upright, face facing straight ahead without wearing footwear, the result was read in cm. By category for men and women, normal  $\leq 24.9$  and obesity  $\geq 25.0$ . This research was conducted at Tunas Pembangunan University, Surakarta, with bodyweight training treatment 3 times a week for 2 months.

This study used descriptive analysis techniques to describe the results of the pretest and post-test carried out during the study. Furthermore, a prerequisite test was carried out using the Normality Test to determine the distribution of the data obtained, and a homogeneity test was carried out to determine the similarity of test data variants before and after treatment. If the resulting value shows a significance value of  $< 0.05$ , then the data variance of the two groups is not homogeneous.

## Research Procedure

Eight months exercise program with 1 group, Bodyweight workout treatment consists of several movements, namely: Pistol Squats – (each leg), Jumping Air Squats, Lung Matrix (10 each leg), Jumping Step-Ups (11 each leg), Knee Lifting Dips, L Pull-Ups -Sits, Tandem Grip Chin-Ups (or reverse body weight line with bottom grip), Single leg Push-Up (each leg), Bulgarian Split Squat 35 seconds. Subjects were counselled to do some things that were avoided in treating subjects, such as not doing a physical activity other than research treatment and always being in good health. Before being given treatment in research activities in the form of bodyweight workout treatments, prospective research subjects must measure BMI obtained through anthropometric measurements using weight and height measurements. Furthermore, after the BMI data before the treatment was inputted, the subjects were given bodyweight workout treatment for 18 meetings, and continued BMI measurements were obtained through anthropometric measurements using weight and height measurements after treatment.

## 1 RESULT

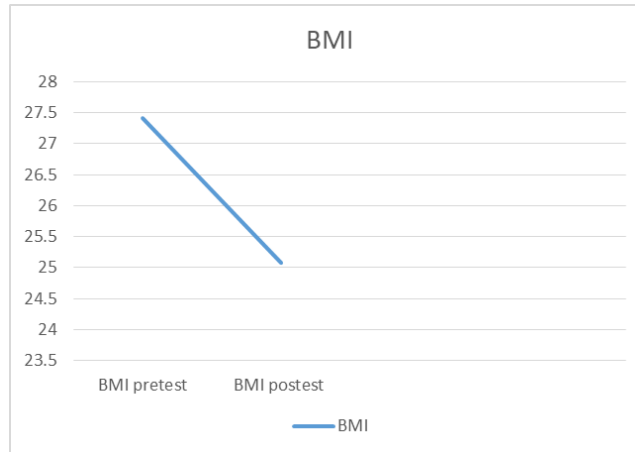
The results of this study are presented in a description of the data processing results by taking on the study results. The purpose of this study can be achieved by taking data from a predetermined sample. This study determined the effect of bodyweight workouts on reducing body mass index (BMI). A summary of the results of data analysis is presented in the form of tables below.

**Table 1.** BMI data description

Variable	N	Minimum	Maximum	Mean	Std. Deviation	P-Value
BMI pretest	35	22.6	33	27.411	2.606	0,44049
BMI posttest	35	20.2	31	25.086	2.665	0,45053
Decrease in BMI	35	0.6	4	2.326	0.858	0,01004

The results of the descriptive statistical tests in the table above show an average BMI pretest value of 27.411 with a standard deviation value of 2.606. The minimum pretest BMI score is 22.6, and the maximum score is 33. The descriptive statistical test in the table above shows that the

average post-test BMI score is 25.086, with a standard deviation of 2.665. The minimum post-test BMI score is 20.2, and the maximum is 31. The table above shows that the average BMI value has decreased by 2.326 with a standard deviation of 0.858. The minimum lowers BMI by 0.6 and the maximum by 4.



**Figure 2.** The Decrease in BMI

From the picture above, it can be seen that there was a decrease in BMI in this group, namely, the initial average was 27,411, which then fell to 25,086.

**Table 2.** BMI categories before and after treatment

Category	Interval	Pretest		Posttest	
		n	%	n	%
Normal	18.6-22.9	1	2.9	6	17.1
Overweight	23-24.9	6	17.1	11	31.4
Obesity I	25-29.9	22	62.9	16	45.7
Obesity II	>30	6	17.1	2	5.7
Total		35	100	35	100

In the pretest, it was known that there were respondents with a normal BMI of 1 (2.9%), and then the post-test increased to 6 (17.1%). In the pretest, it was known that there were respondents with an Overweight BMI of 6 (17.1%), then in the post-test, it increased to 11 (31.4%). In the pretest, it was known that there were respondents with BMI Obesity I as much as 22 (62.9%), and then the post-test was reduced to 16 (45.7%). In the pretest, it was known that there were respondents with BMI Obesity II as much as 6 (17.1%), then in the post-test, it was reduced to 2 (5.7%).

The distribution of BMI categories can be seen in the form of a histogram below.

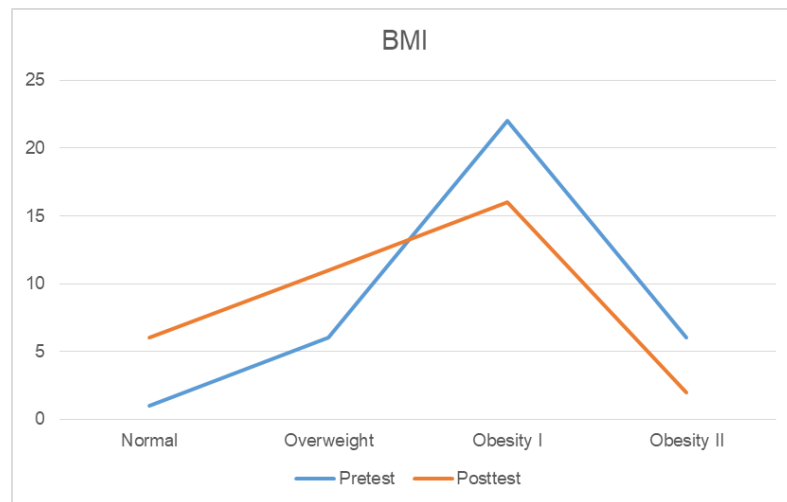


Figure 3. The distribution of BMI categories

a. Assumption Test

Before conducting data analysis, it is necessary to test the normality distribution. The data normality test in this study used the Shapiro-Wilk method because the number of samples was  $\leq 50$ . The criterion for the normality test was that if the probability value (sig.)  $> 0.05$ , it was stated to be normally distributed, while if the probability value was  $< 0.05$ , then it was declared not normally distributed. The results of the data normality test performed in each group are as follows:

Table 3. Normality Test Results

	Shapiro-Wilk			statistical	test results
	Statistic	df	Sig.		
pretest_BMI	0.973	35	0.542	normal	Uji t
posttest_BMI	0.977	35	0.647	normal	

In the BMI observation, based on the results of the data test using the Shapiro-Wilk technique, it can be seen that the p (sig) value for pre\_IMT is 0.542, which is  $> 0.05$  and for pos\_IMT, is 0.647, which is  $> 0.05$  so that pre\_IMT is normally distributed and pos\_IMT is normally distributed. These results indicate that the assumption of normality is fulfilled, so the statistical test used is the paired t-test.



b. Statistic test

Based on information on the normality test to find out whether there is a decrease in BMI, the statistical test used is the paired t-test. The calculation results are as follows:

**Table 4.** BMI reduction test

BMI	Mean	T count	Sig.	Conclusion
Pretest BMI	27,4110	16,031	0,000	significant
Postest BMI	25,0860			

The calculation results obtained an initial BMI average of 27.411, Then, after treatment, the value became 25,086, and the decrease obtained was 2.326 if the percentage was 8.486%.

The results of the study show that the results of the analysis that has been carried out show that there is a significant difference between the pretest and post-test of BMI measurements with the treatment of bodyweight workouts in students. The bodyweight workout treatment on BMI observations obtained an average BMI pretest of 27.411. Then, after treatment, the value becomes 25.086, and a decrease of 2.326 is obtained. The results of statistical calculations obtained a t-value of 16.031 and a probability value of 0.000. The probability value < 0.05 means a significant decrease in BMI due to the bodyweight workout treatment. This means that the hypothesis that the treatment of bodyweight workouts significantly affects BMI is accepted.

**DISCUSSION**

The results of statistical calculations obtained a t-value of 16.031 and a probability value of 0.000. A probability value < 0.05 means a significant decrease in BMI due to bodyweight training treatment. This means that the hypothesis that bodyweight workout treatment significantly affects BMI is accepted. Bodyweight training is one of the sports activities that can be done to maintain body health because it uses its own body and has many variations of movements, does not need to cost much money, and can be done anywhere. Bodyweight workout exercises combined with physical activity have an effect on body fat percentage. Changes in body

composition are indicated by the ratio of muscle, bone, and body fluids compared to fat (Fatimah & Kartini, 2011).

The results of this study support previous research, which confirms that exercise shows that aerobic exercise can reduce BMI. Increase physical activity, thereby causing a decrease in body fat to meet the body's calorie needs when exercising (Batacan et al., 2017; Dupuit et al., 2020; Sigal et al., 2014; Su et al., 2019). By providing exercise intervention for eight weeks with a frequency of three times a week, reducing BMI can increase body fitness (Anam et al., 2016; Kuswari et al., 2021; Stastny et al., 2016). Physical activity that is done regularly well can affect body composition for the better and more balanced. Body composition consists of muscle, fat, bone, water, and various other organs that have their respective roles and functions. Unbalanced body composition can cause decreased organ function or can even cause organ damage that can cause various diseases. Doing exercise correctly and adequately can balance body composition, making all organs carry out their functions better and effectively. According to Gomes De Araujo et al. (2014) and Kuswari & Setiawan (2015), exercise also makes the body healthier and fitter so that a person becomes more productive. Movement series exercises are training applications that can be done using each individual's body weight. The heavier a person is, the more weight he lifts in training with his body weight.

Muscle strength training, cardio, and diet can develop individual motoric conditions to improve body composition (Allsabab et al., 2023). Besides using their body weight, many athletes also use weights to increase their muscle capacity. The athlete can know himself, his limits, his skills, and how to effectively use his body during training without overloading (Harrison et al., 2010; Jaelani et al., 2022). A Korean study explained that in the group of adult and elderly women, physical activity levels were not associated with factors related to health conditions but had an influence on weight, waist circumference, BMI, and age (Chung et al., 2017). Further research needs a control group to be able to compare.

More research is needed on variations of bodyweight workout movements with physical activity that have an influence on body fat percent.

Physical activities in childhood and adolescence are also associated with numerous health benefits (Sugiharto et al., 2021), even though they are not active in many situations (Jeki et al., 2022). The right level of physical activity can motivate while reducing the risk of obesity and health-related risks associated with increased weight (Andriana et al., 2021; Desrida et al., 2018; Waluyo, 2023). Physical activity also contributes to greater bone density (Hendra et al., 2016), reduces the clustering of Cardiovascular Disease risk factors (Bauman et al., 2012; Janssen & LeBlanc, 2010), improves body composition, and aids in maintaining weight loss (Lestari et al., 2022).

Our increased understanding of factors contributing to excessive weight gain stems from lifestyle behaviours from infancy through childhood, adolescence, and adulthood (Lo et al., 2019). Overweight adolescents have a fourfold risk of being overweight as adults compared to normal-weight adolescents, and this association strengthens throughout the developmental years (Park et al., 2022).

Research still needs to be proven by measuring the percent of body fat against physical activity. Furthermore, further research must be directed to test several bodyweight workout exercises that can reduce BMI. This research still needs to improve due to the limited number of samples and the bodyweight workout model, which requires a variety of exercises so that the effects resulting from the training are successful. So, further research needs to be developed by adding research variables, for example, to support the results of this research.

## CONCLUSION

These findings suggest that bodyweight training can reduce BMI in college students. Physical activity in the form of bodyweight workouts is a positive way to reduce BMI by doing bodyweight workouts. The body's calorie needs can be met by burning body fat reserves while exercising.

The results of this research can also be a reference for various physical

activities that can be done to reduce BMI. In the future, this research will be limited to a few subjects so that it is more varied and that future researchers can develop many other research variables related to obesity.

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