

## THE INFLUENCE OF WEIGHT TRAINING IN THE METHOD OF SET SYSTEMS ON THE WEIGHT GAIN AND FAT PERCENTAGE

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### ABSTRACT

This research aims to find out how big the influence of weight training in the method of set systems on the weight gain and fat percentage of students of Sports Science Department of Sports Science Faculty of Yogyakarta State University (IKOR FIK UNY).

This research uses the experimental method in the design of *the one group pre-test – post-test design*. The research participants were the students of IKOR FIK UNY class 2011. The sample in this study involves the entire students of IKOR FIK UNY class 2011 taking the fitness expertise. The instrument used was the weight scale with units of kilograms. The data were analyzed using the normality test to find out if the data were at the normal Gaussian distribution. The test of its variant homogeneity was conducted to test the similarity of data variant of the experimental groups. A t-test was conducted to find out if there was a difference between the pre-test and post-test variables on the experimental groups.

The research results show that the analysis on the t-test obtained the t value of 4,972 with the significance value of 0.000. Because the significance value of 0.000 was smaller than 0.05 ( $p < 0.05$ ), it can be concluded there was a significant difference on the students' weight between the pre-test and the post-test. These results demonstrate that the weight training using the method of set systems can gain weights of the students of IKOR FIK UNY. The t-test analysis on the fat percentage results in the t-value of 1,935 with a significance value of 0,068. The significance value of 0,068 was greater than 0.05 ( $p > 0.05$ ) so that it can be concluded that there was no significant difference in fat percentage of students during the pre-test and the post-test. It can be inferred that the weight training using the method of set systems has no effect on the fat percentage of the students of IKOR FIK UNY.

Keywords: weight training, the method of set systems, weight, fat percentage

### INTRODUCTION

The ideal and athletics body shape is very desirable by every person in life. Various ways and attempts are made to get the ideal body shape. One popular way is to do physical exercise. Training is usually defined as a systematic process of repetitive exercises, progressive, having the ultimate goal of improving athletic performance (Bompa, 1999: 1). Exercise is a type of physical activity that is planned, structured, and repetitive body movements with the purposes of improving or maintaining one or more physical fitness components (Wenner, 2010: 7). In short, exercises give regular, systematic, and sustained physical pressure in such a way so that the athletes can improve the physical abilities in undertaking activities (Fox et al., 1993: 69). Exercises are physical activities performed systematically, standardized, and organised in accordance with the proper dose in a relatively long and with progressive sustainable burden aimed at improving one's physical abilities gradually.

The physical activity is often done with the loading system that is often known as weights. According to Suharjana (2007: 87), weight training is an exercise performed systematically by using loads as tools to increase the strength of the muscle function in order to improve the athlete's physical condition, to prevent the occurrence of injury, or for health purposes. Weight training can be done using one's own weight or the outside load or free weights such as dumbbell, barbell, weight machines (gym machines). The most widely used forms of exercises using one's own weights are chin-ups, push-ups, crunches, or back up, and ones using free weight are very numerous and vary according to the purpose of the exercise as well as the muscles subjected.

According to Sadoso Sumosardjuno (1990: 39), weight training is a way of maintaining condition of the body with the repetitive motions, such as scrunching biceps, shrugged with a sub-maximum load, and others. Baechle (2014: 1) says that weight training will be able to increase muscular strength, muscular endurance, neuro-muscular (nerve-muscle) coordination, and bone density (helping prevent osteoporosis). According to Djoko (2000: 59), weight training is a form of exercises that uses media tools in order to support the process of load exercises with the aim at improving fitness, muscle strength, speed, muscle hypertrophy, muscle toning, rehabilitation, as well as the weight gain and reduction.

According to Djoko (2009: 65), weight training is also called as resistance training which is one of the sports exercises using weights as a means to provide stimulus of motion in the body. Initially, weight training was developed to train the muscles especially to increase its strength and durability as well as muscle hypertrophy. In the development, weight training can be designed to enhance the durability of cardiovascular and to improve body composition.

Most people who undertake weight training want their bodies to be in the ideal category, similarly for someone experiencing underweight. The ideal or athletic body shape will be obtained for any person when that person wants to do weight training in accordance with an appropriate exercise programme. One of the exercise programmes that can be performed to gain weight is the weight training. This exercise program should be carried out in accordance with the appropriate dose so that the desired goals can be achieved. In addition, it should also implement the basic principles of exercise in order to achieve maximum physical performance.

An exercise program is one of the planned references that are used as the basis to do exercise in the training process so that it can run effectively, efficiently, and securely. Here are the forms of exercise programs for weight gaining. The goal of this exercise is the enlargement of muscle mass and muscle formation. The safe weight gaining program can be performed gradually of 0.5-1 kg/week.

**Table 1. The Weight Gaining Exercise Program**

<b>Kinds of Exercises</b>	<b>Exercise Portion</b>	<b>Information</b>
<b>The Main Exercise:</b> <i>Weight training</i>	Frequency: 3-4 times/week Intensity: 70-80 % RM Numbers of Sets: 3-6 Set Repetition: 8-12 times Recovery: 30-90 seconds interval	The levels of exercises are gradually increased Numbers of posts: 10-12 Intensity: medium The method: <i>Set block/Set systems</i>
<b>Additional Exercises:</b> - Aerobic with medium intensity - Anaerobic	Frequency: 3-4 times/week Intensity: 65-75 % MHR Duration: > 20 minutes Intensity: > 85 % MHR Duration: 20-60 minutes	The levels of exercises are gradually increased - Increasing body metabolism - Increasing appetite

Source: Fitness Clinic of FIK UNY (2006)

In addition to the weight gain, researchers also will look at the extent of the influence of weight training using the method of the set systems on the fat percentage. This was performed in order to note that the increase in body weight was not gained from the increase fat percentages. According to Dadang (2000: 42), fat is the largest energy-producing nutrients, more than twice the amount of energy produced by carbohydrates. However, fat is an energy source that is not economically in use. It is because fat metabolism spends more oxygen than of carbohydrates. Djoko (2007: 9-10) states that fat is salt formed from the unification of fatty acids with organic alcohol called glycerol or Glycerine. The basic components of fat are triglycerides, which is made up of glycerol and fatty acids (Noerhadi, 2004: 51). In addition, there is cholesterol that is derived from fat. Cholesterol is required to help the formation of gall juices and hormones. However, cholesterol also

can harm cardiovascular health if it is consumed in large quantities. There are a lot of cholesterol in foods that come from animals, such as the brain, heart, intestines, tripe, egg yolk, and skin.

The excess fat will cause the muscle on the framework should work harder to do the motion, so that the energy necessary is larger and it also become dependents for the heart. In addition to burdening the heart, excess fat will also affect on the process of circulation of oxygen and carbon dioxide. Excess fat will also affect the work of other organs such as the liver and kidneys as it will serve more tissue in the body.

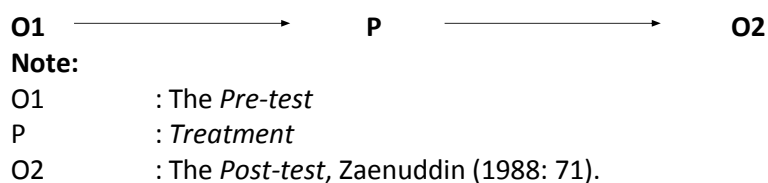
Fat is one of energy sources needed by our body. Body fat was involved during activities, especially in sport or physical exercises. During the exercises, fat is broken down into fatty acids and glycerol. Free fatty acids are transported into the muscle tissue and used as energy. However, the energy formation from fatty acids requires more oxygen than from carbohydrates. Fat can only produce energy when the oxygen is available or sufficient. Thus, the fat can produce energy only at aerobic.

According to Djoko Pekik (2004: 81), the quality of the human body composition is represented by the percentage of body fat. The normal body fat levels are 15%-20% form men and 20%-25% for women. The body composition is defined as the relative fat percentage, muscles, bones, and other tissues in the human body. It can also be interpreted that body composition involves two components, namely, body fat and lean body mass. Given the importance of the ideal body fat percentage and the levels that exist in the human body, the researchers intended to conduct research on the influence of weight training using the method of set systems on the weight gain and fat percentage on the students of IKOR FIK UNY whose weights were less than ideal.

## METHOD

This is experimental research. According to Zainuddin (1988: 56) experimental research is likely to test the relationship between a cause and an effect. Experimental research can be defined as a method of research used to determine a particular treatment effect against the other in controlled conditions (Sugiyono, 2013: 109). It is said that this research is experimental research because this research will examine the relationship of cause and effect on the influence of weight training with against weight gain.

The research design of this study is *the one-group pre-test – post-test design*. According to Leedy (1980: 169), *the one-group pre-test – post-test design is a type of experiment where a single group has (1) a pre-experimental evaluation, then (2) the influence of the variable, and finally (3) a post-experimental evaluation*. Thus, it can be said that the one-group pre-test – post-test design is a form of research experiments in which one group becomes an evaluation prior to the experiment, giving influence on the variables, and the last, giving an evaluation and experimentation. Therefore, it can be said that the results of the pre-test are the control for this research. The design of this research can be described as follows:



Instruments for collecting data in this study are measurement tools using the weight scales of kilograms. While the instruments for measuring the body fat are the electric tools with digital system i.e. Omron Body Fat Monitor. Measurement was carried out by entering data on weight, height, age, and gender. The results of body fat percentage can be directly read on a digital screen which can then be categorized according to the amount of body fat percentage, gender, and the age and then inserted into the table of the Omron Body monitors.

Data analysis techniques used in this research are as follows: the normality test was performed to find out if the data were at the normal Gaussian distribution. The test used was the

Kolmogorov Smirnov test. The homogeneity test is a test to find out whether the variants of the populations were the same (Budiyono, 2004: 175). The homogeneity test on the variants was carried out to test the equality of data variants of the experimental group in the pre-test and post-test. The homogeneity test was Evene's Test using the F-test. The T-test was done to find out if there was a difference between the pre-test and post-test variables on the experimental group. The analysis of the results revealed that there was a difference if the significance value was less than 0.05 ( $P < 0.05$ ). Data obtained from the initial test (the pre-test) and the ultimate test (the post-test) will descriptive-statistically be analyzed using the t-test on the SPSS computer program with the significance level of 5% or 0.05.

## RESULTS AND DISCUSSION

The data of this research is the results of the measurement on the weights and fat percentage after weight training using the method of set systems. The measurement data were obtained from two tests, i.e. before the treatment (the pre-test) and after the treatment (the post-test). The data was made into the descriptive analysis to facilitate the presentation of research data. The results of data analysis can be seen in the following table.

**Table 2. The results of data analysis**

<b>Data</b>	<b>Min.</b>	<b>Max.</b>	<b>Mean</b>	<b>Median</b>	<b>Modus</b>	<b>Std. Dev</b>
Weight (the pre-test)	49.00	73.00	59.65	57.75	51.00	7.16
Weight (the post-test)	51.00	74.00	61.37	61.75	51.00	6.79
Fat Percentage (the pre-test)	8.50	24.80	16.87	16.00	8.50	5.29
Fat Percentage (the post-test)	8.70	24.20	17.40	16.95	16.70	4.67

### 1. The Description of the Pre-test Data on Weights

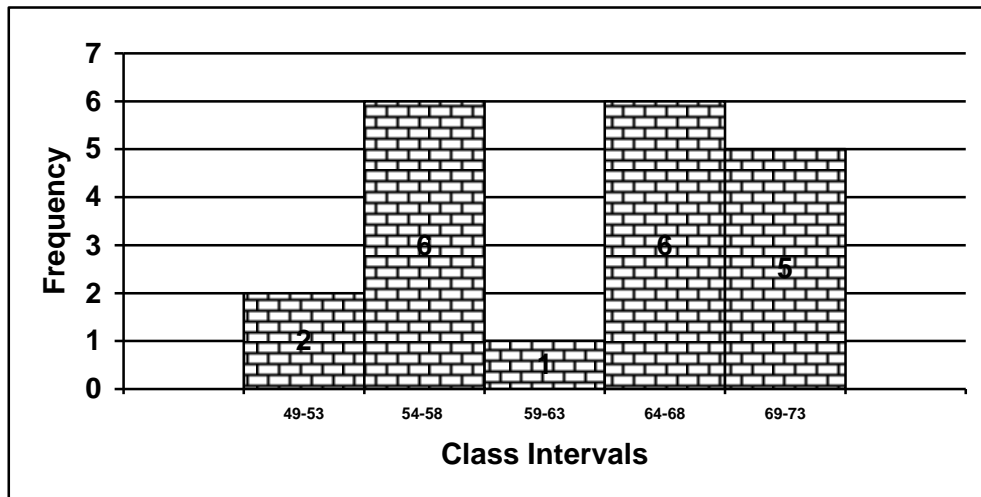
Results of data analysis of weights on the pre-test show that the lowest score was 49.00 and the highest score was 73.00. The descriptive statistics analysis results demonstrate the average value ( $M$ ) = 59.65; Standard deviations ( $SB$ ) = 7.16; Median ( $Me$ ) = 57.75; and Mode ( $Mo$ ) = 51.00.

The following is the table of frequency distribution of weight data on the pre-test.

**Table 3. The Frequency Distribution of Weight Data on the Pre-test**

<b>Class Intervals</b>	<b>Frequency</b>	<b>Percentage (%)</b>
69 – 73	2	10.0
64 – 68	6	30.0
59 – 63	1	5.0
54 – 58	6	30.0
49 – 53	5	25.0
Total	20	100.00

The histogram of the frequency distribution of weight data on the pre-test is as follows.



**Figure 1. The Histogram of Weight Data on the Pre-test**

Based on the above picture, it can be inferred that the weight data on the pre-test were mostly on the interval scores of 54 - 58 and 64 - 68.

## 2. The Description of the Post-test Data on Weights

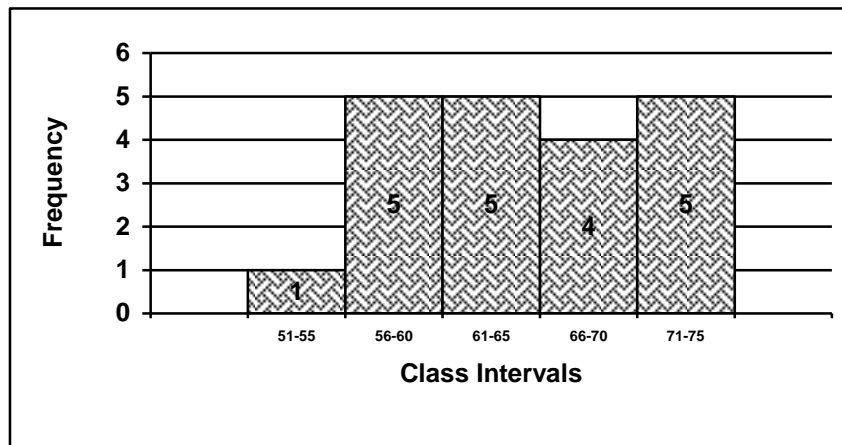
Results of data analysis of weights on the post-test show that the lowest score was 51.00 and the highest score is 74.00. The descriptive statistics analysis results demonstrate the average value (M) = 61.37; Standard deviations (SB) = 6.79; Median (Me) = 61.75; and Mode (Mo) = 51.00.

The following is the table of frequency distribution of weight data on the post-test.

**Table 4. The Frequency Distribution of Weight Data on the Post -test**

Class Intervals	Frequency	Percentage (%)
71 – 75	1	5.0
66 – 70	5	25.0
61 – 65	5	25.0
56 – 60	4	20.0
51 – 55	5	25.0
Total	20	100.00

The histogram of the frequency distribution of weight data on the post-test is as follows.



**Figure 2. The Histogram of Weight Data on the Post-test**

Based on the above picture, it can be inferred that the weight data on the post-test were mostly on the interval scores of 51-55, 61-65, and 66-70.

### 3. A Description of the Pre-test Data on the Fat Percentage

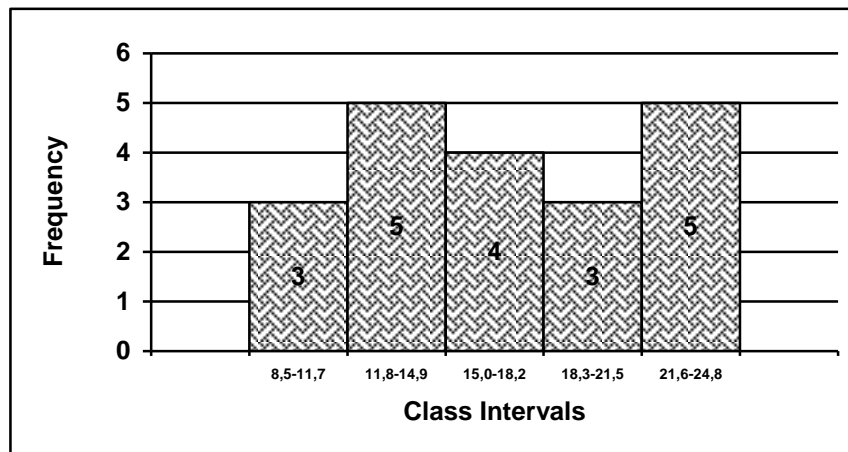
Results of data analysis of fat percentage on the pre-test show that the lowest score was 8.50 and the highest score was 24.80. The descriptive statistics analysis results demonstrate the average value (M) = 16.87; Standard deviations (SB) = 5.29; Median (Me) = 16.00; and Mode (Mo) = 8.50.

The following is the table of frequency distribution of fat percentage data on the pre-test.

**Table 5. The Frequency Distribution of Fat Percentage Data on the Pre-test**

Class Intervals	Frequency	Percentage (%)
21.6 – 24.8	5	25.0
18.3 – 21.5	3	15.0
15.0 – 18.2	4	20.0
11.8 – 14.9	5	25.0
8.5 – 11.7	3	15.0
Total	20	100.00

The histogram of the frequency distribution of fat percentage data on the pre-test is as follows.



**Figure 3. The Histogram of Fat Percentage Data on the Pre-test**

Based on the above picture, it can be inferred that the fat percentage data on the pre-test were mostly on the interval scores of 11.8 - 14.9 and 21.6 - 24.8.

### 4. A Description of the Post-test Data on the Fat Percentage

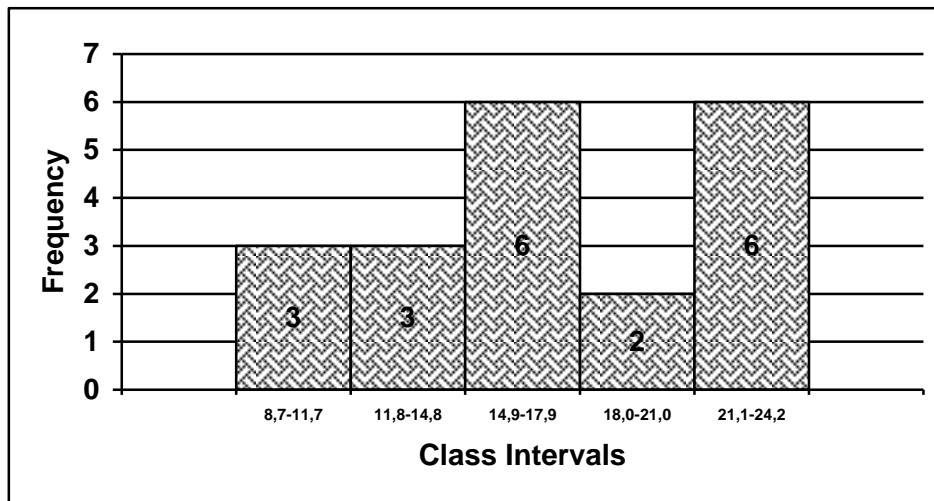
Results of data analysis of fat percentage on the post-test show that the lowest score was 8.70 and the highest score was 24.20. The descriptive statistics analysis results demonstrate the average value (M) = 17.40; Standard deviations (SB) = 4.67; Median (Me) = 16.95; and Mode (Mo) = 4.67.

The following is the table of frequency distribution of fat percentage data on the pre-test.

**Table 5. The Frequency Distribution of Fat Percentage Data on the Pre-test**

Class Intervals	Frequency	Percentage (%)
21.1 – 24.2	6	30.0
18.0 – 21.0	2	10.0
14.9 – 17.9	6	30.0
11.8 – 14.8	3	15.0
8.7 – 11.7	3	15.0
Total	20	100.00

The histogram of the frequency distribution of fat percentage data on the post-test is as follows.



**Figure 4. The Histogram of Fat Percentage Data on the Post-test**

Based on the above picture, it can be inferred that the fat percentage data on the post-test were mostly on the interval scores of 14.9 - 17.9 and 21.1 - 24.2.

## 5. Hypothesis testing

The hypothesis of this research states "there is the influence on the weight gain of weight training using the method of set systems on the students of IKOR FIK UNY". Hypothesis testing was through the t-test. Results of the data analysis on research hypothesis testing are as follows.

### a. The Results of T-test on the Weight Data

The results of the t-test on weight data of weight training using the method of set systems on the weight gain are as follows:

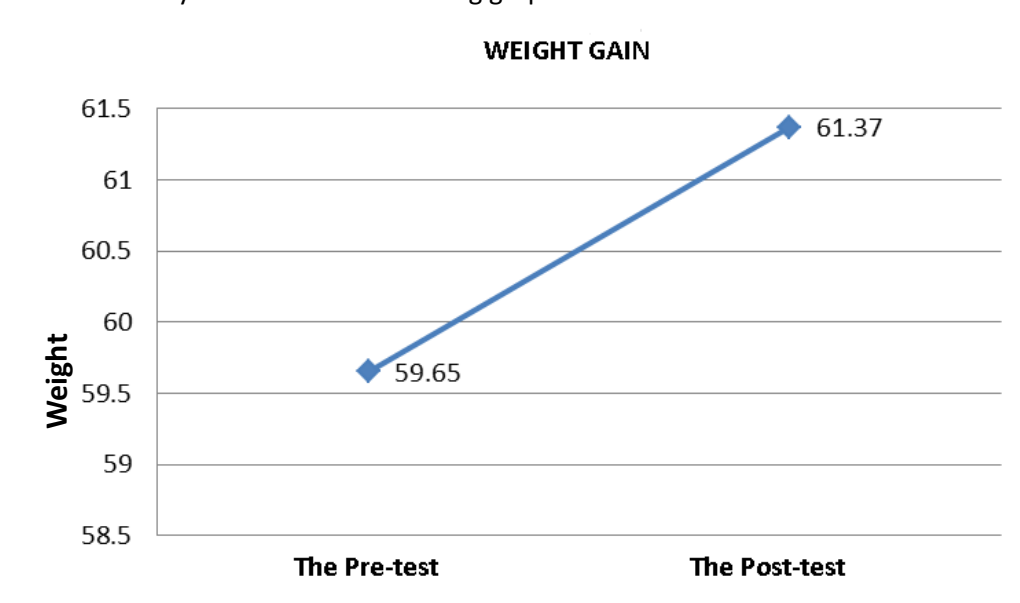
**Table 7. The Results of the T-test on Weight Data on the Pre-test and the Post-test**

Data	Tests	Mean	T-Score	p	Mark
Weight	The Pre-test	59.65	4.972	0.000	Significant
	The Post-test	61.37			

Source: Processed Primary Data

The analysis on the results of the t-test show the t-score of 4.972 with the significance value of 0.000. Because of the significance value of 0.000 was smaller than 0.05 ( $p < 0.05$ ), it can be concluded there was significant weight differences of the participants on the pre-test and on the post-test. These results demonstrate that weight training using method of the set systems could gain weights of the students of IKOR FIK UNY. Thus, the hypothesis of this research is acceptable.

Weight changes as the results of weight training using the method of set systems could clearly be seen in the following graph.



**Figure 5. Weight changes as the result of weight training using the method of set systems**

Based on Figure 5, there was an increased weight as the result of weight training using the method of set systems from 58.65 to 61.37 and it was statistically proven significant.

b. The Results of T-test on the fat percentage

The results of the t-test on fat percentage data of weight training using the method of set systems on the weight gain are as follows:

**Table 8. The Results of the T-test on the Fat Percentage on the Pre-test and the Post-test**

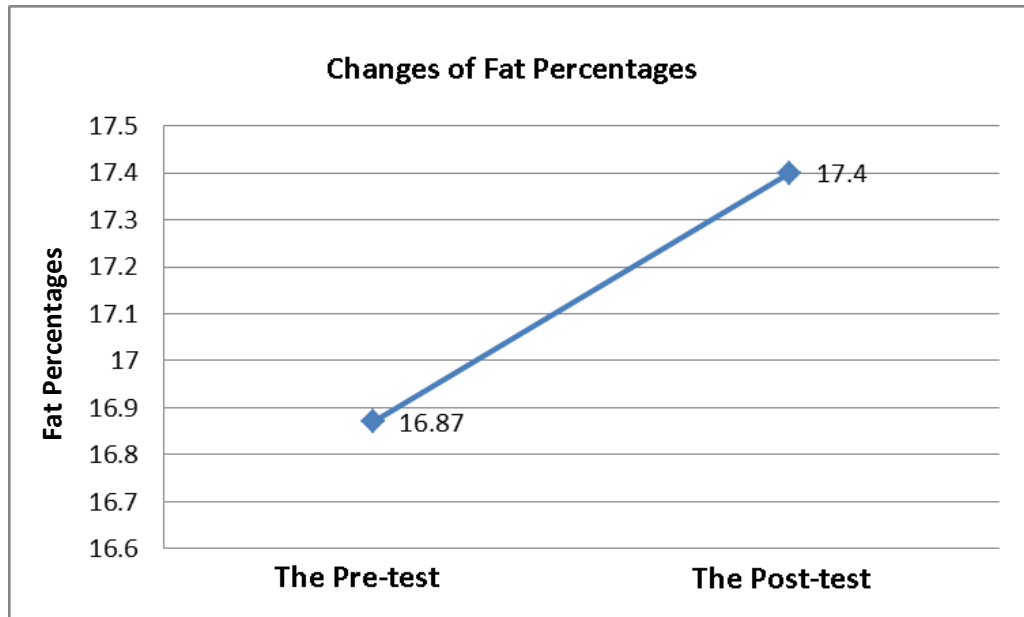
Data	Tests	Mean	t-score	p	Mark
Fat Percentage	The Pre-test	16.87	1.935	0.068	Not significant
	The Post-test	17.40			

Source: Processed Primary Data

The analysis on the results of the t-test show the t-score of 1.935 with the significance value of 0.068. Because of the significance value of 0.068 was bigger than 0.05 ( $p < 0.05$ ), it can be concluded there was no significant weight differences of the participants on the pre-test and on the post-test. These results demonstrate that weight training using method of the set systems had no effects on the fat percentage of the students of IKOR FIK UNY.

The changes of fat percentage as the results of weight training using the method of set systems could clearly be seen in the following graph.





**Figure 6. The change of fat percentage as the results of weight training using the method of set systems**

Based on Figure 6, there was an increased fat percentage as the result of weight training using the method of set systems from 16.87 to 17.40 and it was statistically proven insignificant.

The analysis on the results of the t-test show the t-score of 4.972 with the significance value of 0.000. Because of the significance value of 0.000 was smaller than 0.05 ( $p < 0.05$ ), it can be concluded there was significant weight differences of the participants on the pre-test and on the post-test. These results demonstrate that weight training using method of the set systems could gain weights of the students of IKOR FIK UNY. Thus, the hypothesis of this research is acceptable.

Based on the above research results, it can be concluded that weight training to gain weight was completed using the method of set systems and organized into 10-12 stations or posts, with the loads of 70-80% of maximum loads, and 12 times of repetitions completed in 4 sets with 30-second rests was proved to be able to gain weight.

The analysis on the results of the t-test show the t-score of 1,935 with the significance value of 0,068. Because of the significance value of 0,068 was greater than 0.05 ( $> p 0.05$ ), it can be concluded there was no significant difference in fat percentage of students during the pre-test and the post-test. These results demonstrate that weight training using the method of set systems has no effect on the fat percentage of students of IKOR FIK UNY.

Based on the above description, it can be concluded that there was insignificant changes on the fat percentage as the results of weight training using the method of set systems and organized into 10-12 stations or posts, with the loads of 70-80% of maximum loads, and 12 times of repetitions completed in four sets with 30-second rests.

## **CONCLUSION**

Based on the results of the study, it can be concluded that there were effects of weight training using the method of set systems on the weight gain of students of IKOR FIK UNY. However, there was no significant effect on the fat percentage of weight training in the method of set systems on the students of IKOR FIK UNY. The increase of body weight that occurs after the preferential treatment of weight training using the method of set systems was because of the increase of muscle mass. This could be inferred from statistical tests on the significant increase of

body weight with the insignificant increase of fat percentage. Thus, weight training using the method of set systems can be used to gain weight.

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