The Effect of Aerobic Combination Weight Training toward VO2 Max, Body Mass Index, and Fat Percentage

Afeb Chesa Arianto[1], Rachmah Laksmi Ambardini[1]

[1]*Universitas Negeri Yogyakarta, Yogyakarta, Indonesia*
Departement of Sport Science, Graduate School

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Abstract: The aim of this study was to determine the effect of aerobic combination weight training toward VO$_2$ max, body mass index, and fat percentage of Fitness Center Club House Casa Grande Yogyakarta members. This study used an experimental method with one pretest-posttest group. The sampling employed purposive sampling technique with total sample of 10 participants. The data were collected using tests and measurements. Then, the research instrument was in the form of multistage fitness test, weight and stadiometer scales, and skinfold caliper. The data were analyzed using t-test to find out whether there were some differences of variables between pretest and posttest in the experimental group. The result of this study stated that there is an influence of aerobic combination weight training toward VO$_2$ max, body mass index (BMI), and body fat percentage of Fitness Center Club House Casa Grande Yogyakarta members.

1 INTRODUCTION

In this modern era, people are motivated to be more productive in their own job. The life competition is getting higher. People are required to learn and work harder to improve their self-quality. They should be more productive by taking some advantages of technology that is growing rapidly. As we know, technology helps to get information, communicate with people who are far away, and visit the wanted places out of the blue. All of them could be done easier with the help of technology. The simple example is that when people want to go to their offices, they can log in their online taxi applications to book a taxi to pick them up. Therefore, the role of modern technology can unwittingly reduce people's physical work activities.

Fit body is a very important factor in our daily life because it is related to health. In this case, a sport is one of the physical and psychological activities that are useful for maintaining and improving our health. One of the places chosen for sports is a fitness center.

In general, there are so many fitness centers in Indonesia, specifically in the Special Region of Yogyakarta. One of the fitness centers in Special Region of Yogyakarta is the Fitness Center Club

House Casa Grande. It is located in the El Grande Casa Grande sports arena, Ringroad Utara Street, Maguwoharjo, Sleman. It is one of popular fitness centers which provides some facilities, such as a fitness center, an aerobics studio, a cardio vascular studio, a swimming pool, tennis and badminton courts, a table tennis spot, and a canteen.

Based on the conducted observation, the members of that fitness center did not have their own programs. They only asked for suggestion or direction about the use of the tools and instructions for using a suitable supplement from the instructor at Fitness Center Club House Casa Grande. They came to the fitness center reluctantly. Sometimes, they just came for weight training. However, they actually got other fitness facilities like cardio and swimming pool as official member of that fitness center.

Based on the considerations, providing weight and aerobic training methods was needed. This so-called physical training is a combination of two different or the same trainings but using different models. This method is called cross training. Cross training is combining two or more types of training to get good results (Sumosardjuno, 1996). One of the examples is triathlon that is a combination of running, swimming and cycling. This method has the benefits of reducing or eliminating the feeling of boredom in training. The Fitness Center Club House

Casa Grande provided weight and aerobic training for the members. The weight training was done at the fitness center, and the aerobic training was done by cycling. The members had the facilities after they joined as official members. In this research, an overview of the level of physical fitness related to health, which is more specific cardiac endurance, VO_2 max was provided. In addition an overview of nutritional status with measurements of body mass index and fat percentage was also provided.

2 RESEARCH METHODS

This study is an experimental method whose design is one pretest-posttest group (Arikunto, 2010).

2.1 Research Population and Samples

The population of this study included the members of the Fitness Center Club House Casa Grande Yogyakarta. This study employed purposive sampling method. purposive sampling used a determining technique of samples with certain considerations, such as being 18-25 years old, male, actively practicing for at least 2 months, members for the next 3 months and willing to be the research sample (Sugiyono, 2006).

2.2 Research Instrument

VO_2 max is the ability of the Fitness Center Club House member of Casa Grande Yogyakarta to consume oxygen maximally in conducting a Multistage Fitness Test. The test was done by running on a track with a distance of 20 meters. The position of the test takers to start the test was standing, and putting their both feet behind the starting line. When the test takers heard "ready go" (the sound produced by a cassette), they ran according to the rhythm towards the finish line until one foot finally crossed the finish line. The end of their run, back and forth, was marked by a single "TUT" signal, and the end of each stage was marked by three times of "TUT" signal. The test takers must always place one foot behind the finish line mark at the end of the run. They must continue to run as long as possible until they were not able to follow the running speed set by the tape. The time interval between the "TUT" sounds would decrease, so the running speed would increase. In each stage, time interval is 1 minute and the sound of the tape progresses up to level 21. The results of this running test were recorded in a multi-stage running record

form. It recorded the stage number (level) and the feedback number. Then, the test results in the form of levels and feedback were matched to the Beep Test norm in the form of VO_2 Max predictions.

The measurement of BMI used the equation of weight in kilograms divided by the square of height in meters.

$$BMI = \frac{Weight\ (kg)}{Height\ (m^2)} \tag{1}$$

The instrument used to measure weight is a weight scale, while the instrument used to measure height is a stadiometer. There were some steps for measuring the subjects' weight, such as: (1) Each subject in turns stood on a weight scale, (2) The researcher stood next to the person, (3) The researcher recorded the measurement results based on the numbers listed on the weight scale.

There were some steps for measuring the subjects' height, such as: (1) Each subject stood at a height measurement spot, and put the sight straight forward, (2) The researcher stood next to the subject by holding the size limit on the stadiometer. (3)The researcher recorded the measurement results based on the numbers listed on the stadiometer.

Furthermore, the results of the BMI calculation are reffered to the following criteria:

Table 1: BMI Threshold Categories for Indonesia.

	Categories	BMI
Thin	Lack of heavy weight	< 17,0
	Lack of light weight	17,0 – 18,5
Normal		> 18,5 – 25,0
Fat	Lack of light weight	> 25,0 – 27,0
	Lack of heavy weight	> 27,0

(Ardana A. R. 2012)

The measurement of body fat percentage was done using a skinfold caliper device which has an accuracy of 0.1 millimeters. The measurement was done on the body parts of the biceps, triceps, subscapula, and suprailiaca. Then, the fat thickness was calculated on the four measurement areas. Then, the amount of fat percentage was determined by using a table of body fat percentage based on the

folds produced under the skin. The steps for implementing this method were as follows: (1) *Biceps*, The part of left hand on the mid acromiale-radiale line was pinched with the thumb and forefinger so that the pinch is vertical and parallel to the upper arm axis. The subject stood with relaxed arms, and with elbow joints and shoulder joints slightly highlighted. Then, the most anterior aspect of the front surface of the upper arm on the side view was pinched too; (2) *Triceps*, The part of left hand on the posterior side of the mid acromiale-radiale line was pinched with the thumb and index finger. Then, the most posterior surface of the upper arm in the muscle triceps brachii area on the side view was pinched too. At the measurement with realaxed arms, the shoulder joints were slightly highlighted and the elbow joints were extended beside the body; (3) *Subscapula*, People tried to stand upright with both arms beside the body. It is continued by touching the bottom of the inferior angular scapulae with the thumb to determine the edge of the section. Pinching was then done on the skin with a pinch direction downward to form an angle of 450° to the horizontal line;(4) *Suprailiaca*, A pinch was done to the intersection area between the line formed from the anterior superior iliac spine (SIAS) to the anterior axilla border and the horizontal line through the edge of the iliac crista. The position of this area is about 5-7 cm above SIAS for the adult subject, and 2 cm for children subject, the pinch direction form 450° towards the horizontal line.

2.3 Data Analysis Technique

The data were analyzed using normality test, homogeneity test, and t test.

3 RESEARCH RESULTS

3.1 Pretest and Posttest VO$_2$ Max

VO$_2$ max pretest and *posttest* results are presented in the table below:

Table 2: *Pretest* and *Posttest VO$_2$ max* results.

Number of the Subject	Pretest	Posttest
1	36	36
2	31	36,4
3	27,6	36
4	32,5	43,3
5	29,9	41,1
6	27,4	30,2
7	24	24
8	25,2	26,8
9	31	31
10	29,1	30,2
Mean	29.3700	33.5000
SD	29.5000	6.12717
Minimum	24.00	24.00
Maximum	36.00	43.30

The conducted pretest resulted in a minimum value of 24, a maximum value of 36, an average of 29.37, and a standard intersection of 29.5. While he post test resulted in a minimum value of 24, a maximum value of 43.3, an average of 33.5, and a standard intersection of 6.12.

3.2 Pretest and Posttest Body Mass Index

The results of the pretest and posttest on Body Mass Index are presented in the table below:

Table 3: Pretest and Posttest Results of Body Mass Index.

Number of the Subject	Pretest	Posttest
1	20,9	20,5
2	22,78	22,23
3	19,75	19,15
4	25,68	24,94
5	22,01	21,89
6	22,38	22,15
7	32,97	31,98
8	24,69	23,76
9	24,62	22,99
10	23,98	23,7
Mean	23,976	23,329
SD	3,64972	3,46781
Minimum	19,75	19,15
Maximum	32,97	31,98

The conducted pretest resulted in a minimum value of 19.75, maximum value of 32.97, average of 29.97, and standard intersection of 3.64. In the BMI study, the weight of all members decreased. It can be seen from the conducted posttest which resulted in a minimum value of 19.15, maximum value of 31.98, average of 23.42, and standard intersection of 3.46

3.3 Fat Pretest and Posttest

The *pretest* and *posttest* on fats are presented in the table below:

Table 4: Fat *Pretest* and *Posttest* Results.

Number of the Subject	Pretest	Posttest
1	16,4	14,7
2	16,4	14,7
3	14,7	12,9
4	19	16,4
5	14,7	12,9
6	17,7	16,4
7	24,8	24
8	24	23,1
9	19	17,7
10	17,7	16,4
Mean	18,4400	16,9200
SD	3,48623	382,849
Minimum	14,70	12,90
Maximum	24,80	24,00

The conducted pretest resulted in a minimum value of 14.70, maximum value of 24.80, average of 18.44, and standard intersection of 3.48. There was a significant change on the posttest results. The conducted posttest resulted in a minimum value of 12.90, maximum value of 24.00, average of 16.92, and standard intersection od 3.82.

The measurement of this normality test was conducted using the Kolmogorov-Smirnov Z formula. The results are shown in table 1:

Table 5: Normality test.

Group	p	Sig.
VO₂ Max Pretest	0,998	0,05
VO₂ Max Posttest	0,963	0,05
BMI *Pretest*	0,705	0,05
BMI *Posttest*	0,635	0,05
Fat *Pretest*	0,632	0,05
Fat *Posttest*	0,539	0,05

According to the table above, it can be seen that all data have a value of p (Sig.)> 0.05 so the variables are normally distributed.

Homogeneity tests are useful for testing the similarity of variants samples taken from the population which are same or not. The results are shown in table 2:

Table 6: Homogeneity Test.

Group	df1	df2	Sig.
VO₂Max Pretest-Posttest	2	4	0,364
BMI *Pretest-Posttest*	2	4	0,626
Fat *Pretest-Posttest*	2	4	0,949

According to the table above, it can be seen that the value of the pretest-posttest sig. p> 0.05. Therefore, the data were homogeneous.

The hypothesis was tested using paired t test with SPSS. The hypothesis test results are shown in the table below:

Table 7: the t-test results of the Pretest and Posttest on VO2 max.

t-test for Equality of means				
t ht	t tb	Sig.	Difference	%
2,898	2,26	0,018	4,13	14.06 %

From the t-test above, it can be seen that the t count was 2.898 and t table was 2.26 (df 9) with a significance p value of 0.018, so this result showed

that there was a significant difference. Thus, the alternative hypothesis (Ha) "there is an effect of aerobic combination weight training toward VO_2 max of Fitness Center Club House Casa Grande" members is accepted.

Table 8: Pretest T-Tests and BMI Posttest.

t-test for Equality of means				
t ht	t tb	Sig.	Difference	%
5,931	2,26	0,000	0,547	2,28%

From the t-test above, it can be seen that the t count was 5.931 and t table was 2.26 (df 9) with a significance p value of 0.000, so this result shows there was significant difference. Thus, the alternative hypothesis (Ha) "there is an effect of aerobic combination weight training toward BMI of Fitness Center Club House Casa Grande" members is accepted.

Table 9: Pretest and Posttest Body Fat T-Tests.

t-test for Equality of means				
t ht	t tb	Sig.	Difference	%
9,239	2,26	0,000	1,52	8,24 %

From the t-test above, it can be seen that the t count was 9.239 and t table was 2.26 (df 9) with a significance p value of 0.000, so this research shows that there is significant difference. Thus, the alternative hypothesis (Ha) "there is an effect of aerobic combination weight training toward body fat of Fitness Center Club House Casa Grande" members is accepted.

4 DISCUSSIONS

The research findings showed that there is a difference between the average value on VO_2 max pretest and posttest, i.e. the posttest value > pretest value. It shows that VO_2 max of the members increased significantly as indicated by the average of difference from 29.37 to 33.5. The increase can be seen if the difference between pretest and posttest is calculated as 4.13, with a percentage of 14.06%. Therefore, it can be concluded that the aerobic training with static bicycles can increase VO_2 max of the Fitness Center Club House Casa Grande members as much as 14.06%.

The increasing methods of aerobic endurance can be used, including continuous training, one of which using static bicycles. Continuous training is a training carried out continuously without stopping. The time used is relatively long, between 30-60 minutes (Suharjana, 2013). Continuous training uses an intensity of 60 - 80% of the maximum heart rate. In addition, it happens because it is done repeatedly and programmed, and it will be patterned on the cardiovascular endurance system that produces an adaptation effect on the increase of VO_2 Max.

Furthermore, the research findings showed that there is a difference between the average value on BMI pretest and posttest, i.e. the pretest value > posttest value. According to the differences, it shows that BMI members experienced a significant decrease as indicated by the mean difference of 23.97 to 23.42. It can be seen if the difference between pretest and posttest is calculated 0.547, with a percentage of 2.28%. Therefore, the aerobic combination weight training with static bikes can reduce BMI of Fitness Center Club House Casa Grande members as much as 2.28%.

The most effective type of training to lose weight is long-term aerobic training within 20 - 60 minutes with the frequency of 3-5 times a week, and 65% - 75% of the maximum heart rate (Suharjana 2013).

Finally, the research findings showed that there is a difference between the average value on body fat pretest and posttest, i.e. the pretest value > posttest value. It can be said that the percentage of the members' body fat experienced a significant decrease as indicated the mean difference of 18.44 to 16.92. The decrease can be seen if the difference between pretest and posttest is calculated as much as 1.52, with a percentage increase of 8.24%. Therefore, it can be concluded that aerobic combination weight training with static bicycle can reduce body fat percentage of Fitness Center Club House Casa Grande members as much as 8.24%.

These results are obtained because the training was done continuously. It also needed a lot of energy to carry out the activities. One of the energy sources comes from burning fat. This also indicates that the method can provide good benefits for the body to help burn calories. Calorie burning shows a decrease in body fat and weight indirectly. Physical training, the body can maintain the stability of the amount of fat and weight so that the body will be ideal (Irianto, 2004).

5 CONCLUSION

Based on the research findings and the discussions, it can be concluded that: (1) There is an effect of aerobic combination weight training on VO_2 max,

with t count 2.898 > t table 2.26, a significance value of 0.018 < 0.05, on a precentage of 14.06% ;(2) There is an effect of aerobic combination weight training on BMI, with t count 5.931> t table 2.26, a significance value of 0.000 <0.05, on a precentage of 2.28%; (3) There is an effect of aerobic combination weight training on body fat, with t count 9.239> t table 2.26, a significance value of 0.000 <0.05, on a precentage of 8.24%.

REFERENCES

Arikunto, S., 2010. *Prosedur penelitian suatu pendekatan praktik*, PT Rineka Cipta, Jakarta.

Irianto, D.P., 2007. *Panduan gizi lengkap untuk keluarga dan olahragawan*, Andi Offset, Yogyakarta

Sugiyono, 2009. *Metode penelitian kuantitatif kualitatif dan R&D*, Alfabeta, Bandung.

Suharjana, 2013. *Kebugaran jasmani,* Jogja Global Media, Yogyakarta.

Sumosardjuno, S., 1996, *Sehat dan bugar petunjuk praktis berolahraga yang benar*. PT Gramedia Pustaka Utama, Jakarta.