

Interval and Continuous Training for Resting Pulse and Cardiovascular Enhancement of Students

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Abstract

Basketball games are played for 40 minutes divided into 4 quarters, where one quarter is 10 minutes. To play the game of basketball requires having excellent stamina which can be seen from the value of VO_2 Max. There are various types of exercises to improve VO_2 Max, such as interval training and continuous training. The purpose of this study: is to determine the difference in effect between interval training and continuous training on VO_2 Max on basketball players in extracurricular students at Senior high school 2nd Pasuruan City. Research methods: This study used the Pre and Post Test two Groups Design design, with a sample of 12 basketball players as an interval training group, and 12 players as a continuous training group taken using a purposive sample technique. The exercise is done 3 times a week for 8 weeks. Measurement of VO_2 Max uses a Multistage fitness test. Data analysis using the comparative test Wilcoxon Signed Ranks test and Mann Whitney test. Results: The difference between pre-test and post-test in the interval training group was 9.94 while in the continuous training group it was 6.02. Based on the test of the effect of interval training on VO_2 Max, the value of $p = 0.008$ was obtained and the test of the effect of continuous training on VO_2 Max was obtained p value = 0.005. Based on the different test of the effect of interval training and continuous training on VO_2 Max, the value of $p = 0.040$ is concluded. Conclusion: interval training and continuous training can increase VO_2 Max. interval training increases VO_2 Max more than continuous training in basketball players in extracurricular curricular students at Senior high school.

Keywords

Interval training;
continuous training;
 VO_2 Max; basketball
players.



I. Introduction

Physical education, sport and health are one of the main subjects that must be taught in schools, ranging from elementary school through high school. This was stated in the Act (Act) No. 20 of 2003 on National Education System (Education) of Chapter X of Article 37, which contains primary and secondary education curriculum. Physical education needs to be improved in the school environment, with physical education is expected to increase student physical fitness, in addition to the academic field will also increase. (Novianti, 2020)

In a basketball game based on International Basketball Federation Rules (FIBA) basketball game is played 40 minutes divided into four quarters, where one quarter consists of 10 minutes. For the game is required adequate physical basic ability. The development of sports today is not only carried out by certain circles, but also owned by sports today that have permeated the broad life and made a positive contribution to creating humans who have a healthy body and spiritually. This is evidenced by the increasing number of people who daily do sports. Everyone is increasingly aware of the importance and benefits of exercise as

a physical and spiritual need. Basketball is a type of large group ball sport consisting of two teams of five opposing people to score points by putting the ball in the opponent's basket. Basketball is very suitable to watch, because it can be played in a closed or open sports room and only requires a relatively small field. The basketball game is played by two teams, each consisting of five players. The goal of each team is to score in the opponent's basket and try to prevent the opposing team from scoring. The match is controlled by the referee, the desk clerk and a commissioner, if present. "In basketball, many factors must be mastered, such as the basic technique of dribbling, passing, shooting, and footwork. After mastering the basic techniques learned then the player is trained in mastering the skills of attack and defense. In a basketball game physical abilities are also needed in order to support the basic techniques of basketball to be better, so that physical training is very supportive in the physical abilities of individuals when playing a basketball game. Also in basketball there are some exercises in the form of strength training, flexibility and speed. Exercise causes the process of adaptation to body organs. The body needs a certain period of time (rest time) so that the body can adapt to all the weight during the exercise process. If the training load is increased progressively then the body's organs will adjust to these changes properly. The level of speed in adapting each training load depends on age, age of exercise, quality of muscle fitness, quality of energy and quality of training, the principle of overloading training load must reach or exceed a little at the threshold of excitatory. A burden that is too heavy will result in being unable to be adapted by the body, if it is too light it does not affect the improvement in physical quality. In improving physical quality, the way taken is to practice by fighting or overcoming the training load. How to increase the training load is done by increasing, aggravated, accelerated and lengthened, the principle of warm-up and cool-down warm-up aims to prepare physically and psychologically in entering core training. With heating is expected to avoid the possibility of injury and pain. The benefits of warming up are helping to increase body temperature, improving blood circulation, heart rate, breathing, oxygen intake and preparing bones, muscles, joints, tendons and ligaments. The purpose of cooling is for the body to return to normality gradually and not suddenly after exercise. The benefits of cooling are to help smooth blood circulation, reduce muscle tension and facilitate the rest of the burning.

Important Cardiovascular tests are conducted to be known how much cardiovascular is held on any aerobic exercise. The result of a cardiovascular test can be used as a reference in evaluating the strengths and weaknesses of the students. In aerobic Cardiovascular examination, which is enabled to know how to measure the Maximum body Capacity (VO₂max), there are several measuring instruments, and in this research using multistage Fitness Test measuring instrument (MFT).

The application of aerobic cardiovascular exercises has many variations by sticking to the basic principles of aerobic cardiovascular such as respiration control, maximum cardiac work, and the suitability of aerobic systems and anaerobic (Ashadi, 2014). These basic principles can be used as a benchmark to make a variety of training programs especially aerobic exercises such as interval training.

Specials as one of the sports branches that require much of the Kabua component or a very good physical component basically all sports branches require good physical capability but the specials should be able to combine between Aerobic or anaerobic energy system which means it is able to be balanced and adjusted to the conditions during play and the

instructions of the trainer sometimes plays with a fast tempo and sometimes also requires the tempo Slower than that, the necessary physical components should be maximal. From the observation of the authors of the problem found in the field is "how trainer in the case of

Extra basketball in the school to improve with a significant physical deterioration because it is different from the club that is indeed an exercise program and more intense training Schedules than in-school extracurricular exercises.

From the explanation above it can be assumed that the increase in cardiovascular through interval and continuous training in basketball exercises is shown to develop the ability of physical or cardiovascular condition of the player specials and increase the freshness (physical fitness) for students of high school extracurricular Senior high school 2nd grade Pasuruan.

Therefore, it is necessary to develop a model of interval and continuous training to improve the cardiovascular level of students in the extracurricular basketball public high School 2 Pasuruan City so that the students boa basketball SMA Negeri 2 Pasuruan City can and able to do activities By not feeling exhaustion that means through interval training and continuous in particular the extracurricular basketball SMA Negeri 2 Pasuruan City.

II. Research Method

Research used is experimental with the approach of *experimental quasi* using the design of *Pre and Post Test two groups design* namely by the number of samples 8 basketball players as a training interval training group and 8 players as a continuous training group with modified exercises. This research draft uses *Matching-only design*. This Design does not use random as a way of entering a subject into or with another one based on a certain variable (Maksum,2012:100) "The research method is a way of solving a planned research problem and With the intention of obtaining facts and conclusions in order to understand, explain, predict and control the state of "Syamsudin and Damayanti (2011:14).

The design of this study is described as follows:

<i>Pret</i>	<i>Treatm</i>	<i>Posttest</i>
T11	X1	T21
T12	X2	T22
T13	-	T23

Description :

- M : *Matching*
- T11 : Group 1 *pretests* pulse Rest and *VO2 Max*
- Q12 : Group 2 *pretests* pulse resting and *VO2 Max*
- T13 : Group 3 *pretests* pulse resting and *VO2Max*
- T21 : Group 1 *posttest* pulse resting and *VO2 Max*
- T22 : Group 2 *posttest* pulse resting and *VO2 Max*
- T23 : Group 3 *posttest* pulse rateistirahat dan *VO2 max*
- X1 : Interval Training
- X2 : Continuous Workouts

- : Conventional exercise
- Note : The implementation of each test is one week

In order to obtain data according to the research variables namely fitness conditions, researchers use tests and measurements.

Test and variable implementation as follows:

Participant preparation before and after the test:

1. A day before the data retrieval of MFT (*Multi stage Fitness test*), dating to SMAN 2 Kota Pasuruan for the gathering of participants who will take the MFT test (*Multi Test fitness test*) in one room.
2. Informs the MFT's implementation procedures to students of the high school basketball extracurricular N 2 Pasuruan to take the MFT test.
3. Preparing the test equipment and infrastructure needed in the test.
4. Conducting tests and data retrieval by way 4 weeks at SMAN 2 Pasuruan in this case the same time to do the test is in the afternoon starting at 15.30.
5. to process and analyze test result data.

2.1 Test implementation

1. Officers occupy a post that is already available with all the tools that have been prepared.
2. Participants are given concise instructions on the implementation of the test and the order to be performed during the test.

2.2 Research step

The implementation of this research activity consisted of two stages, namely the preparation and implementation stages.

a. Preparation phase

- 1) Request a letter of research recommendation to the director of the postgraduate program at Surabaya State University.
- 2) Arrange a research permit to approve extracurricular basketball students of SMA Negeri 2 Kota Pasuruan as tastes in the study.
- 3) Contact and gather researchers and notify their respective assignments.
- 4) Contact and collect research assistants and notify their respective assignments.
- 5) Give the informed consent format to the research subjects as a willingness and willingness as a research taste.
- 6) Prepare procedures for conducting tests for research. Research assistants, and research tastes.

2.3 Research Implementation Stage

In carrying out this research activities include the following activities. The implementation of this research includes the following activities

- 1) Determine the sample that will be the subject of research
- 2) Carry out a pretest for initial data collection.
- 3) Placing research subjects into three groups by ordinal pairing.
- 4) Divide the treatment to each group by random method.

- 5) Conduct a pretest in each group by conducting an MFT (multi-stage fitness test) to develop the method to be used.
- 6) Carry out post tests to collect final data.

2.4 Data Collection Techniques

Data collection techniques used in this study are physical measurement techniques using tests. The data in this study were obtained from the measurement of resting pulse rate using a pulse oximeter. And VO₂ max measurements using the MFT test (multi stage fitness test).

2.5 Instrument and Research Aids

Research Instrument:

The research instrument is a measuring instrument used to collect data in research (Maksum, 2012: 111). In this study, the type of test used to measure resting pulses uses a pulse oximeter and to measure fitness using the MFT (multistage fitness test) test.

There are research aids:

- a. Stationary
- b. Meter
- c. Alcohol
- d. Cotton
- e. Tissue
- f. Pulse Oximeter
- g. Format for calculating test results
- h. Laptop for entering test results into a formula
- i. Whistle
- j. Stopwatch
- k. Camera

2.6 800 meter interval training

Implementation of interval training programs

1. The testee warms up before doing the exercises
2. Testee stands at the starting line
3. At the signal "Yes / whistle sound" the testee ran up to a distance of 800 meters.
4. Running speed in accordance with the training program, starting from 70% to 80% of the maximum running speed that can be achieved by each subject in running for a distance of 800 meters. For example: ATP in the 800 meter pretest has 120 minutes (2 minutes), then 70% of the travel time = $(30/100) \times 120 + 120 = 156$ seconds (2 minutes 36 seconds) and 75% = $(25/100) \times 120 + 120 = 155$ seconds (2 minutes 35 seconds), while 80% = $(20/100) \times 120 + 120 = 144$ seconds (2 minutes 24 seconds). So in the first week to second week, the ATP travel time in reaching a distance of 800 meters is 2 minutes 36 seconds, and for the third and fourth weeks the travel time that ATP must reach is 2 minutes 35 seconds. Whereas in the treatment of the fifth to the sixth week the travel time that must be achieved is 2 minutes 24 seconds.
5. After that it is followed by an interval (active rest), with a comparison between running time and interval is 1: 1 and the interval time follows from the exercise program.

- The above activity is carried out 3 times repetition.

2.7 2400 meters continuous training

- Testee warms up
- Testee stands in the starting line
- At the signal "yes / whistle" the testee ran up to a distance of 2400 meters
- Running speed in accordance with the training program, starting from 70% to 80% of the maximum running speed that can be achieved by each subject in a distance of 2400 meters. For example: ACK in a 2400 meter pretest has 8 minutes 16 seconds (496 seconds) then 70% of the travel time = $(30/100) \times 496 + 496 = 645$ seconds (10 minutes 45 seconds), and 75% = $(25/100) \times 496 + 496 = 620$ seconds (10 minutes 20 seconds), while 80% = $(20/100) \times 496 + 496 = 595$ seconds (9 minutes 56 seconds). So in the treatment of the first week to the second week, the ACK travel time in reaching 2400 meters is 10 minutes 45 seconds, and the third and fourth weeks of travel time that ACK has to achieve is 10 minutes 20 seconds. Whereas in the fifth and sixth week of treatment the travel time that must be achieved is 9 minutes 56 seconds.
- Implementation of this treatment lasts for 6 weeks with a frequency of exercise 3 times a week.

In this study will be assisted by officers with the following names:

- Ardhianto Cahyono S. Pd as an extracurricular contractor and teacher of P.E SMA Negeri 2 Pasuruan
- Aris Munandar S. Pd graduated of UNESA University year 2018
- Ach Fitratur Rizqi Alumni UNESA students in 2016 as: Documentary (cameraman).

III. Result

Hasil uji pengaruh latihan

Kelompok	p	Keterangan
<i>High intensity interval training</i> (HIIT)	0,008	Ha diterima
<i>Continues training</i>	0,005	Ha diterima

Data sampel penelitian

Nilai	VO ₂ Max					
	Kelompok HIIT			Kelompok <i>continues training</i>		
	<i>Pre test</i>	<i>Post test</i>	Selisih	<i>Pre test</i>	<i>Post test</i>	Selisih
Mean	39.71	49.65	9.94	34.37	40.39	6.02
Median	41.45	50.5	9.05	34.30	38.85	4.55
Std. Deviasi	4.32	6.62	2.29	4.12	5.89	1.77
Minimum	32.90	36.40	3.5	29.50	32.54	2.95
Maksimum	43.90	56.25	12.35	41.45	51.65	10.20

Hasil uji beda pengaruh antara kelompok HIIT dan CT

Kelompok	P	Keterangan
<i>High intensity interval training</i> (HIIT)	0,040	Ha diterima
<i>Continues training</i>		

IV. Discussion

Effect of High intensity interval Training (HIIT) to VO₂ Max according to research of Gems (2015), with the interlude between high intensity and the intensity of recovery causes the body to effectively form and use energy derived from Anaerobic system. The addition of intervals helps to discharge the metabolism of muscles during resting period during high intensity interval training is being performed by the body. Changes in the period of exercise carried out this alternately help the body increase the volume in consuming oxygen while training on the maximum volume and capacity (VO₂ Max) during exercise (Kolt, 2007). According to the American College of Sports Medicine it states that more oxygen is used when

Performing high intensity interval exercises than on No interval exercises. In accordance with the research on high intensity interval training conducted by Buhler et al, (2017) about the effect of high intensity interval training (HIIT) on 28 teenagers with a high Body Mass Index (BMI) value showed increased VO₂ Max and Improve the compositor.

Karakteristik sampel penelitian penelitian berdasarkan IMT

IMT	Kategori	Kelompok HIIT				Kelompok <i>continues training</i>	
		jumlah	%	Jumlah	%		
<18,5	Kurang	1	11,1	1	10		
18,5-22,9	Normal	8	88,8	3	30		
23-24,9	Beresiko obes	0	0	2	20		
25-29,9	Obes I	0	0	4	40		
≥30	Obes II	0	0	0	0		
Total		9	100,0	10	100,0		

Sumber: *Centre for Obesity Reaserch and Education 2007*

The influence of Continues training against VO₂ Max according to the research Arifuddin (2016) Continues training in Effects of cardiovascular endurance, this exercise can also strengthen the respiratory muscles so as to provide great benefits to Maintenance of cardiac and lung fitness. With continuous exercises without resting breaks that use the aerobic system so more oxygen is needed. So the heart of someone who performs regular exercise is larger in size.

A pulsed blood volume (stroke volume = SV) will increase. With increased blood volume pulsed then to meet the needs of oxygen and the exposure of heart carbon dioxide do not need to pump with a high frequency. Then the heart rate frequency will decrease, so the heart has a higher heart rate Reserve (HRR).

High Intensity interval Training (HIIT) increased VO₂ Max by 25.03% while in sample groups given continued training increased VO₂ Max by 17.52%. This difference occurs because in high intensity interval training (HIIT) There is a recovery phase that serves to help the disposal of the metabolism of muscles during the resting period during the high intensity interval training is being performed by the body. Changes in this interchangeably exercise period helps the body increase the volume in consuming oxygen during exercise. This is because the fewest cells consume oxygen when the muscles are in the state of the Break (ACSM, 2014).

V. Conclusion

Based on the study of research and discussion, the conclusions taken are High intensity interval training (HIIT) and Continues training can improve VO₂ Max. High intensity interval training (HIIT) Further increased VO₂ Max than Continues training in students of extracurricular basketball players SMA Negeri 2 Pasuruan.

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