IO_1-2_CHANGES_OF_ANAEROBIC_THRESHOLD_AND_LACTATE_ACID_LEVEL

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EXERCISE RATIO 1:2; CHANGES OF ANAEROBIC THRESHOLD AND LACTATE ACID LEVEL

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ABSTRACT

Training is a form of physical exercise that can improve physical fitness if done with correct frequency and intensity. Regular and measured training requires various training programs, such as interval training, circuit training, continuous training, combination training/exercise, or weight exercise, each of which has measurable exercise ratio to individual needs. Regular and measured training will result in increased work of respiratory system, cardiovascular system, strengthen skeletal muscles and endurance. The purpose of this research is to analyze the effect of exercise ratio 1:2 on changes of anaerobic threshold and lactate acid level in students of Physical Education, Health, and Recreation Study Program, Sport Education Department, Faculty of Sport Sciences, Universitas Negeri Yogyakarta (PJKR FIK UNY). Research method used was by quasi-experimental. Research design applied pretest-posttest group design, with quantitative research type. Data collection for the variables studied was done by test instrument anaerobic threshold test using Fitmate version 2.2, Wellness Technology a Division of Cosmed and treadmill, lactate acid level test using Accutrend Plus. Research results indicate that they are three conclusions; the first eexercise ratio 1:2 gives significant effect on anaerobic threshold changes of PJKR FIK UNY students. The second, eexercise ratio 1:2 gives significant effect on lactate acid level changes of PJKR FIK UNY students. The third, exercise ratio 1:2 gives significant effect on changes of anaerobic treashold and lactate acid level of PJKR FIK UNY students.

Key words: Exercise Ratio, Anaerobic Threshold, Lactate Acid

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INTRODUCTION

Nowadays, sports in modern era become the needs of all humans to improve their health and fitness level. Achieving fitness by training habitually, regularly, directed, continuous and measurably influences individual physical condition. Sports are beneficial for maintaining health and disease, this is also revealed by McKinney *et al* (2016.p.131) who states that high level of physical activity and cardiorespiratory fitness can reduce development of chronic diseases such as hypertension, diabetes, stroke, and cancer, besides it can also improve cognitive function and psychosocial health. Physical fitness is influenced by level of success in increasing speed, agility, strength, explosive power, endurance, balance, coordination, reaction, and flexibility (Bompa and Haff, 2009, p. 65). Furthermore Moore *et al* (2012, p. 841) states that doing sports continuously will improve cognitive, affective, and psychomotor abilities. Sport seems to be progressing in present development, inseparable from success of community in sporting society and promoting sports which are supported by application of science and technology in sports. Researchers results show that sports have been successful with the application of science and technology in every kind of sports, health sports, and recreational sports, including proper training must require systematic training program and continuous training as revealed by Penggalih *et al*. (2015, p.219) arguing that training/ training is a form of physical training that can improve physical fitness if done with right frequency and intensity. Regular and measured training requires training program. Types of training that can be done are several ways, such as interval training, circuit training, continuous training, combination training, or weight training, each of which has measured training ratio to individual needs. Regular and measured training will result in increased work of respiratory system, cardiovascular system, strengthen skeletal

muscles and body endurance. Results of research by Candra *et al*. (2016, p. 333) show that aerobic training performed with proper intensity, duration and frequency can improve athletes' performance and achievement, thus slowing fatigue during training. Another opinion from Tanzila *et al* (2017, p.47), explaining there is the influence of high intensity interval training on pulse rate significantly in high- activity communities. In accordance with Sandi's research result (2016.p. 1) which states that physical training causes an increase in pulse frequency. This increase is caused by increase in the need for blood that transports oxygen (O2) to active body tissues, transporting waste materials such as carbon dioxide (CO2) and other metabolic byproducts. If physical training is done regularly and continuously for a long period of time, there will be decrease in the frequency of resting pulses. Work ratio given to an training will affect body anatomically and physiologically, such as muscle strength, muscle reaction speed, muscle endurance, muscle stabilization, heart- lungs resistance, muscle explosive power, and muscle coordination. The ratio of this training is comparison of time between training and rest. The ratio of training given to achieving fitness can be seen from various problems including: (1) quality of the person in training that affects fatigue and can survive fatigue threshold, (2) irregular levels of rest can affect training, (3) unfocused concentration that affects muscle fatigue in training, (4) metabolic system and irregular nutritional patterns reduce body function during training. This statement is supported by Ghosh (2004. 24) that training at or slightly above anaerobic threshold intensity increases aerobic capacity and level of anaerobic threshold. Furthermore, Whyte *et al* (2005. p.93) states that trained people can maintain their aerobic activity around 80%, while those who are not trained or inadequate can only maintain aerobic activity around 40-50%. Anaerobic threshold is the level of oxygen consumption where there is a rapid and systemic increase in blood lactate concentration, one form of training is High Intensity Interval Training (HIIT), which is training with the load above anaerobic threshold in short time and interspersed with active recovery period (Vidiari, 2017. p. 62.). Based on the problems above, researchers were inspired by process of figuring out the effect of circuit training ratio 1:2 on changes in anaerobic threshold and lactate acid level. The reason why researchers focused on the problems above was because of the training ratio revealed by Bompa and Buzzichelli (2015. p. 46) that shorter work-rest intervals (such as 1:1 - 1:3) will selectively target the oxidative system, while those that longer (1:12 - 1:20) targeting the phosphate system. Bompa and Buzzichelli (2015. p. 43) explain in their book that anaerobic threshold training can be done with repetition duration 1-10 minutes, number of repetitions 3 - 40, rest interval 1:0.3 - 1:1, 4-6 sets of intensity maximum 90-100%, but the results of the study had not been conducted to find out whether it was true that the statement above was suitable for changes in anaerobic threshold and lactate acid level. Results of several observations that some problems occuring in students of Physical Education, Health, and Recreation Study Program, Faculty of Sport Sciences, Universitas Negeri Yogyakarta (PJKR FIK UNY) include: (1) students of 2nd semester of PJKR FIK UNY have never been given circuit training with 1:2 ratio to determine changes of anaerobic threshold; (2) students of 2nd semester of PJKR FIK UNY have never been given circuit training with ratio 1:2 to determine lactate acid level; (3) students of 2nd semester of PJKR FIK UNY still cannot manage healthy lifestyle, especially diet and rest adjustments, this is based on the results of interviews with several students who said that their eating and rest patterns are less regular due to adaptation to new environment; (5) students of 2nd semester of PJKR FIK UNY are still too much full material and lecture practice so that they lack programmed trainings on average in 3 courses a day. Problems of observation and prerequisite observation results above give inspiration for researchers to examine in depth "Effect of Circuit Training Ratio 1:2 on Changes of Anaerobic Threshold and Lactate Acid Level". The research firstly aims at analyzing effect training ratio 1:2 on changes of anaerobic threshold; secondly, analyzing effect on training ratio 1:2 on lactate acid level; and thirdly, analizing effect training ratio 1:2 on changes of anaerobic tthreshold and lactate acid level

METHODS

Research Design

The research used quasi-experimental method which aimed to analyze the effect of circuit training ratio 1:2 on changes in anaerobic threshold and lactate acid level of 2nd semester students of Physical Education, Health, and Recreation Study Program, Faculty of Sport Sciences, Universitas Negeri Yogyakarta (PJKR FIK UNY). Research design used pretest-posttest group design with quantitative research type (Creswell, 2012. p.297). The research was conducted in February to June 2018.

Giving the training ratio 1:2 means that once doing work in this case is doing circuit training consisting of 7 posts including shuttle run, sit up, push up, half squat jump, back up, squathrush, and jumping jacks for 3 sets and rest periods for twice working time.

The training program was done for 16 weeks, 3 times every week and repetitions week 1 to 2, 50% of 1 RM; week 3 to 4 60%, week 5 to 6 70%.

Research Subjects

Targeted population of the research was of 2nd semester students of Physical Education, Health, and Recreation Study Program, Faculty of Sport Sciences, Universitas Negeri Yogyakarta (PJKR FIK UNY). Sampling technique was based on purposive sampling. These criteria included 1) 2nd semester PJKR students, 2) aged between 17-20 years old, 3) not in sick condition, 4) not injured, 5) male sex, 6) not professional athlete , 7) not undergoing training program, 8) not undergoing training camp, 9) willing to be research subject, 10) willing to follow research process. Research samples that met the criteria were 10 students.

Variable Operational Definition

This research has 1 independent variable which is circuit training ratio 1: 2 and 2 dependent variables including changes in anaerobic threshold and lactate acid level. Circuit training ratio 1:2 means 1 time doing work in this case doing circuit training consisting of 7 posts including shuttle run, sit up, push up, half squat jump, back up, squathrush, and jumping jacks for 3 sets and rest periods twice working time. Training is performed for 16 treatments (6 weeks), 3 times a week frequency, repetition in week 1-2 50% of 1 RM; week 3-4 60%, week 5-6 70%. Rest between repetitions is 2 times of the length of working time while resting between sets (length) that is the total working rest length of each post.Anaerobic Threshold change in question is the time of anaerobic threshold when running on treadmill with test run 12, maximum test measured by using Fitmate version 2.2, Wellness Technology a Division of Cosmed. Lactate acid level was result of carbohydrate metabolism without using oxygen. Lactate acid referred to in this research was level of lactate acid formed when running on treadmill with test run 12, maximum test. Measurements were made using Accutrend Plus in mmol unit in same heart rate condition between initial test and final test.

Instruments and Data Analysis Technique

1. Instrument

Instruments used in this research include for measuring:

a. Anaerobic Threshold Change

Anaerobic threshold change was by using Fitmate version 2.2, Wellness Technology a Division of Cosmed. When measuring anaerobic threshold, it was also equipped with other supporting tools such as treadmills.

b. Lactate Acid Levels

Lactate acid levels are measured using Accutrend Plus.

2. Data Analysis Technique

Data that had been obtained, then analyzed by using SPSS Statistics 24 program with following steps:

a. Normality Test with Kolmogorov Smirnov

b. Homogeneity test with Levene test

c. Test the Hypothesis with T-Test

RESULTS

The data described was the data taken from results of reduction (difference) of post test (after) with pre test (before). The data obtained can be described one by one as follows:

Anaerobic Threshold

The results of the anaerobic threshold measurement test data with number of samples n = 10 performed before and after doing the training, the training ratio 1:2 can be seen in the following table:

Table 1. Data of Anaerobic Threshold Measurement

	Min	*Max*	*Std. Dev*	*Mean*	*95% Confidence Interval for Mean*	
					Lower Bound	Upper Bound
Anaerobic Threshold	60	180	42.544	111.0	80.57	141.43

The description of the results of anaerobic threashold measurement data in Table 1 shows that training ratio 1:2 has minimum value of 60, maximum value 180, average value ($\bar{x}$) of 111.0 and standard deviation of 42.544.

Lactate Acid Level

Data of measuring test results of lactate acid level with number of samples n = 10 were applied before and after doing the training, training ratio 1:2 can be seen in the following table.

Table 2. Lactate Acid Data Measurement

	Min	*Max*	*Std. Dev*	*Mean*	*95% Confidence Interval for Mean*	
					Lower Bound	Upper Bound
Lactate Acid	4	7	.956	5,01	4.33	5.69

Description of measurement data results for lactate acid level in the table above shows that the training ratio 1:2 has minimum value 4, maximum value 7, average value ($\bar{x}$) is 5.01 and the standard of deviation is 0.956.

Hypothesis Testing

Before the data were analyzed, prerequisite test was conducted first. The prerequisite test was done by conducting normality test. The prerequisite test performed to meet the data analysis by using Manova technique done by the normality test by Shapiro Wilk's technique (p> 0.05

a. Anaerobic Threashold Normality Test

Then, the result of the normality test of training ratio 1:2 on anaerobic threashold is presented as shown in the following table.

Table 3. Normality Test of

Variable	Sig.	Status
Anaerobic Threshold	0.249	Normal

Anaerobic Threshold

Result of the anaerobic threshold prerequisite test analysis in the table above shows that training ratio 1:2 is sig. 0.249 (p> 0.05), it can be said that data with ratio 1:2 is normally distributed.

b. Normality Test on Lactate Acid

The results of normality test of training ratio 1:2 on lactate acid test results are presented in the following table.

Table 4. Normality Test on Lactate Acid

Variable	Ratio	Sig.	Status
Lactate Acid	1:2	0.495	Normal

Analysis result of lactate acid prerequisite test in the table above shows that training ratio 1:2 is sig. 0.495 (p> 0.05), it can be said that data with training ratio 1:2 is normally distributed.

c. Difference Test (Paired t Test)

The following is explained the result of difference test results of training ration 1:2 data for changes in anaerobic threshold and lactate acid level as in the following table.

Table 5. Paired Samples Correlations

	Paired Differences		t	df	Sig. (2-tailed)
	Mean	Std. Deviation			
Pretest AT – Posttest AT	-111,00000	42,54409	-8,251	9	,000
Lactate Acid Pretest - Lactate Acid Posttest	5,01000	,95621	16,569	9	,000

	N	Correlation	Sig.
Pretest_AT & Posttest_AT	10	,544	,104
Pre test_ Lactate Acid & Post test_ Lactate Acid	10	,373	,289

Table 6 Paired Samples Test

Hypothesis test that had been done which can be seen in Table 5 and Table 6 shows that the change in anaerobic threshold showed that the correlation was obtained at 0.544 while the t value obtained was 8.251 with the Sig. 0,000. Because the value of Sig. 0,000 <0.05, so Ho was rejected, so it could be concluded that the circuit training ratio 1:2 can increase the anaerobic threshold change at $\alpha = 5\%$.

Hypothesis test on the effect of circuit training ratio 1: 2 on lactate acid level which could be seen in Table 5 and Table 6 indicated that the lactate acid level showed correlation of 0.373 while the t value obtained was 16.569 with the Sig. 0.000. Because Sig. value 0.000 <0.05, so Ho was rejected, so it could be concluded that circuit training ratio 1:2 could make lactate acid level better at $\alpha = 5\%$.

DISCUSSIONS

Physiological process occuring when conducting circuit training with ratio 1:2 on anaerobic threshold is stated significant. Syaifuddin (2011. p.357) states that human body when doing training or activities continuously will result in changes in chemical energy in body cells to convert chemical energy into mechanical energy, osmotic energy, electrical energy, and heat, so that research subjects who are continuously trained in their bodies will be able to adapt not to experience fatigue which means that oxygen level during training can be stable. Above statement is strengthened by Antunes research results (2015. p.1) at Federal University of Rio Grande Dosul, Brazil in 12 active women given aerobic training have achieved significant improvement when practicing maximally by prioritizing cardiorespiration directly related to muscle mass involved

in the training. Reinforced by the research results in Denpasar, Bali, Indonesia for 24 running extracurricular students by Vidiari (2017.p.62) arguing that training with over anaerobic threshold weight is better than training with weights approaching anaerobic threshold in achieving long anaerobic threshold.Circuit training in ratio 1:2 on anaerobic threshold has different effect on duration of rest period. The statement above is reinforced by Vidiari's research result (2017.p.62) in Denpasar, Bali, Indonesia for 24 extracurricular runners given weight training approaching anaerobic threshold only close to anaerobic thresholds compared to high intensity training that can exceed anaerobic threshold significantly. Training problem in the research was only due to longer rest than high intensity.Regular training/ exercise will cause changes in anaerobic threshold. Special training will affect the increase in anaerobic threshold so that the body is able to adapt and prevent fatigue quickly. Physical activity on anaerobic threshold when the training intensity reaches highest stage and decreases the concurrent duration in fatigue zone (Boreham. 2006, p. 1).The physiological process that occurs when performing circuit training with ratio 1:2 on lactate acid is stated to be significant. Lactate acid is decreased because burning process cannot be re-processed into energy, so the dominant one will use aerobic energy system to produce energy/ power so that it can do training again.Trained athletes anaerobically will release lactate acid by 80% compared to athletes performing aerobic exercise by 75%, so that trained athletes in anaerobic training will not feel significant fatigue. (Green, et al., 2014.p.329-338). This is in accordance with research result results o from Grossi et, al (2012.p.161) stating that the best training for athletes is by using anaerobic training to produce high lactate threshold. Flora (2015.p. 40) says that anaerobic physical training results in increased plasma lactate level and decreased levels of lactate in heart muscle tissue.Circuit training with ratio 1:2 is a training with high intensity and availability of recovery. With programmed and intensive training, physiological adjustments will occur. The recovery given that is fulfilled will re-form Adenosine Tri Phosphate (ATP) - Posphocreatin (PC) that has been used. As a result of adaptation process that occurs, then, the formation of lactate acid will decrease or slow. Programmed training will be able to reduce lactate acid level faster because the distribution of lactate acid from various muscles will be channeled to other parts of muscle quickly. When doing the training, blood vessels will work to channel blood to muscles that contract so that it will automatically reduce lactate acid level in contracting muscles. System reconstitution of lactate acid means removing the excess lactate acid collected in all body fluids. This is very important because lactate acid causes extreme fatigue. When adequate amounts of energy are available from oxidative metabolism, removal of lactate acid is achieved in two ways: (1) small portion of it is converted back into pyruvic acid and then oxidized metabolically by all body tissues. (2) The remaining lactate acid is converted into glucose, especially in liver, and glucose in turn is used to replenish muscle glycogen reserves. (Guyton, 2011, p.1034)

CONCLUSIONS

Based on the research results, it can be summed up that there are The first is that exercise ratio 1: 2 gives significant effect on anaerobic threshold changes of PJKR FIK UNY students. Secondly, Exercise ratio 1:2 gives significant effect on lactate acid level changes of PJKR FIK UNY students. Thirdly, exercise ratio 1:2 gives significant effect on changes of anaerobic treashold and lactate acid level of PJKR FIK UNY students.

CONFLICT OF INTEREST

This academic work made is no conflict of interest either financially, making decisions or engaging with other parties. This work is also not yet and will not be published in other journals or other scientific forums.

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ETHICAL CLEARENCE

Ethical Clearance done by explaining to research subjects related to research background, time of research, treatment of research subjects, objectives, benefits and impacts that will occur after the research process is conducted. The researchers also explain the rights and obligations to be obtained. After the research subjects understood, they then filled out the voluntary consent statement (Informed concent) with no element of coercion.

REFERENCES

Antunes, Amanda. H., Alberton, Cristine L., Finatto, Paula., Pinto, Stephanie. S., Cadore, Eduardo.L., Zaffari, Paula., Kruel, Luiz F. M. Active female maximal and anaerobic threshold cardiorespiratory responses to six different water aerobic exercise. Research Quartely for Exercise and Sport, 2015; 1-7. Doi: 10.1080/02701367.2015.1012577

Bompa, T. O. & Haff, G.G. Periodization: Theory and methodology of training. (5ed). United States: Human Kinetics. 2009

Bompa, T.O., & Buzzichelli, C. Periodization training for sports.(3rd). United States: Human Kinetic. 2015

Boreham, C. Physical activity for health. Journal of Sports Sciences. September 2006; 917-918. Doi: 10.1080/02640410600886520. 917-918

Candra, A., Rusip, G., & Machrina, Y. Pengaruh latihan aerobik intensitas ringan dan sedang terhadap kelelahan otot (muscle fatique) atlet sepakbola Aceh. Jurnal kedokteran dan kesehatan, volume 3 nomor 1, Januari 2016, 333-339.

Creswell, J.W. Educational research; Planing, conducting, and evaluating, quantitative, and qualitative research (4th ed). Lincoln: University of Nebrasca. 2012

Flora, Rostika. Pengaruh Latihan Fisik Ananerobik Terhadap Kadar laktat Plasma dan Kadar Laktat Jaringan Otot Jantung Tikus Wistar. Biomedical Journal Of Indonesia Vol 1 No 1 Januari 2015; 40-42

Ghosh AK. Anaerobic threshold:its concept and role in Endurance sport. Malays J. Med. Sci. 2004;11(1):24–36

Green, J Matius. Hornsby., Hornsby, Jared H., Pritchett, Robert C., and Pritchett, Kelly. (2014). Lactate Threshold Comparison in Anaerobic VS Aerobic Athletes and Untrained Participant. *International Journal of Exercise Science* 2014; 7(4) : 329-338.

Grossi, Talita., De Lucas, Ricardo Dantas., De Souza, Kristopher Mendez,. Guglielmo, Luiz Guilherme Antonacci. Maximal lactate steady-state and anaerobic thresholds from different methods in cyclists. *European Journal of Sport Science.* 2012; 12:2, 161-167

Guyton & Hall. Textbook of medical physiology (12 ed). USA: Saunders Elsevier. 2011

Mc Kinney, J., Lithwick, D.J., Morrison, B.N., Nazzari, H., Isserow, S.H., Heilbron, B., & Krahn, A.D. the health benefit of physical activity and cardiorespiratory fitness. BC Medical Journal. Vol 58 No 3, April 2016; 131-137

Moore, R.D., Romine, M.W., O'Connor, P., & Tomporowski, P.D. The influence of exercise-induced fatique on cognitive function. Journal of Sport Science, May 2012; 841-850

Ni Cheilleachair, N.J., Harisson, A.J., & Warrington, G.D. HIIT enhances endurance performance and aerobic characteristics more than high-volume training in trained rowers. Journal of Sports Sciences. 2016; 1-7. Doi: 10.1080/02640414.2016.1209539

Penggalih, M.H.S.T., Hardiyanti, M., & Sani, F.I., Perbedaan perubahan tekanan darah dan denyut jantung pada berbagai intensitas latihan atlet balap sepeda. Jurnal Keolahragaan. Volume 3 Nomor 2, September 2015; 218-227

Sandi, I.N. Pengaruh Latihan Fisik Terhadap Frekuensi Denyut Nadi. Sport and Fitness Journal. 2016; Volume 4, No. 2 Oktober

Syaifuddin. 2011. Anatomi Fisiologi: Kurikulum Berbasis Kompetensi untuk Keperawatan dan Kebidanan Edisi 4. Jakarta: EGC

Tanzila, R. A., & Bustan, M. F. Pengaruh Latihan Interval Intensitas Tinggi terhadap. Denyut Nadi Mahasiswa Kedokteran. Global Medical and Health Communication, 2017; Vol. 5 No. 1

Vidiari, J. I., Adiatmika, I.P.G., Adiputra, L.M.I.S.H., Tirtayasa, K., Muliarta, M., & Griadhi, A. High Intensity Interval Training (HIIT) lebih Meningkatkan Ambang Anaerobik daripada Steady State Training pada Siswa Anggota Kelompok Ekstrakurikuler Atletik Lari Jarak Pendek. Sport and Fitness Journal. 2017; Volume 5 nomor 3, September. 62-70

Whyte, G.P., Harries, M., & Williams, C. ABC of Sports and Exercise Medicine. 3rd edition. Australia: Blackweel Publishing Ltd. 2005

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