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The Effect of Roller Foam Massage on Decreasing Levels of Lactic Acid Post Exercise at Taekwondo Club

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Abstract. This study focuses on the effect of using Roller Foam Massage on decline rate sour lactate after training at the Taekwondo Athlete Club YD Gor Fat Bekasi District . Taekwondo is art self-defense popular with challenges physically tall , however _ enhancement rate sour lactate can affect athlete performance and recovery . The purpose of this research is to evaluate is Roller Foam Massage technique can be effective in reducing rate sour lactate in athletes after exercise. Type research use an approach quantitatively with the one group pretest and posttest method . population as many as 16 players and using purposive sampling. With value based on data analysis obtained t-test and before has tested normality and homogeneity especially first . Normality test using Shapiro-Wilk the pretest results have a significance of 0.655 > 0.05 then the pretest data is normally distributed , and the normality test using the Shapiro-Wilk on the posttest results have a significant 0.111> 0.05 , the posttest data is normally distributed . The homogeneity test has a sig value . 0.945 > 0.05 then it can be obtained data distribution is homogeneous. Then the Paired t test shows that the value of Sig. (2-tailed) of 0.001 <0.05, it can be concluded that there is a real difference between the results of using roller foam massage on the Pretest and Posttest data.

Key words: lactic acid, recovery, Roller Foam Massage, Taekwondo

Abstract in Indonesia. Penelitian ini berfokus pada pengaruh penggunaan Roller Foam Massage terhadap penurunan kadar asam laktat pasca latihan pada Atlet Club Taekwondo YD Gor Tambun Kabupaten Bekasi. Taekwondo merupakan seni beladiri populer dengan tantangan fisik yang tinggi, namun peningkatan kadar asam laktat dapat mempengaruhi performa dan pemulihan atlet. Tujuan penelitian ini adalah untuk mengevaluasi apakah teknik Roller Foam Massage dapat efektif dalam mengurangi kadar asam laktat pada atlet setelah latihan. Jenis penlitian menggunakan pendekatan kuantitatif dengan metode one group pretest and postest . populasi sebanyak 16 pemain dan menggunakan purposive sampling. Dengan nilai berdasarkan analisis data memperoleh Uji-t dan sebelumnya telah diuji normalitas dan homogenitas terlebih dahulu. Uji normalitas menggunakan Shapiro-wilk hasil pretest memiliki signifikan 0,655 > 0,05 maka data pretest berdistribusi normal, dan uji normalitas menggunakan Shapiro-wilk pada hasil posttest memiliki signifikan 0,111 > 0,05 maka data posttest berdistribusi normal. Uji homogenitas memiliki nilai sig. 0.945 > 0.05 maka dapat diperoleh distribusi data adalah homogen.Kemudian Uji Paired t test bahwa nilai Sig. (2-tailed) sebesar 0,001 < 0,05, maka dapat disimpulkan bahwa terdapat perbedaan yang nyata antara hasil menggunakan roller foam massage pada data Pretest dan Posttest.

Kata Kunci: lactic acid, recovery, Roller Foam Massage, Taekwondo

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INTRODUCTION

Taekwondo is one of the most popular martial arts. Taekwondo is a martial arts sport originating from the ginseng country, namely South Korea. (Pamekasan et al., 2022). Taekwondo is a martial arts sport that is growing rapidly and has been practiced in 210 countries, making it the only popular sport in the world, one of which is in Indonesia. (WTF, 2020).

Taekwon do is art or method discipline self or art defend self using foot and hand technique empty. Taekwondo is knowledge art defend self that has various values contained in it like attitude care social, work hard work, discipline, tolerance and trust self. According to Suryadi in (Wardani, Pusari, and Wakhyudin 2019). Taekwondo is an international martial arts sport practiced in 210 countries around the world as an official Olympic sport. Taekwondo competitions occur in three rounds, with a duration of 2 minutes per round and a 1 minute rest between rounds. (Kim and Nam 2021).

Attack and defense techniques that are allowed during the game only punch with fist hands tight and straight to the body armor and technique kick idan dollyo chagi (kick slide), dolyyo chagi (kick coiled

inward), ap hurigi (kick hoe), yep chagi (kick push side), dual chagi (kick push back), dual hurigi (kick back hook), narae chagi (kick oblique twice with one unity), dolge chagi (kick rotating) leading to the pickguard and armor head , According to Hardian & Harlianto in (Febryota 2019).

The basics of taekwondo consist of 5 components, (1) Body parts that are targeted (keup so), (2) Body parts that are used to attack and defend, (3) Stance (Seogi), (4) Defensive techniques / parry (Makki), (5) Attack technique (Kongkyok Kisul) which consists of punches (jierugi), slashes (chigi), stabs (chierugi), kicks (chagi), according to Suryadi Dalam (Nur Ahmad Muharram and Puspodari 2020).

Exercise (using oxygen) involves large muscle groups and is carried out at a sufficiently low intensity and for a sufficiently long time, so that fuel sources can be converted into ATP by using the citric acid cycle as the predominant metabolic pathway. (Jatmiko RS, 2022).

Aerobics is physical activity that requires oxygen for a long time and has a low intensity. Meanwhile, anaerobic is a physical activity that does not require oxygen for a short period of time and high intensity. (Muchlis Jubairi & Widyah Kusnanik, 2020).

Basically aerobic exercise is a resource exercise the energy originate from oxygen and exercise carried out continuously continuous and involved big muscles. Anaerobic exercise is source training method energy is not needed oxygen (2020 Hit).

Aerobic exercise is activity exercise systematically with an increase load gradually and continuously using originating energy from combustion using oxygen and need oxygen without raises exhausted (Dharma and Boy 2020).

D yes stand anaerobic is a form resilience characterized by the absence of oxygen . Without use oxygen , the body can maintain level intensity certain only for time short. According to Crossfit Journal in (Jatmiko RS 2022).

Anaerobic exercise is a high-intensity activity that requires fast energy in a short time, but cannot be done continuously for a long duration. According to Palar Djon; Ticoalu, Shane HR in (Nursarita, Corniawati, and Patty 2019).

Anaerobic exercise is exercise without supply oxygen until make sign easy run out breath and create explosion fast energy one time. This exercise is done with a short duration but with high intensity. This type of exercise can stimulate activity deep muscles intensity height that could increase strength and power stand muscle. An example of anaerobic exercise is lifting exercises load, sprint (run fast) (Saptono, Sumindarsih, and Saleh 2021).

Sour lactate is metabolic product carbohydrate without use oxygen (metabolism anaerobic). Sour lactate produced in cells muscle during supply insufficient oxygen to support production energy (Setiawan, Nurmansyah, and Laktat 2018).

Lactic acid which is a by-product of anaerobic glycosis (Rusdiawan, A., & Habibi 2019). A lactic acid is the result of carbohydrate metabolism in the absence of oxygen (anaerobic metabolism). (Hendra Hasibuan and H. Jutalo 2020). Formation of energy by breaking down glycogen can be done without using oxygen, if burning glucose without using oxygen, the body will excrete lactic acid. (July Fitrianto and Maarif 2020).

Sour lactate is the metabolites that cause fatigue, produced from system lactate or glycolysis anaerobic as consequence solving imperfect glucose. According to Fox in (Zaidah 2018) Lactic acid is the result of the formation of carbohydrate metabolism which is carried out in the absence of oxygen (anaerobic metabolism) (Aksana 2019). The energy used during activities in anaerobic conditions will produce a by-product in the form of lactic acid (Wahid 2022).

Sport recovery is divided into 2, namely active recovery and passive recovery. Active recovery is a form of rest in which the athlete does not sit idly by but still does physical activity with very light intensity. Active recovery is a recovery method in which someone who has been doing physical activity does physical activity with very light intensity. (Kusumawardhana 2018).

While Passive Recovery is an exercise that does not involve any physical activity. A good recovery process is when someone who has carried out the recovery process does not feel tired anymore due to the physical activities carried out before and is ready to carry out further physical activities, According to Pahlawan Nasution in (Kandupi 2022).

One of the causes of slow recovery is the accumulation of lactic acid in the muscles and blood, the body is only able to accept the presence of lactic acid in the blood. In this case the recovery procedure becomes important. Should be an integral part of the training session. (Laksana, Ugelta, and Jajat 2019)

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Body Humans normally carry out metabolic processes to produce energy. Energy that becomes source movement body. That energy used during activities under anaerobic conditions will produce product side form sour lactate. The body has limitations in tolerating the amount of acid lactate. Acid levels lactate will increases with vigorous activity high and long long time. Lactate is the end product of anaerobic metabolism, this process takes place in the absence of oxygen. The blood lactate level of a healthy person at rest is about 1-2 mM/L.

Hoarding lactate in the blood become problem fundamental in physical performance because it causes fatigue and reduces physical performance. In the Championships that were participated in during 2022, a number of athletes experienced a decrease in the acquisition of medals. The Taekwondo Club Taekwondo Athlete, YD Gor Tambun, Bekasi Regency, is one of the Taekwondo Clubs that has always been a regular champion in every existing event. On the results of field observations, the following is data on the acquisition of medals.

Table 1. Observation Results

CHAMPIONSHIP	NUMBER OF ATHLETES	Medallion		
		GOLD	SILVER	BRONZE
Chief of Police Cup 4	30	10	5	2
Menpora Cup	30	9	4	7
DKI Jakarta Taekwondo League Series 2	30	11	6	3
Indonesia Taekwondo challenge	30	13	5	1
Taekwondo Championship Bharaduta Championship 3	30	8	3	6
Jakarta Taekwondo Championship	30	5	7	8

This is a concern, because in this championship there has been a decrease in obtaining gold medals. Unlike the previous championships, the majority won gold medals and the players often lost focus during matches, according to the team of coaches the athletes lost focus during the second half.

Lack of knowledge The coach does not provide passive recovery to athletes, so during a match many athletes are prone to injury. Besides that, the habit of athletes after training and after competing is not to cool down, because not cooling down is also a factor that greatly influences the buildup of lactic acid, one of the tools for passive recovery by using Roller Foam Massage.

Foam Rolling uses a tool made of cylindrical foam known as a Foam Roller. Foam Roller which makes it easy for users to apply it. (Cheatham and Stull 2018) . Foam rolling as therapy can be used before nor after practice. Objective use foam roller before workout is as warming-up . Body need prepared physically and psychologically , stretching _ aims to eliminate tension and expand range motion body. as well function cognitive on retrieval right decision _ become factors that contributed to its success performance (Racinais, Cocking, and Périard 2017) . Therapy after the exercise is expected to recover the physical condition and able Relieves stiffness , pain and redness . _ (Kong et al. 2018) .

Based on the background above and the sources that support the problem, researchers want to examine more deeply about the use of Roller Foam Massage to reduce lactic acid levels in Taekwondo Club Athletes YD Gor Tambun, Bekasi Regency. So the researchers proposed the following title: "The Effect of Using Roller Foam Massage on Decreasing Post-Exercise Lactic Acid Levels in Taekwondo Club Athletes YD Gor Tambun, Bekasi Regency".

METHODS

This research is an experimental research . Experiments are used when researcher want to do an experiment for look for variable effect independent / treatment / treat specific to variables dependent / result /output under controlled conditions . Besides that experiment used when researcher want to know cause and effect _ between variables independent and dependent . This researcher must control all variable to be influence outcome except independent variable (treatment) that has been set , (Creswell,

2012).

this research uses approach quantitative . study Quantitative is more functional to prove hypothesis based on that theory has exist or prove hypothesis based on new thoughts (Sugiyono , 2021). The research design uses pre-experimental designs (non designs).

This type of research is pre- experimental with the form of one group pre research test – post test design Where subject study become One group Then data collection and measurements were carried out before and after given treatment with a known purpose There is nope change rate sour experienced lactate _ subject before and after given treatments . subject will tested using a measuring device sour lactate . As for the research design that used can depicted as following:

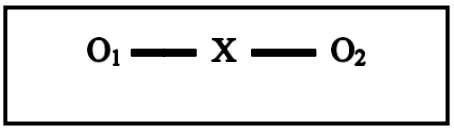

Figure 1. One group pre test-post test design

Information :
O_1 = value pre-test (before given Roller Foam Massage)
X = treatments (Roller Foam Massage)
O_2 = mark post-test (after given Roller Foam Massage)

Research location in Gor Fat Bekasi Regency , on August 1 2023 and held 1 meeting . The test instrument for this study was the Edge Lactate Analyzer **.** The value of resting lactic acid levels in healthy people is around 1.1.8 mMol/l (Lesmana 2019) . Blood lactic acid levels that are above the average normal level (greater than 2 mMol/l) is an indication of fatigue (Mattner, 1988).

The research tools used were the Edge Lactate Analyzer as a tool for measuring lactic acid levels, a lancet needle for stabbing blood samples, one swab for smearing blood sampling marks, a stopwatch for calculating the time, a stationery for recording the results of the data collected, a roller foam massager for treatment.

The population of YD Club Gor Tambun athletes in Bekasi district is 30 people, then the sample is taken using a purposive sampling technique with the following criteria; 1) the sample is a taekwondo athlete YD Club Gor Tambun, Bekasi Regency, 2) the sample is a junior class student (at least grade 1 junior high school), 3) the sample is male and female, 4) the sample is willing to take a blood sample to check its lactic acid level. The number that the researchers got was 16 athletes.

Data analysis used normality test analysis, homogeneity test and hypothesis testing using paired sample t-test using the IBM SPSS application.

RESULTS AND DISCUSSION

Based on research data, most athletes experience a decrease in lactic acid levels in the body by using roller foam massage. It can be seen that most of the athletes have good decline results. These results were obtained with a treatment using a roller foam massage tool.

Table 2. Lactic Acid Statistical Results

Descriptive Statistics				
	N	Means	Std. Deviation	Variances
Pre Test	16	8.147	2.3522	5.533
Posttest	16	6.810	2.3185	5.375

Based on the table above, the pre-test is before being given treatment and the post-test is after being given treatment. N is the total sample that took part in the study, the mean is the average rater from the pre-test and post-test data. Std.Deviation is a statistical measure that measures distribution or variation of data from average value . variance is a statistical measure that measures how much variation or difference between the values in the data with the average value .

Based on the table above, it is known that the total sample is 16 games. The mean of the Pre-test is 8.147, and the Post-test is 6.810. Furthermore, the deviation from the Pre-test is 2.3522 and for the standard deviation is 2.3185. Then the variance of the Pre-test is 5,533 and for the Post-test is 5,375.

In the mean column, the pre-test has a value of 8,147 and the post-test has a value of 6,810. of the two data has a difference in numbers, namely 1,967. This has decreased from the pre-test and post-test, hereby proving that the research has decreased.

Normality test

The Normality Test is carried out with the aim of seeing whether or not the data obtained from the research results is normal. On research. In this study, the data normality test was carried out using the SPSS 21 data processing program through the normality test using Shapiro Wilk. If the data comes from a normally distributed population, then data analysis is continued with a simple regression test and hypothesis testing. The decision-making criterion of normality is "if the sig. Or significant <0.05, the distribution is not normal, and if the value is sig. or significant > 0.05, then the distribution is normal". The hypothesis being tested is, Ho: the sample comes from a normally distributed population. Ha: the sample does not come from a normally distributed population. This means that the hypothesis (Ho) is accepted if the data is normally distributed with an indication that the Asymptotic Significance is greater than the significant level $\alpha = 0.05$. But on the other hand, the null hypothesis (Ho) is rejected if the data distribution is not normal.

Table 3. Shapiro-Wilk Normality Test

	Test Of Normality					
	Kolmogorov-Sminov [3]			**Shapiro-Wilk**		
	Statistics	**df**	**Sig.**	**Statistics**	**df**	**Sig.**
Pre-Test	.132	16	.200 *	.960	16	.655
Post-Test	.147	16	.200 *	.909	16	.111

Based on the table above, statistics are the resulting values or metrics from statistical analysis to measure the extent to which the data distribution approximates normal distribution . df in the normality test is a term that refers to degrees important freedom of choice _ whether the data fits the normal distribution or not. sig. or value the probabilities in the normality test provide information important about the extent to which the data support assumption normal distribution .

Based on the table above using the Shapiro-Wilk normality test. The sampling data is 40. Then use the Shapiro normality test if 16 > 100 sampling, therefore, use the Shapiro-Wilk. The table above shows a sig value of 0.655 (*Pre-Test*) > 0.05, so the distribution in the *Pre-test* is normal and the sig value is 0.111 (*Post-Test)* > 0.05, so the *Post-Test distribution* is normal.

The results of the table above are said to be normal, because they are in accordance with the objectives of the researchers regarding the effect of using roller foam massage on reducing lactic acid levels at the YD Gor Tambun taekwondo club, Bekasi Regency.

Homogeneity Test

Homogeneity test regarding whether or not the variances of two or more distributions are equal. Homogeneity test is usually used as a requirement in the analysis of independent samples T-test an ANOVA. The basis for making a homogeneity test decision is if the significance value is > 0.05, then the data distribution is homogeneous. If the significance is <0.05 then the data distribution is not homogeneous.

Table 4. Homegeneity Test Results

Test of Homogeneity of Variance			
Levene Statistics	dfl	df2	Sig.
0.005	1	30	.945

Levene's statistics are scores statistics used in homogeneity tests to measure differences in variability between data groups in the sample. dfl " is an abbreviation from "degrees of freedom for the residuals" or " degrees freedom for residues " in Indonesian . df2 helps us in interpreting the normality test results and the p-values that appear from the statistical analysis , thus providing insight into the extent to which the data fits a normal distribution . sig refers to value probability (p-value) indicating is variability between data groups differ significantly or not . sig. or value the probabilities in the normality test provide information important about the extent to which the data support assumption normal distribution.

Based on the table above, there is a sig. 0.945 > 0.05, it can be obtained that the data distribution is homogeneous. The results from the table above are said to be homogeneous, because it is in accordance with the objectives of the researchers regarding the effect of using roller foam massage on decreasing lactic acid levels in the YD Gor Tambun taekwondo club, Bekasi Regency.

Hypothesis testing

Test the hypothesis using the Paired sample t-test. The paired sample test is used to determine whether there is a difference in the mean of two paired samples. The two samples in question are the same sample but have two data. The paired sample t-test is part of statistics, therefore according to the rules in parametric statistics the research data must be normally distributed.

Basis for decision making if the value of Sig.(2-tailed) <0.05 then there is a significant difference between learning outcomes in the pre-test and post-test data.

Table 5. Interpretation of the First Output

Paired Sample Statistics					
		Means	**N**	**Std. Devitation**	**Std. Error Mean**
Pair 1	Pre-Test	6.894	16	2.3522	.5880
	Post-Test	5.575	16	2.3185	.5796

In the table above the Mean is the average value of the data that has been collected, N is the number of samples participating in the study. Std.Deviation is a statistical measure that measures distribution or variation of data from average value . Std.Error Mean is a statistical measure that measures estimate the uncertainty or variation of the sample mean in relation to the larger population.

Table 6. Interpretation of the Second Output

Paired Samples Correlations				
		N	**correlations**	**Sig.**
Pair 1	Pre-Test & Post-Test	16	.853	.000

Based on the table above, N is the number of samples participating in the study. Correlations are for judging is connection between two variables has significance statistics . sig. or value the probabilities in the normality test provide information important about the extent to which the data support assumption normal distribution.

Table 7. Interpretation of the Third Output

Paired Sample Correlation									
		Paired Difference							
		95% Confidence Interval of the Difference							
		Means	**Std. Deviation**	**Std. Error Mean**	**Lower**	**Upper**	**t**	**df**	**Sig. (2-tailed)**
Pair 1	Pre-Test & Post-Test	1.3188	1.2671	.3168	.6435	1.9940	4.163	15	0.01

Based on this output, the summary results are shown statistics descriptive from both samples or data Pretest and Posttest. The second part of the output is the result of the correlation or relationship between both data or variables namely Pretest and Posttest. Third output section It is known that the Sig. (2-tailed) of 0.01 <0.05, it can be concluded that the Hypothesis accepted.

In the sample research flow, data collection was carried out especially first, which includes sample name and sample age. Then the sample did anaerobic exercise with plyometrics. Then after the sample performs anaerobic exercise, the sample is given time rest for 2 minutes. After 2 minutes the sample was given a blood sample for post-test data collection. After carrying out the post-test assessment, the samples were given treatment using a roller foam massage using the program that had been prepared prepared and carried out for 10 minutes. Then after doing the treatment, sample back blood samples were taken for post-test data collection.

In carrying out a series of pre-test and post-test, athletes follow Suite from start to end and athletes also get roller foam massage treatment. Athletes feel convenient and there change immediately after given treatment using roller foam massage, this also has an impact on the results aimed at by researchers that is decline rate sour lactate and gives good results.

Analysis results it was found that the use of a roller foam massage device had a significant effect on reduction rate sour lactic acid in the body of YD Gor taekwondo club athletes Tambun , with a t value of 0.945 with a p value of 0.01.

From the results of this study it was found that the effect of using a foam roller massage tool on decline rate sour lactate in the body .

Based on the results of previous research with the results of research that there are differences, namely differences in the number of 60 samples no athletes , meanwhile researchers total 16 samples of athletes . In that research use experiment with design factorial 1 x 2, while researchers using a pre-experiment with a one group pre-test post-test research design . In this study using analysis of variance (Anava) and Newman Keuls range test , while researchers using Shapiro-Wilk and t-test.

Based on data analysis using the t test, the results show 1) there is an effect of the roller foam massage tool on decline rate sour lactate at Club Taekwondo YD Gor Tambun , because t count = 4,163 < t table = 2,119 , you can get concluded below t arithmetic < t table with the meaning that Ho is rejected and Ha is accepted (there is influence) and level significant of 0.00 < 0.05 with 2 tailed, it can be concluded If Sig value . (2-tailed) < 0.05 , so there is a significant effect on the decline rate sour lactate in YD Gor taekwondo club athletes Chubby , seen from the results of the pre-test average obtained 6,894 (55%) meanwhile decline the mean on the post-test was 5,575 (45%), then There is significant decrease.

CONCLUSION

Based on the results it is known that the value of Sig. (2-tailed equal to 0.001 <0.05. So it can be concluded that there is an effect of the results of giving roller foam massage to reducing lactic acid levels in the body in athletes of the YD Gor Tambun Taekwondo Club. Oriented to the results of the analysis and conclusions of the results of the research that has been done, then researcher put forward some suggestions to coaches and athletes on the use of roller foam massage for weight loss rate sour lactate in the body. Main thing that has been done by YD taekwondo club athletes is to continue to do active recovery and passive recovery among them use of roller foam massage. In preparing the training program the trainers or management of the YD taekwondo club team should provide more facilities for handling active recovery or passive one use of roller foam massage. In support achievement , one of which is support facilities and infrastructure , the management of the YD Taekwondo Club should provide more facilities to support athlete training. One of them is lighting training ground.

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