

THE EFFECT OF SPORT MESSAGE TOWARD THE DECREASE OF FATIGUE

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ABSTRACT

Fatigue is a process of decreasing tolerance to physical activities. This study investigating the treatment of *sport message* is more effective than active resting to reduce the lactic acid level of Indonesia *overall* water ski athletes. The reseach subject were 18 Indonesian water ski athletes, which were divided into 2 periods with different treatment. Period I was given *sport massage treatment* and Period II was given active resting treatment, 3 days break was occurred between treatments, so the research was conducted for 5 days. Lactac acid was measured by taking blood sample and by using a tool, *accurted lactate*. The result in this reseach is obtained the average of lactic acid before active resting 7.29 ± 0.67 mmol/L, and after active resting is 4.41 ± 0.82 mmol/L. The differential test result of lactic acid before treatment between Period 1 and Period 2 is there is no significant difference with $p=0.791$ ($p>0.05$). The decrease in the level of lactic acid between two periods by using *paired sample t-test* shows that $p=0.01$ ($p<0.05$) which means the two periods have significant difference, from the difference in before and after *sport massage* treatment is 4.1 ± 0.78 mmol/L, while the difference in before and after active resting treatment is 2.88 ± 0.54 mmol/L. This means that *sport massage* treatment is more effective to decrease the level of lactic acid rather than active resting. Both *sport massage* and active resting can reduce the lactic acid level, however *sport massage* is more effective than active resting.

Keyword: *Fatigue, Sport Massage, Lactic Acid*

INTRODUCTION

Fatigue is a process of decreasing in tolerance to physical work. The cause is very specific which depends on the characteristic of the activity¹. Excessive activity, lack of time in resting, weak physical condition, daily training and pressure can lead to fatigue². Fatigue can be divided into two types, mental fatigue and physical fatigue. Mental fatigue is a fatigue as the effect of mental work, such as saturation because lack of interest. Meanwhile, physical fatigue is caused by physical or muscle activity³.

In the sport with high internsity in a short duration, the fulfillment of energy needs is increased and almost a hundredfold. The accumulation of lactic acid > 19.5 mmol/L can cause fatigue¹. Based on the previous reseach which is done by Purnomo, there is an increase of blood lactic acid in 5 minutes after maximum training⁴. Lactic acid in muscles will obstruct enzyme functions and disrupt the checimal reaction in muscles. This situation will disrupt muscles contraction becomes weak and as the result the muscles experiences exhaustion⁵.

Fatigue can be minimized by optimalizing recovery. Recovery provides possibility for body to replenish energy, reduce lactic acid and reduce fatigue of central nerve system⁷. Recovery mechanism of lactic acid from muscles and blood is highly affected by kinds of activity and after maximum activity or anaerobic. This will affect the mechanism of lactate release from muscle to blood, increased blood flow, lactate uptake by the liver, heart and skeletal muscle⁸.

The ways to fasten the recovery after experiencing fatigue are vary, one of them is by performing *sport massage* method. *Sport massage* is one of health massages which is provided to

particular people who have healthy body, especially to athlete. This massage provides its effect that is to unleash blood circulation⁹.

Water ski sport is an anaerobic sport. Water ski has 3 kinds of sport event which are competed, if the athlete joins *overall* so the athlete will join all events in a row with one day duration which affect to the accumulation of lactic acid.

The activity which is categorized as anaerobic will increase the production and accumulation of lactic acid, which cause muscle exhaustion². From the observation result of athlete condition who experienced fatigue, recovery familiarization by performing observation and providing *sport massage* is done to observe the effect of sport massage toward the reduction of fatigue. The problem is arising that not all water ski athletes, especially *overall* sport event, understand about one of ways to reduce lactic acid level is by performing *sport massage*. Related to the problem, the researcher has an intention to conduct a research entitled "The Effect of Sport Massage toward the Decrease of Fatigue".

METHODS

a. Methodology

Study design

This research was conducted in Taman Buah Mekarsari, Bogor. The duration of research is 3 months, from November–Desember 2019. This research is an experimental study by using similar subject design (*treatment by subject design*).

Subjects recruitment

Subjects that were chosen to be participants of this research is all Indonesian overall waterski athletes.

Sampling technique

The sampling techniques in this research is with total sampling. The number of samples was 18 who were given intervention in Period I and Period II. In Period I was provided with sport massage and in Period II was active resting. This research was conducted for 5 days with 3 days of washing out periode in between Period.

b. Material and Procedure

Accutrend Lactacid is used as the measurement tool to measure the level of blood lactic acid. Accutrend Lactacyd does not have validity and reliability scores. However, this tool is standardized and meets the validity standard to be used to track lactic acid levels and Stopwatch is used to measure the duration time while the treatment is performed. Furthermore, in measuring temperature while performing the treatment use Thermometer and other equipments needed for massage, such as mat, towel and lubricant.

Asking for agreement to the sample is done by providing oral explanation about the purpose and objectives of research and authorization which was provided for the sample. When conducting the research, on the first day of the sample, a water race simulation was carried out for all sports competitions arranged by the coach, followed by a pre-test of blood lactic acid levels by health workers with tools provided by researchers in the form of Accutrend Lactacyd, needles for blood collection, and sterile cotton. After that, a sports massage is given for 30 minutes and performed by a certified massage therapist. A post-test is performed for the following treatments to collect blood samples to determine lactic acid levels after treatment.

The sample is given a break for 72 hours based on the theory stated above until the sample is taken back after the activity. On day 4, the sample repeated the simulation competition as instructed by the trainer and continued with a pre-test of blood lactic acid levels using the same tool on the first day. The sample was then subjected to an active rest (jogging) for 30 minutes by the trainer and after that a post test of blood lactic acid levels was carried out. The overall results are provided in the table.

Technique in collecting data which was done during the research were test and measurement. The collected data in this reseach is in a form of lactic acid level before and after treatment.

c. Assessment

Variable measured in this research is the level of blood lactic acid, using *Accutrend Lactacyd* tools.

d. Data analysis

1. Data Normality Test

Normality test was conducted by using Shapiro-wilk test. The result of data analysis of all samples in two Periods is normally distributed.

2. Hypotheses Test

The process of data analysis of this research used Statistical Product and Service Solution (SPSS) version 20.0 for windows. Analysis data techniques used paired sample t-test analysis

RESULT**Research Subject Description**

The characteristics of subject are age and ambient air temperature. Based on the data analysis result, the average of air temperature while performing Period 1 and Period 2 is 23.9 °C.

Normality Test

The result of normality test sig. p before performing *sport massage* is 0.094 and after performing *sport massage* is 0.137. In the other side, before performing active resting is 0.201 and after active resting is 0.143. The difference of sig. p value in before and after active resting treatment is 0.773. Both treatments have normally distributed because $p > 0.05$.

The Result of Differential Test to the Decrease of Lactic Acid Level Before and After *Sport Massage* and Active Resting Treatment.

Table 1. The result of differential test to the decrease of lactic acid level before and after treatment

Lactic Acid Level	SD (mmol/L)	Difference (mmol/L)	p
<i>Before Sport Massage</i>	7.2333 ± .99173	4.1000	0.01
<i>After Sport Massage</i>	3.1333 ± .70711		
<i>Before Active Resting</i>	7.2889 ± .67116	2.8828	
<i>After Active Resting</i>	4.4061 ± .82253		

Based on the Table 1, the result of differential test shows the decreased level of lactic acid after and before treatments. Both Periods shows p is lesser than 0.05 ($p < 0.05$). So that the value indicates significant decrease of fatigue in *overall* water ski athletes.

Differential Test of Lactic Acid Level Before *Sport Massage* and Active Resting Treatment

Table 2. The result of differential test of lactic acid level before *sport massage* and active resting treatment

Lactic Acid Level	Mean ± SB (mmol/L)	p
<i>Before Sport Massage</i>	7.2333 ± .99173	0.791
<i>Before Active Resting</i>	7.2889 ± .67116	

Based on Table 2, it shows that p is greater than 0.05 ($p > 0.05$). So that the value shows no significant difference in *sport massage* and active resting treatment.

Differential Test of the Decrease on Lactic Acid Between Periods

Table 3. The result of differential test on the decrease on lactic acid between periods

Lactic Acid Level	Mean ± SB (mmol/L)	p
Difference in Sport Massage	4.1000 ± .77763	0.01
Difference in Active Resting	2.8828± .53714	

Based on the result in Table 3, the difference average between Period 1 and Period 2 is $p = 0.000$. It means there is significant difference between two groups after training ($p < 0.05$).

DISCUSSION**A. The Effect of *Sport Massage* Towards the Decrease of Lactic Acid Level**

Based on the analysis result, it shows that *Sport Massage* impacts the decrease of lactic acid level. The average level of lactic acid before doing the sports massage period was 7.2333 mmol / L while after the sports massage period was 3.1333 mmol / L. Lactic acid is a result of carbohydrate metabolism without using oxygen (anaerob metabolism).

Lactic acid is produced in muscle cells when there is insufficient oxygen supply to support energy production. According to Soekarman “in high intensity physical training, the muscles contract in anaerobic state, so that the provision of ATP occurs through the process of glycolysis. While training, pyruvate is formed”¹⁰. If the oxygen supply is not fulfilled to break down pyruvate, then lactate is produced.

Lactate enters the muscle, tissue and blood cells. The reduction of pyruvate to lactic acid is the final reaction of glycolysis and this reaction is called as “dead end” which means lactic acid cannot be further catabolized. After being produced, lactic acid can leave the cell, accumulate in sell or dioxide to pyruvate due to *Lactate Dehydrogenase* (LDH) enzyme which is reversible¹¹.

This lactic acid will wait for the muscle to become aerobic to be converted again into pyruvic acid by cells in muscle tissue or in the spleen and liver¹². An activity that can accelerate lactate recovery is an increase in oxidation and gluconeogenesis process, which involves a lot of red muscle fibers and accelerates the distribution of lactate to the liver¹³. Based on the research conducted by Falks is that the important things of lactic recovery are improve blood circulation, cardiac output and lactic transport to boost and form back energy. The duration of recovery is conducted by improving the consumption of O₂. This situation keep processing until there is an enough amount of ATP formed to contract again. Providing *sport massage* method helps smoothen blood circulation and the rest of the metabolites return to normal levels. Therefore, the provison of energy source and its fuel will be assured. The statement is supported by the research which is conducted by Bale and James in Colleen Cupido, that *sport massage* can improve the decrease of blood lactic acid level compared to normal resting¹⁴.

Manipulation which is carried out from the body to the heart in mechanical way is done to push blood flow in the veins to the heart¹⁵. It is supported by the statement of Hipocrate which states massage towards the heart, starts from the feet upwards, while from above which is the head or neck down towards the heart. This is an evidence that there is a scientific basic for doing massage. Providing *sport massage* is an artificially activating venous pump mechanism and lymph pump to speed up recovery through accelerating circulation in a state of complete rest (relaxed lying).

Activation of venous and lymph pumps occured in dynamic muscle contraction (isotonis) by alternating contraction and relaxation of muscles³. When the muscles contract, the veins in and around the veins are squeezed, so that blood and lymph are squeezed out of the vessels, then during relaxation, the vessels are filled again with blood and lymph from the active muscle tissue, not from blood and lymph that had been squeezed out. The recent research which was done by *Buck Institute* for Aging Research in *McMaster University*, Ontario shows that massage can reduce inflammation and improve the growth of new mitochondria, which is energy-producing units in cells. Meanwhile,

mitochondria are a cell respiration tool which needs oxygen. Therefore, the more oxygen produced, the more the growth of new mitochondria. The research is supported by a research conducted by Justin Crane where the cells which obtained massage can improve mitochondria. Furthermore, the muscles which are being massaged show less inflammation.

B. The Effect of Active Resting Towards the Decrease of Lactic Acid Level

From the research result, it shows the decrease of blood lactic acid level in active recovery. The average change of lactic acid level in before and after is 2.8828. It is due to the simple activity which helps blood circulation has a purpose to fasten the movement of lactic acid from muscles to liver which then converted into glucose via circulation. The recovery with low intensity significantly reduce the lactic acid which is accumulated in the muscles and fasten the recovery. Active resting is one of effective recoveries to improving the speed of blood flow through the working muscular system¹⁶ so the transport of lactic acid accumulated in the muscles is also more optimal¹⁷. Active resting will be beneficial, if the previous pressure is not exhausting. Active resting can decrease the accumulation of lactic acid, but still performing an activity with low intensity¹⁸. Active resting and *sport massage* have similar advantages; however, *massage* can reduce the level of anxiety and stress,¹⁹ so body is comfortable after recovery¹⁹. The comfortable feeling affects low level of fatigue after training²⁰.

C. Effectiveness Comparison between *Sport Massage* and Active Resting in Decreasing Lactic Acid Level

From the result of analysis, it reveals that *sport massage* and active resting has similar sig. 0.000, which can be defined that the two treatments affect the decrease of lactic acid level. However, *sport massage* is more effective than active resting. It is proven from the difference of value average in before and after of lactic acid level after the *sport massage* treatment is greater than in active resting. Both treatments, in *sport massage* and active resting have similar effects, but *sport massage* can decrease the level of anxiety and stress,¹⁹ where the body feels comfortable after recovery with massage treatment²¹. Active resting treatment will be efficient if low intensity of training is given. Therefore, it is not efficient if anaerobic training is provided and has high intensity of training.

CONCLUSION

Both sport massage and active resting method is evident in decreasing the level of lactic acid, however, the sport massage method is proven to be more effective in decreasing the level of lactic acid of Indonesia *overall* waterski athletes.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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