



Differences in Influence of Sex Types and Foam Rollers Massage Method on Reducing Lactic Acid Levels

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Abstract

This study aims to determine the difference in the effect of gender and the method of foam rollers massage on the reduction of lactic acid levels. When doing interval training, it usually uses overload or excess energy, which is the end result of the ATP-PC system (phosphogen system) and anaerobic glycolysis (lactacyd system). Foam Rollers Massage is a treatment that can be used for recovery and optimization of physical performance as a result of DOMS and reducing pain. This is because doing a foam rollers massage can affect the increase in blood flow, resulting in a decrease in the level of lactic acid in the blood. This study used an experimental design. The training was given in the form of interval training. The population in this study were students of SMK Islam Yasnuhu NW Pringgabaya class X totaling 16 people, namely 8 male students and 8 female students. There are 2 groups, each consisting of 8 people. Measurement of lactic acid levels was carried out twice, namely after interval training (pre-test) and after giving the foam rollers massage method (post-test). The data analysis technique used independent sample test with a significance level of $\alpha = 0.05$ then analyzed using SPSS for windows version 23. From the results of the study, it was obtained that the value of $p = 0.636$ was calculated to be greater than ($p > 0.05$), which means that there was no significant difference between sex and foam rollers massage on the decrease in lactic acid levels.

Keywords: *Foam Rollers Massage; Interval Training; Lactic Acid*

Introduction

Lactic acid is the end product of anaerobic metabolic processes, which take place in the absence of oxygen (Purnomo, 2011). During physical exercise, there is an increase in lactic acid levels in the blood and muscles (Rusdiawan & Habibi, 2020). Lactic acid in the body is produced continuously in the cytoplasm (Welis, 2012). Lactic acid produced during metabolism cannot be disposed of directly outside the body, but is reduced through gluconeogenicity and oxidation processes during recovery (Fahmi & Ashadi, 2019). The presence of lactic acid accumulation can cause fundamental problems related to physical performance, because it causes chronic fatigue, which affects the decline in physical performance (Supriatna, 2015).

Interval training is an exercise program that consists of repetition periods of work interspersed with periods of rest (Boer, 2019). When doing interval training, it usually uses overload or excess energy (Foster et al., 2015). Which can increase the need for energy by increasing the intensity of the exercise program, will produce lactic acid (Moniz et al., 2020). Lactate is the end result of the ATP-PC system (phosphogen system) and anaerobic glycolysis (lactacyd system) (Saha Roy et al., 2014).

Muscle fatigue is the inability to continue the contractions that occur in muscles (Mulyono, 2016). Fatigue can be divided into three, namely central fatigue, muscle fatigue and neuromuscular fatigue (Widiyasmono, 2013). One of the causes of muscle fatigue is due to the accumulation of lactic acid (Ningrum & Rahayu, 2018). The accumulation of lactic acid is what then causes the muscles to become less responsive to stimuli (Zhang & Ji, 2016).

Foam Rollers Massage is a technique to relax muscles by rolling a limb that is experiencing tension on foam rollers, which functions to smooth the area of blood vessels and reduce inflammation (Cheatham & Stull, 2019). Massage with foam rollers can be used for muscles that are recovering or recovering (Juliansyah Noor 2019). Foam rollers massage is carried out by applying pressure from the loading of the body mass and then applying pressure to certain points on the body which can help in the muscle recovery process and help restore normal muscle function (Young et al., 2018). The normal function is that the muscles are back elastic, healthy and ready to appear right away (Behm et al., 2020).

Foam Rollers Massage is a massage alternative that has been proven to improve ROM, flexibility, and aspects of muscle performance. In addition, FRM can reduce the effects of DOMS after exercise and allow faster recovery after exercise (Cole, 2018). Foam Rollers Massage is a treatment that can be used to restore and optimize physical performance due to DOMS and reduce pain (Hartono et al., 2019). This is because doing foam rollers massage can affect the increase in blood flow, resulting in a decrease in the level of lactic acid in the blood, reducing edema, and tissue healing and optimizing oxygen delivery to muscles (Pearcey et al., 2015). Self myofascial release (SMR) using a roller provides safe benefits and helps the process of breaking down the layers that have tissue adhesion and scarring in the fascia and muscles. Foam rollers massage provides an effective, inexpensive, and comfortable way to reduce densification and accumulation of scar tissue (Macdonald et al., 2014).

Methodology

This study used a quasi-experimental design (Experimental Research). The population in this study were students of SMK Islam Yasnuhu NW Pringgabaya class X totaling 16 people, namely 8 male students and 8 female students. There are 2 groups, each consisting of 8 people. Measurement of lactic acid levels was carried out 2 times, namely after interval training (pre-test) and after giving the foam rollers massage method (post-test). The data analysis technique used independent sample test with a significance level of $\alpha = 0.05$ then analyzed using SPSS for windows version 23.

Data normality test using the Saphiro Wilk Test. The data in this study were normally distributed if the p value was > 0.05 . Testing the hypothesis of this study using the independent sample test which is used to determine the differences between two groups that are not paired.

Result and Discussion

1. Description of Research Data

The value of lactic acid levels after the foam rollers massage intervention showed that the mean value of lactic acid in the male foam rollers massage group after treatment was 6,850 and the standard deviation before treatment was 1.9741, while the mean after foam rollers massage treatment for the female group was 5.912 and the standard deviation after treatment was 1.6057.

Table 1 Value of lactic acid levels in mmol / l units after administration Foam Roller Massage based on gender

| Respondents / Sample | Lactic acid levels | |
|-------------------------|--------------------|------------|
| | FRM male | FRM female |
| A | 8.20 | 4.50 |
| B | 5.50 | 6.40 |
| C | 9.30 | 5.30 |
| D | 6.50 | 7.60 |
| E | 6.10 | 6.20 |
| F | 7.30 | 8.60 |
| G | 3.20 | 4.80 |
| H | 8.70 | 3.90 |
| Mean | 6.850 | 5.912 |
| SD | 1.9741 | 1.6057 |

2. Normality Test

The data normality test before and after treatment used the Saphiro Wilk test with the results as shown in the following table:

Table 2 Data Normality Test Results of foam rollers massage in males and females

| Variable | P Value | |
|--------------------|---------|-----------|
| | FRM Man | FRM Girls |
| Lactic Acid Levels | 0.805 | 0.778 |

The results of the normality test for the male FRM group were $p = 0.805$ and the FRM for women with a p value = 0.778 because the p value after treatment between the male and female FRM groups had a value of more than 0.05 ($p > 0.05$) then the data is normally distributed so that it is included in the parametric statistics and the statistical test used for the hypothesis is the independent sample test.

3. Hypothesis Testing

The research hypothesis test was to determine the difference in the effect of gender and foam rollers massage on the reduction of lactic acid levels in Yasnuhu Islamic Vocational School. With a value of $P = 0.636$ ($p > 0.05$), which means that there is no significant difference between gender and the foam rollers massage method on reducing lactic acid levels in students at SMK Islam Yasnuhu NW Pringabaya.

Table 3 Data Hypothesis Testing Results
Foam Rollers Massage Method

| Group | Mean | Std. Deviation | $\rho = 0.636$ |
|--------------|-------------|-----------------------|----------------|
| Man | 6.850 | 1.9741 | |
| Girls | 5.912 | 1.6057 | |

Lactic acid is a metabolic waste caused by the anaerobic energy system used during exercise. Lactic acid is produced from the glycolysis metabolic system, glucose is converted into ATP and lactic acid. resulting from the anaerobic glycolysis metabolic system where glucose is converted into ATP and lactic acid. If there is no oxygen in the energy system, eating lactic acid cannot be metabolized into pyruvic acid and ATP during the krebs cycle. The buildup of lactic acid in the blood is physiologically eliminated and synthesized when a person performs light physical activity where the lactic acid in the blood will be pumped through the pumping action mechanism by the motion of muscle contraction which will then be channeled into the day to be synthesized in the cori cycle. the principle of lactic acid metabolism is a smooth circulatory system.

Massage can increase blood flow through a mechanism of temperature changes in the skin and superficial hyperemia so that it can reduce lactic acid levels. This increase in blood flow can help reduce lactic acid levels, which can improve recovery effectiveness and prevent muscle fatigue, the effect of massage can reduce 25% lactic acid levels after 10 minutes of recovery by increasing the removal of lactic acid in muscle tissue (Wiltshire et al., 2010). This is consistent with the statement of (Pearcey et al., 2015) stated that post-workout massage reduces pain in muscles thereby rapidly reducing the concentration of lactic acid in muscle cells. Providing stretching and massage has been shown to be more effective than resting or conventional programs. Treatment using massage is a common intervention technique proposed to prevent continued fatigue.

In this study, the type of massage that researchers used to help reduce lactic acid levels was a foam rollers massage. Using a foam rollers masage, individuals apply their own body mass to the foam roller to compress muscle tissue. Movements that are performed directly and exert pressure on the soft tissues, stretching and producing friction between the body and foam rollers. Foam rollers can be considered a form of self-induced massage because the pressure that the rollers exert on the muscles resembles the pressure exerted on the muscles through manual manipulation. So, it can be explained that the application of the foam rollers method will help in the recovery process due to fatigue and help to maintain physical performance.

In general, many think that there is a difference between the decrease in lactic acid levels in men and women because men have a larger heart size, a higher hemoglobin concentration, a larger blood volume and a high oxygen consumption. But it differs in terms of lactic acid production during continuous exercise and the decrease in lactic acid during recovery. However, the sex differences in peak lactic acid concentration and lactic acid recovery have not been investigated further. In a study conducted by (Zhang & Ji, 2016) it was found that the average value of blood lactate concentration at rest was almost the same, there was no significant difference with a value of $0.99 + 0.41$ vs $0.97 + 0.39$ mmol, one each for men and women. Another factor that helps women to get rid of lactic acid, although they have less muscle mass than men, women have higher plasma concentrations of EPI during strenuous exercise. If the plasma EPI concentration was higher in women, it would be possible to increase the rate of glycogenesis and a greater decrease in glycogen during exercise. Because skeletal muscle with low glycogen levels will allow it to take up more lactate (in an effort to metabolize energy). It is possible for women to have low glycogen levels, so they can remove lactic acid from the blood more quickly during the recovery process which can compensate for the small muscle mass.

Conclusion

From the research results obtained p value = 0.636 ($p > 0.05$), which means there is no difference in the effect between gender and the method of foam rollers massage on decreasing levels of lactic acid. The application of the foam rollers massage method has an effect on decreasing the lactic acid levels of male and female students because both groups experienced a decrease in lactic acid levels. So that there is no difference between the two. So, it can be concluded that there is no difference in the effect between gender and foam rollers massage on reducing lactic acid levels.

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