

SURAT KETERANGAN

Nomor: 631/UNUSA/Adm-LPPM/VII/2019

Lembaga Penelitian dan Pengabdian Kepada Masyarakat (LPPM) Universitas Nahdlatul Ulama Surabaya menerangkan telah selesai melakukan pemeriksaan duplikasi dengan membandingkan artikel-artikel lain menggunakan perangkat lunak **Turnitin** pada tanggal 12 Juli 2019.

Judul : The Effect of Two Recoveries in Reducing Lactic Acid of Badminton Athletes

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Identitas : The 1 st Yogyakarta International Seminar on Health, Physical Education and Sports Science 2017

No. Pemeriksaan : 2019.07.12.287

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THE EFFECT OF TWO ACTIVE RECOVERIES IN REDUCING LACTIC ACID OF BADMINTON ATHLETES

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Abstract

ObjectivesThe objective of this study is to examine the effect of jogging and massage as recovery active on the change or removal of the lactic acid.

Methods The research subjects amounted to 12 men badminton athletes in Sumenep Regency. The subjects would be divided into two groups: jogging recovery group (Age 18 ± 2.09 , weight 56.83 ± 6.67 kg and height 164.5 ± 6.15 cm) and massage recovery group (age 16.33 ± 1.03 , weight 54.5 ± 3.27 kg and height 162.33 ± 7.76 cm). Levels of lactic acid subjects would be taken by using Accutrend Plus. Taking lactic acid levels was first performed before the research process was performed. The preliminary data were as a reference to normal circumstances. Then all subjects were given the same treatment that was a badminton match with a single system and rally point system. After the winner of the match had been known, the lactic acid of both subjects who had competed would be taken once more to see the change. And finally, the subjects would be given treatment of recovery through jogging and massage in accordance with the group that had been determined. After that, their lactic acid was taken again.

ResultsThe data analysis used was Independent Test of T-Test. The results showed that recovery by jogging significantly ($p < 0.05$) lowered lactate acid levels compared with recovery by massage. Recovery active by jogging and massage could reduce lactic acid after doing exercise however recovery by jogging was able to reduced lactic acid more quickly than recovery by massage.

ConclusionThe conclusion of this study was that recovery with jogging more effective to reducing lactic acid after performing and exercises than massage.

Keywords: badminton, recovery, jogging, massage.

INTRODUCTION

Sport is a thing that will not be separated from human life at this time. The large number of sports available allows people to choose the type of sport they want and according to their interests. Badminton is one of the most popular sports in Asia. In Indonesia badminton is a second popular sport after soccer. Many achievements have been obtained by Indonesia. One of them is a gold medal from Susi Susanti on women's single and Alan Budi Kusuma on men's singles at the 1992 Olympics Barcelona. Since then it has competed at the Olympic level. Badminton sports attract various age groups, different levels of work units, skills, men and women to play this sport indoors or outdoors for the purpose of recreational means or as a venue for achievement (Kusnani et al, 2011). In Indonesia, there has already been many badminton clubs formed and the level of the competition ranges from junior to senior level.

In achievement sports, research is always conducted which is intended to improve the athlete's performance and to achieve maximum results during the competition. Game strategy as well as badminton needs reviewing very much in order to achieve the achievement that can be gained faster and optimally. Several factors that are involved in achieving success in sports is technical and tactical, mental preparation (psychological) and strategy in the game (Kurniawan, R. 2015).

Energy is an important factor in a game or practice. Energy obtained from the food eaten then processed through the process of digestion and metabolism. The main ingredients of energy are carbohydrates, fats, and proteins but also we need vitamin and mineral. This food will serve as a

carrier of energy and replace the damaged cells in the human body. Characteristics of badminton change energy system from aerobic system to anaerobic system. The capital needed in the short and long rally is energy from anaerobic system and aerobic energy (Forestier et.al, 1998)

An anaerobic system is an energy system that the process does not require oxygen, so it will produce lactic acid. Lactic acid occurs in humans when performing an activity or exercise using an anaerobic glycolysis energy system and anaerobic glycolysis is used in a fairly short time and does not use oxygen (Benardot, Dan. 2006).

Lactic acid accumulation in the body can be resolved by removing the lactic acid from the muscles to the blood, increasing blood flow, taken lactate by the liver, heart and skeletal muscle. Lactic acid can be removed or lowered by recovery. The main purpose of recovery is to restore the depleted energy supplies during activity, and the return of this energy supply is perfectly performed by the aerobic system. The process of recovery is just as important as the process during physical exercise. Incomplete recovery will decrease ability (Kurniawan, R. 2015).

In a sports competition, in addition to optimal training and adequate nutrition, one of the important factors that support athletes in gaining achievement is the optimization of the recovery period. This is because today there are many sports competition systems that require repetitive high intensity work with short duration of rest. Therefore, it is important for athletes to take advantage of recovery time and consider that the loading-recovery cycle is a key point of the exercise process (Kusnani et al, 2011).

Two forms of recovery are active and passive recovery. Active recovery is another type of recovery period in which a person performs a low-intensity exercise. Examples of active recovery is to perform activities such as running or walking in a certain period of time while example of passive recovery is only silence as sitting or lying down without doing any activity. Previous research has shown that active recovery is faster than passive recovery (Afriwardi dan Wenny Rahmalia Rezki. 2008, Pinar S., et.al, 2012, Monedero J. et.al, 2000)

In addition to using active recovery and passive recovery, there are other recovery techniques performed with the help of others through massage manipulation or known as sports massage. With jogging and massage, the results obtained show that jogging active recovery has a small index of fatigue. When it was viewed from the significance value of $0.335 > 0.05$, it means that there was no significant difference between the use of jogging and massage to the index value of fatigue. Meanwhile, when viewed from the average value based on the results of jogging and massage groups, it was found that the jogging group had equal to 3,809: 4,714. The results of the study were calculated by formula (11) a (RAST) (Kusnani et al, 2011).

The aim of this study is to examine the effect of jogging and massage as recovery active on the change or removal of the lactic acid.

METHOD

The design of this study is Quasi Experiment which is an estimate for information that can be obtained with true experiments in circumstances that are not possible to control and or manipulate all the relevant variables (Badriah Laelatuk. 2006.)

Sample

The sample used in this study was male athletes of Sumenep with an age range of 15-21 years. We used twelve athletes from Sumenep Regency. The subjects were divided into two groups i.e. jogging group and massage group. The anthropometric of the subject is shown in Table 1.

Table 1 Anthropometric of the subject

No.	Anthropometric	Groups	
		Jogging (n=6)	Massage(n=6)

1.	Age	18±2.09	16.33±1.03
2.	Weight (kg)	56.83±6.67	54.5±3.27
3.	Height (cm)	164.5±6.15	162.33±7.76

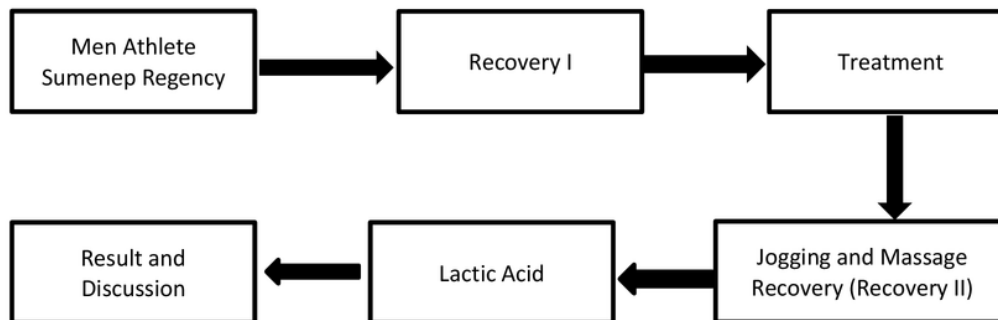


Figure 1. Research Design

Tools

The tool which were used to take lactic acid contents was Accutrend Plus. Accutrend Plus from Roche cobas made in Germany and it can measure glucose, Cholesterol, Triglycerides and Lactace.

Procedure

All subjects must complete and sign the informed consent. All subjects were required to fast for 10 hours before the study. Subjects were given warming up to equal of physical condition. Taking of lactic acid would be done three times.

Recovery I

At this stage the subject's lactic acid content will be taken to determine whether it was normal or not and will be used as the initial reference of the researcher about the normal condition of the subject after given the treatment.

Treatment

At this stage all subjects will be given the same treatment that is a badminton match with a single type and rally point system following the rules set by BWF. After getting the winner of the match, the subject's lactic acid content was taken to see the change.

Recovery II

At this stage the subjects who have finished the badminton match, the winner and the loser will be given re-treatment of recovery with jogging and massage. The subject will perform the recovery in accordance with predefined divisions. On the jogging recovery subject will run around the field within 150 m in five minutes with light intensity. Meanwhile, for the massage recovery, some massage techniques were done i.e. the movement of effleurage (rubbing), petrisage (squeezing), friction, tapotament (body blow), vibration, shaking and they are done by experts in the field of massage.

The taking process of lactic acid is done by medical personnel and in accordance with the standards applicable in Indonesia, starting from the use of rubber gloves, cotton, and alcohol.

Data analysis

Data analysis in this study was Independent T - Test. The results of this test will show how much is the difference between jogging and massage recovery.

RESULTS AND DISCUSSION

Results

The content of lactic acid in recovery I shows different results and tends to be too different. This is because many research subjects perform activities that can increase lactic acid content before the data retrieval process. Actually each subject has been arranged in such a way so that their physical condition and physiology are the same.

Table 2.Result Lactic Acid (mmol)

No.	Information	Groups	
		Jogging (n=6)	Massage(n=6)
1.	Recovery I	2.47 ± 0.40	5.27 ± 1.01
2.	Treatment	5.00 ± 0.39	5.06 ± 0.14
3.	Recovery II	2.70 ± 1.17 *	4.40 ± 1.61

*) Significantly different between Treatment and Recovery II ($p < 0.05$)

Content of lactic acid during the treatment that playing badminton showed an increase in both groups in the jogging and massage groups. The content of lactic acid obtained was not significantly different from that of previous studies (Cabelllo Manrique D et.al , 2000, Forestier et.al, 1998) Menzies, P, 2010). This suggests that there were high differences in lactic acid and could cause fatigue.

The results showed that lactic acid content on recovery by jogging decreased lactic acid significantly ($p < 0.05$), whereas recovery with massage did not decrease lactic acid significantly. This indicates that a good recovery was done after the game for the recovery period was by jogging. However, recovery with massage also showed a decrease in lactic acid content.

Discussion

Result lactic acid after treatment to increase lactic acid the jogging recovery group increased and the results were consistent with several previous studies (Forestier et.al, 1998, Cabelllo Manrique D et al, 2003, Menzies, P., 2010). But in the massage recovery group to fall. This is because before the treatment of the badminton match the subject had rest for a while waiting for a turn and made it possible to lower lactic acid.

The accumulation of lactic acid can cause of fatigue (Pinar S., et.al, 2012). The phenomenon of fatigue can be caused by: 1) problem in the provision of energy; ATP-PC and anaerobic glycolysis, 2) accumulation of products such as $[H^+]$ lactic acid, 3) muscle mechanical failure to contract, and 4) nervous system changes (Majumdar, P, 1997). The incidence of muscle fatigue during exercise can be caused by many things, including: the depletion of energy reserves derived from ATP, creatine phosphate, and glycogen; accumulation of lactate in muscle; homeostatic disorders, e.g. impaired plasma osmolarity, plasma volume, decreased pH of body fluids and decreased electrolyte levels of body fluids; fatigue due to neuro muscular or central disorder; and fatigue caused by environmental conditions, both due to temperature and humidity (Kusnani et al, 2011).

This fatigue will affect the performance of athletes in the field (Monedero et al, 2000, Pinar S., et.al, 2012). Fatigue can cause damage to the coordination of the human body (Fox, Edward L. 1979), which will lead to decreased performance of athletes and the results of athletes can't compete with the maximum.

The consequence of the inadequate recovery time is the incomplete (re-synthesizing) ATP-PC that has been used up. The less recovery time, the recoverable ATP-PC as an energy source for

repetition of subsequent activities will also be reduced. When these conditions occur, there will be a mechanism of energy formation through anaerobic glycolysis system, while it is known that this energy system produces lactic acid that accumulates in the muscle and will eventually cause fatigue (Kusnani et al, 2011).

The lactic acid removal after the subject recovers with jogging and massage. Lactic acid levels in the jogging recovery group experienced considerable decline and lactic acid were almost in accordance with the initial state prior to the match. in the massage recovery group also tends to decrease but not too different. The results showed that both active recovery gave good results to restore physical condition after activity, but treatment with jogging treatment tended to be better compared with massage.

Decreased lactic acid during recovery after exercise or match is associated with several factors. These factors include the bicarbonate buffer system, the decrease or alteration of lactic acid from the muscle to the blood, the blood flow and a small or rapidly brought lactic acid to the liver, muscle and heart (Pinar S., et.al, 2012).

When performing active recovery by jogging then the body will get oxygen and make the body use aerob energy system. The lactic acid presents in the muscle will be carried by the blood and the oxygen to the liver to be re-processed into new energy that will be used by the moving muscles and the muscle that has produced lactic acid before (Kusnani et al, 2011).

After doing activity or exercise, lactate results in from anaerobic glycolysis of the muscle is released into the bloodstream and transported to the liver, where lactate can be converted back into glucose. This synthesis of glucose is called gluconeogenesis. This glucose can later be reused by the muscles that produce lactic acid. This is called the cori cycle (Kusnani et al, 2011). A decrease in blood lactate content may occur in passive recovery caused during rest after the activity of the cori cycles persists and the oxygen consumption at rest can be adequate so that glycolysis can take place (Kusnani et al, 2011).

Destination in sports is massage divided into three, namely the preparative, preventive and curative. The purpose of preparative is the goal to prepare the physical condition of the athlete before performing the motion activity; the preventive goal is the prevention goal, which is to create the physical condition of the athlete to be ready for further training. Massage efforts in this regard are expected to facilitate the circulation of blood, so that movement and coordination of the body can function properly, preventing and reducing accumulation of excessive combustion remains. The curative purpose of massage is limited to healthy tissue, so curative understanding in this case is to improve the physical condition of the athlete after exercise. With massage is expected to reduce or eliminate pain and fatigue, so that athletes can do the training or the next game in fresh physical condition (Kusnani, 2011).

Active recovery with massage can result lower lactate acid levels but in a long period of time. Massage has many benefits to the body after an activity or exercise. In the world of sports massage can be used for the recovery process and decreased levels of lactic acid in the body (Pinar S., et.al, 2012, Werapong et.al, 2005). In the process of massage, the resulting process is increased tissue and blood flow in the body (Pinar S., et.al, 2012). Increased blood flow has an important role in the process of reducing or eliminating lactic acid in the body. However, there is a study that shows no significant change in blood flow in muscles after a massage (Werapong et.al, 2005).

In some previous research results indicate that recovery with massage did not significantly different from passive recovery (Pinar S et. all, 2012, Werapong et.al, 2005). One of the factors associated with massage is the tissue or organ in the human body itself (Pinar S., et.al, 2012). This factor will affect the body's recovery system after doing the activity.

The game of badminton produces about 4.70 mmol (Menzie, P.,2010), 3.8 mmol (Cabello Manrique D et.al , 2000) and 6.8 mmol (Forestier et.al, 1998). This suggests that badminton is one sport that uses a combination of aerobic glycolysis and anaerobic glycolysis Cabello Manrique D, et al 2003). Lactic acid produced during a match can be removed or lowered at rest after each rally (gain points) or any change set. The average rest period is 11 seconds after the rally (Forestier et.al, 1998). Therefore, recovery by jogging and massage can't be done during the game. This recovery can

be done at the time after the maximum exercise and after the match for the preparation of the next match on the next day.

CONCLUSION AND SUGGESTION

This research had limitation. The limitation was minimum of subject, difficult to keep condition of subjects for doing some activity because it can be influenced to lactic acid and limitation of tools. From the results of research that has been conducted to get the conclusion that active recovery with jogging significant can lower lactic acid level good enough after activity than with active with massage. But to form of recovery can reducing lactic acid after game and exercise. Active recovery by jogging indicates a decrease in lactic acid levels similar to the initial conditions before treatment.

However, the suggestion for further research is the measured recovery time that is measured and biased using other lactic acid gauges also can use more many subject.

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