EFFECT OF WATER IMMERSION RECOVERY COMBINED WITH MASSAGE AFTER EXERCISE ON LACTIC ACID IN THE BLOOD.

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ABSTRACT

The purpose of the present study was comparing the effects of post-exercise recovery methods on lactic acid in the blood. Thirty rugby football players aged between 18-22 years were Simple Random Sampling into two subgroups. In each of the two different groups: 1.) cold-water immersion group (CWI) 2) cold-water combined with a total of 30 massages (CWIM). Resting heart rate and blood lactate were recorded throughout the testing sessions. Recovery after exercise in both groups with the method of cold-water immersion was a significant decline in blood lactic acid and heart rate with a statistical level of 0.001. There was a significant decline in blood lactic acid and heart rate after CWI compared with CWIM with a statistical level of 0.001. These findings indicate that CWIM is useful in blood lactic acid and heart rate, and this performance benefit is associated with athlete recovery.

Keyword: Water Immersion, Recovery After Exercise, Massage, Lactic Acid

INTRODUCTION

Strenuous exercise for long-time results in the accumulation of tiredness in the body. Moreover, it is resulting in the next exercise, not being able to be performed at full efficiency. This stagnation began with the body creating more and more lactic acid in muscle cells. The accumulation of lactic acid in muscle cells in large quantities stimulates the senses of pain. The accumulation of lactic acid in muscle cells in large quantities will stimulate the sensory nerves of pain, causing pain or regression in the musculoskeletal system, and most importantly, causing discomfort in the muscles. When fatigue occurs, the muscles become difficult to move, slow movement, and not fully functional. When fatigue occurs, the muscles will be challenging to move, slow to work, not fully working, including the mental state of stress and anxiety from exercise fatigue [1]. Recovery from exercise is as essential as using energy in exercise. If we can recover quickly, we will be able to exercise again.

In recent years, research has focused on strategies for increasing rehabilitation efficiency to speed the recovery of physiological functions back to normal [2]. Coldwater immersion is one of the most popular methods because cold water immersion shows to reduce muscle damage and injuries, which can lead to the recovery of performance. However, sports massage nowadays has a role in helping the athlete's mind to be ready to enhance athletic performance in recovering from intense exercise or competition and also to treat muscle injuries and body parts to return to normal quickly [3]. Massage restoration believed to increase circulation, increase muscle mass, and increase muscle tissue temperature, which will increase the effectiveness of treatment. [4], increase muscle performance [5] reduces cell adhesion, and increases muscle flexibility [6]. It also reduces the risk of injury [7]. Massage therapy used to refresh and relax for thousands of years around the world. Recent research from the United Kingdom shows that in past years, massage therapy takes approximately 45% of the time in physiotherapy. Massage therapy is used in general practice, including preparation for the competition, during the competition, and for the rehabilitation of

competition rather than specific treatment problems [8]. Massage is a popular treatment option for athletes, coaches, and sports physiotherapists [9].

Therefore, the researcher realizes the importance of rehabilitation after exercise and therefore studies recovery after exercise. With the method of cold water immersion and with the method of cold water infusion combined with massage Before and after exercise Towards lactic acid in the blood

OBJECTIVES

1. The effect of recovery Exercise with cold water immersion methods before and after exercise has reduced lactic acid in the blood.
2. To study the effect of exercise recovery with cold water immersion method combined with massage before and after exercise on lactic acid in the blood.
3. To compare the effect of recovery after exercise between cold water immersion methods and cold water immersion methods combined with a massage on lactic acid in the blood.

METHODOLOGY

The study of the effect of recovery from water infusion combined with a post-exercise massage on blood lactic acid. This research is quasi-experimental. (Quasi-Experimental Research Design)

Participants

The subjects in this study were male from Kasem Bundit University, who were 30 rugby football players from 18-22 years of age. The samples were obtained by simple random sampling by dividing the sample into two subgroups: cold water immersion group and cold-water immersion group combined with massage. The samples were selected to participate in the research as follows: male rugby athletes aged 18-22 years, university team or playing continuously at least three days a week, complete health assessment based on physical activity readiness, questionnaire (PAR-Q), no history of heart, lung, and musculoskeletal diseases, no injuries until being unable to participate in the program and voluntarily participate in the research and willing to sign the consent form

Study Design

The selection of samples that meet the criteria specified by the samples selected to participate in the study will be informed of the details of every step of the research, including signing a consent form to participate in the study. Before the experiment, the participants will receive various recommendations. For their practice before taking training and testing as follows: get enough sleep for at least 8 hours a day, eat regular food that they regularly eat, drink enough water for at least 6–8 glasses per day, no food or beverages containing caffeine or alcohol 48 hours before the test, eat at least 2 hours before the test. In terms of safety during research participation, the researchers have the following principles. The researcher will carefully control the intensity of the participants' training using the Polar heart rate monitor to be in the target zone specified during the training. During the training, the Rating of Perceived Exertion (RPE) of the subjects was evaluated. Periodically to measure the level of consciousness of the subjects during the practice. The researcher will immediately stop the experiment when the participants have the following situations: irregular heartbeat and irregular rhythm, tired until unable to continue training or request to terminate training, dizziness or headache, chest pain, or shortness of breath,

Exercise Training Protocol

The Group 1 and Group 2 began to collect primary data using the following methods: weight, height, blood pressure, and resting heart rate. Exercise with the Incremental Maximal Exercise Test. After exercise, draw blood to find lactic acid and record heart rate. Recover after exercise by sitting in a cold water temperature of 15 degrees for 3 minutes, resting for 2 minutes for three sets. After that, Group 1 rest in room temperature 25-28 degrees Celsius for 15 minutes, then draw blood for the lactic acid second time and record the heart rate. Group 2 In the second group, relax with a sports massage in the room temperature 25-28 degrees Celsius for 15 minutes, then draw blood for the lactic acid second time and record the heart rate every time the blood is drawn (Figure 1).

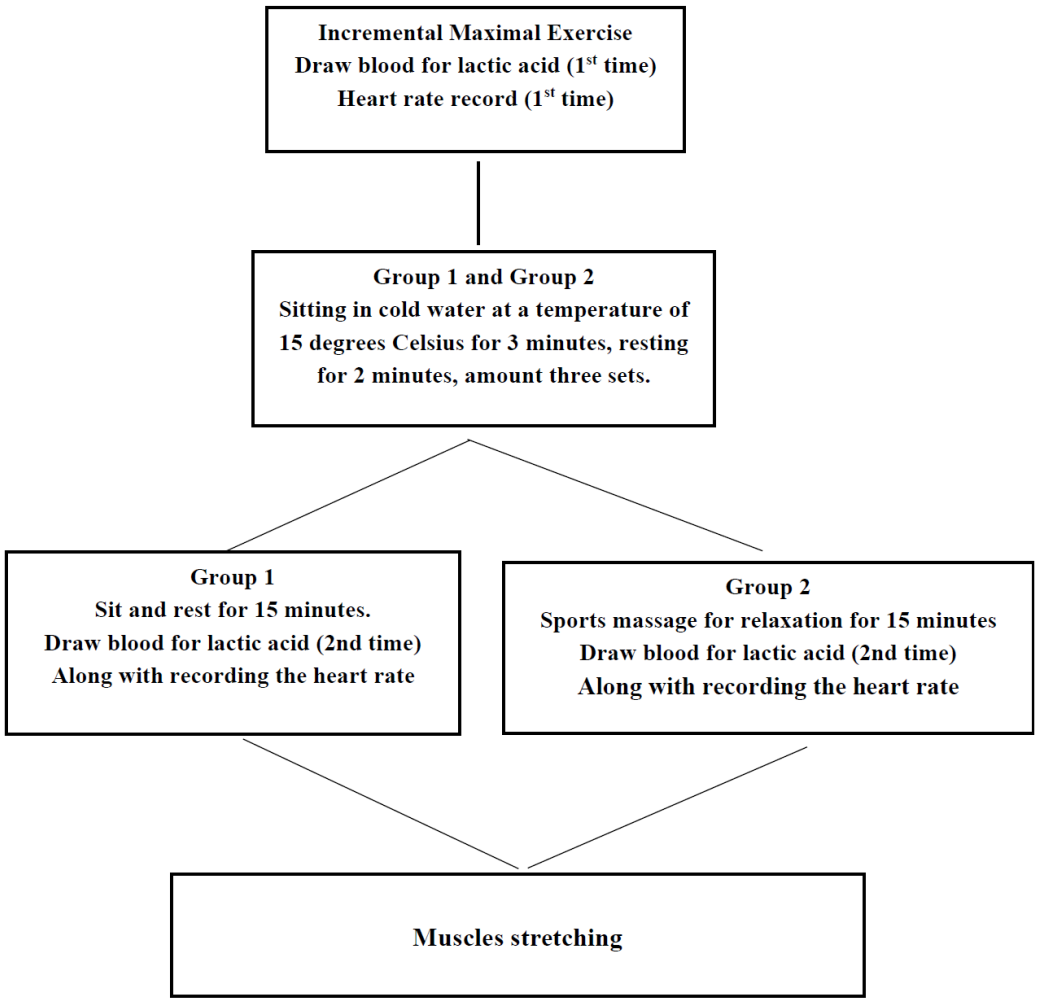

Figure 1. Experiment flow chart protocol

Measurements

In the experiments, the tools for selecting samples were Informed Consent Form, Patient/Participant Information Form, and Physical Activity Readiness Questionnaire: PAR-Q). The physical characteristics include weight, height, and Blood pressure. The measures of physical fitness included maximum oxygen consumption and heart rate. Fatigue and recovery of the body can be measured from lactic accumulation.

RESULTS

Table 1. Mean and standard deviation of physical characteristics before the experiment

Parameter	Before Experiment				*p*-value
	Group 1 (n=15)		Group 2 (n=15)		
	$\bar{x}$	SD	$\bar{x}$	SD	
Age (Years)	19.67	.98	20.20	1.15	.181
Weight (Kg.)	68.13	3.34	68.00	4.61	.928
Height (Cm.)	170.00	2.07	127.27	3.03	.781

* $p \leq .05$

From table 1, it was found that the experimental group 1 had an average age of 19.67 ± .98 years. The average body weight is 68.13 ± 3.34 kilograms, and the average height is 170.00 ± 2.07 centimeters. In the experimental group 2, the mean age was 20.20 ± 1.15 years — the average body weight of 68.00 ± 4.61 kilograms and an average height of 170.27 ± 3.03 centimeters. The physical characteristics, included age, weight, height between the experimental group 1 and experimental group 2 before the experiment, were not different.

Table 2. Mean and standard deviation of physical fitness before the experiment

Parameter	Before Experiment				*p*-value
	Group 1 (n=15)		**Group 2** (n=15)		
	$\bar{x}$	**SD**	$\bar{x}$	**SD**	
Blood lactic acid (mmol/L)	9.96	1.01	9.89	.85	.832
Resting Heart rate (bpm)	173.60	5.32	172.07	3.61	.365

* $p \leq .05$

From table 2, the experimental group 1 before the experiment, the average blood lactic acid value was 9.96 ± 1.01 mmol / l. The average heart rate is 173.60 ± 5.32 bpm. In the experimental group 2, before the experiment, the average blood lactic acid value was 9.89 ± .85 mmol / l. The average heart rate is 172.07 ± 3.61 bpm. Lactic acid and resting heart rate between experimental group 1 and experimental group 2 before the experiment were no different.

Table 3. Mean and standard deviation of physical fitness after the experiment

Parameter	After Experiment				*p*-value
	Group 1 (n=15)		**Group 2** (n=15)		
	$\bar{x}$	**SD**	$\bar{x}$	**SD**	
Blood lactic acid (mmol/L)	3.47	.25	2.52	.22	.001*
Resting Heart rate (bpm)	78.53	2.56	68.80	1.61	.001*

** $p \leq .001$

From table 3, the experimental group 1 after the experiment, the average blood lactic acid value was 3.47 ± .25 mmol / l. The average heart rate is 78.53 ± 2.56 bpm. In the experimental group 2, before the experiment, the average blood lactic acid value was 2.52 ± .22 mmol / l. The average heart rate is 68.80 ± 1.61 bpm.

From table 4, the experimental group 1 before the experiment, the average blood lactic acid value was 9.96 ± 1.01 mmol / l, and the average heart rate is 173.60 ± 5.32 bpm. After the experiment, the average blood lactic acid content was 3.47 ± .25 mmol / l, and the average heart rate was 78.53 ± 2.56 bpm. The parameters within the experimental group 1 after the experiment were the average lactic acid and heart rate values. It was significantly reduced compared to before the experiment.

Table 4. Mean and standard deviation of the same sample group before and after the experiment.

Parameter	**Group 1**				
	Before Experiment		**After Experiment**		***p*-value**
	$\bar{x}$	**SD**	**$\bar{x}$**	**SD**	
Blood lactic acid (mmol/L)	9.96	1.01	3.47	.25	.001*
Resting Heart rate (bpm)	173.60	5.32	78.53	2.56	.001*

** $p \leq .001$

Table 5. Mean and standard deviation of the same sample group before and after the experiment.

Parameter	**Group 2**				
	Before Experiment		**After Experiment**		***p*-value**
	$\bar{x}$	SD	$\bar{x}$	SD	
Blood lactic acid (mmol/L)	9.89	.85	2.52	.22	.001*
Resting Heart rate (bpm)	172.07	3.61	68.80	1.61	.001*

From table 5, the experimental group 2 before the experiment, the average blood lactic acid value was 9.89 ± .85 mmol / l, and the average heart rate is 172.07 ± 3.61 bpm. After the experiment, the average blood lactic acid content was 2.52 ± .22 mmol / l, and the average heart rate was 68.80 ± 1.61 bpm. The parameters within the experimental group 2 after the experiment were the average lactic acid and heart rate values. It was significantly reduced compared to before the experiment.

CONCLUSION

This research is quasi-experimental research to study and compare the effects of water bath recovery and post-exercise massage on lactic acid in the blood. In this research, two methods of recovery were used after hard exercise. The experimental group 1 sit in cold water for 3 minutes, resting for 2 minutes / 3 sets with a temperature of 15 degrees Celsius. After that, relax in the room temperature 25-28 degrees Celsius for 15 minutes and then draw blood and monitor heart rate. The experimental group 2 sit in cold water for 3 minutes, resting for 2 minutes / 3 sets with a temperature of 15 degrees Celsius, sports massage for

relaxation in the room temperature 25-28 degrees Celsius for 15 minutes, and then draw blood, and monitor heart rate. This research found that recovery after exercise by cold water immersion methods and the method of cold water infusion combined with massage has an effect on blood lactic acid, and decreased heart rate differences were statistically significant at the .001 level. After strenuous exercise, the body will accumulate lactic acid, causing fatigue. The circulatory system eliminates lactic acid. Soaking in cold water after a workout helps stimulate the circulatory system to work better. Massage stimulates the muscles from the outside to increase blood circulation as well.

Therefore, massage with cold water after intense exercise helps to get rid of lactic acid and revitalize the body better. In the next research, a control group should be added, and the research was done using a sample of female athletes.

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