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1 Modification of Recovery Techniques to Increase VO2 Max on Women Volley Ball Athlete

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Abstract: Volleyball is one of the quite popular sport in Indonesia. Most of athletes experience fatigue towards the end of a match which can affect the outcome of the match. Recovery techniques are important things to do during and after the match. This study aimed to determine the level of VO2 max of volleyball athletes by modifying the recovery using massage in active and passive recovery. The research subjects were 15 of PORPROV (Provincial Sports Week Championship) female volleyball athletes, Sumenep Regency. Subjects were divided into three groups, namely the first group of recovery with active and massage recovery and the second group with massage recovery and passive recovery and the third group as the control group. The results showed a significant difference in VO2 max in the first and second groups.

1 INTRODUCTION

Volleyball is a sport that consistently holds activities or competitions at the sub-district level to national level in Indonesia, and therefore, it is one of the most popular sports in Indonesia. Volleyball requires its players to always have a pretty good endurance. In addition, it also requires speed and strength during the match.

The volleyball organization in Sumenep regency at the Provincial Sports Week Championship (PORPROV, henceforth) in East Java has formed two teams namely the Volleyball men's team and women's team. However, there is a problem faced by the PORPROV team, namely a decline in athlete's performance caused by physical deterioration. This decrease in physical condition is caused by improper training programs provided by the coach the decrease in physical condition can be seen in the fourth and fifth sets during the match which causes performance to decline. If the performance decreases, it will affect the concentration and accuracy of the game.

Getting an achievement could not be separated from coaching and good training patterns. There is one way that can be used to improve the achievement is by using recovery techniques carried out during and after the match. The special methods are needed to restore the performance of athletes who experience fatigue (Andek, 2013). The right recovery technique will maintain the athlete's endurance. Endurance is a support for players to be able to concentrate on achieving achievements.

In order to support the athlete's performance, it is necessary to have the right technique. There are several ways to do recovery techniques in sport and one of them is by using massage and jogging technique. The results of previous studies indicated that active recovery techniques can quickly restore the body's condition compared to passive recovery. Recovery techniques are very important in restoring the athlete's physical condition when experiencing fatigue while competing. This study aims to modify recovery techniques by combining massage with active and passive recovery.

Table 1: Descriptive Calculation Results

Measurement results		VO2max (satuan)	p-value (<0.05)
Active Recovery & Massage Group	Pre Test	39,40 ± 3,05	0,005
	Post Test	46,40 ± 1,82	
Passive Recovery & Massage Group	Pre Test	34,60 ± 1,52	0,029
	Post Test	39,80 ± 4,97	
Control group	Pre Test	29,60 ± 3,21	0,621
	Post Test	29,80 ± 3,11	

2 METHODS

This research is an experimental research using pure experimental design - Pretest-Posttest Randomized Control Group Design. The data were calculated by using t-test paired statistical analysis and SPSS 18.0 for windows software version.

2.1 Subject

The subjects used in this study were the Volleyball Women's Team in preparation for the Provincial Sports Week Championship (PORPROV VI). The team contained 15 athletes. The first group is the recovery group with massage and active recovery (i.e. jogging). The second group is the recovery group with massage and passive recovery (i.e. sitting). The third group is the control group.

2.2 Procedure

Each subject filled in a letter of willingness to be a part of this study. Each group participated in an endurance measurement test (VO2 max) twice at the beginning and end of the study. VO2 max measurement was done using MVT test. First, the subjects took the VO2 max data. Then, each subject was treated according to the group that had been determined. In the final stage, the data were taken back to see the difference after the treatment.

3 RESULTS

The description of the results of the study is shown in table 1. From table 1, VO2 max increased in all three groups. The first and second groups experienced a significant increase ($p < 0.05$). Meanwhile, the third group did not have a significant increase.

Based on the results of measurements in table 1 above, especially in the active and massage recovery

groups, it could be seen that there was an increase in the mean value between pretest 39.40 ± 3.05 and posttest 46.40 ± 1.82 . In the passive and massage recovery group, there was also an increase in the mean value between pretest 34.60 ± 1.52 and posttest 39.80 ± 4.97 . In the control group, there was also an increase it was mean pretest value of 29.60 and post-test of 29.80. The standard value of the deviation was pretest 29.60 ± 3.21 and post-test 29.80 ± 3.11 . From the average results of the three groups, it was concluded that by giving treatment of VO2 Max, there was an increase from the three groups, although the control group gave the smallest increase.

4 DISCUSSION

Doing certain work or sport activities can cause a person to be exhausted and to face a decline in the quality and quantity of work or sport. Decreasing the quality and quantity of work or sports is caused by the intensity and duration of work or exercise that causes disruption of homeostasis. This condition is subjectively perceived as fatigue. Such fatigue must be prevented and immediately recovered by an athlete. Recovery is a return to the condition of homeostasis to its normal condition. Recovery can indeed occur spontaneously, but it can be accelerated through engineering efforts (Giriwijoyo and Sidik, 2013).

There are two forms of fatigue in humans, namely mental fatigue and physical weakness. This study focused on the handling of physical fatigue as a means of recovery for athletes while carrying out volleyball training activities in increasing VO2 Max. Physical fatigue is caused by physical work or muscle work, and is considered as an attractive problem to physiological experts. It should be understood that physical fatigue is the fatigue of ergosistema-I (ES-I). ES-I functions actively as nervous system and muscular system. The combination of the two is better known as the neuromuscular system, so that fatigue can occur in one of them or a combination of the those systems. It can be concluded that fatigue can occur on both the

nerves and the muscles (Giriwijoyo and Sidik, 2012).

Based on the results of this study, group I had greater increase amounting to 17.77% in VO2 Max for volleyball athletes in Sumenep regency. This is due to combining methods, which included active recovery and massage. The study showed that active recovery was compared to passive recovery, but this difference was not significant. The existence of biological variations in a person and recovery time, that is too short, are important factors for the results and it is recommended to increase recovery time and increase sample homogeneity in order to reduce variations in biology (Afriwardi and Rezki, 2008).

The second group also had an increase, which was about 15.03%, as the results of the pre-test and post-test on VO2 Max in volleyball athletes in Sumenep regency. This number however was smaller when compared to the first group. As stated by previous research, passive recovery can restore maximum muscle strength such as initial muscle strength, when it was being given manipulation of effleurage for 3 minutes, because it can improve the ATP-PC and more quickly oxidized lactic acid will give more energy or strength (Simatupang, 2015). Active and massage recovery techniques are very important to speed up the recovery process. Massage techniques will quickly circulate the blood that

carries oxygen to the working muscles. The muscles will experience a little fatigue when oxygen enters tightly. The oxygen will help lactic acid to produce during the combustion process and the energy system will be quickly discharged by the body. Excellent physical performance of a sportsman also needs to pay attention, in terms of nutrition. Almost all of the athletes need to use the main energy source of carbohydrates (CHO), especially athletes who carry out maximum explosive movements such as volleyball. As we know that, muscles that have enough CHO (muscle glycogen) can make anaerobic power formation. The most important energy resource for exercise or physical work is the main energy source of carbohydrates and fats. The supply of fat in the body is almost always enough even for someone who looks thin, while the supply of CHO in the body must always be considered (Giriwijoyo and Sidik, 2013). Research findings claimed that chocolate milk has superior rehydration properties compared to other sports drinks. It is based on its ability to reduce urine production and increase fluid retention. Thus, chocolate milk provides a practical and convenient choice when choosing post-sports recovery drinks for sports athletes, especially female athletes (Dow et al., 2018).

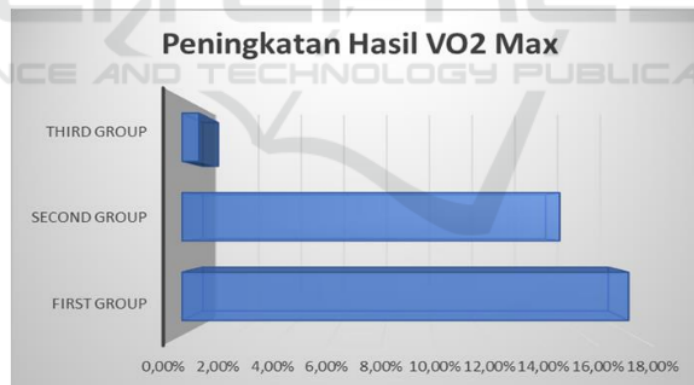


Figure 1: Increased VO2 Max Results

5 CONCLUSIONS

The conclusion of this study is that the identification of recovery techniques by adding massage can increase athletes' VO2 max rapidly. This is due to an increase in the circulation of blood and oxygen throughout the body.

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