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**The Effect of Recovery Technique Physical Training Combination in Improving  
Vo2max of Volleyball Athlete**

Dian Helaprahara, Rajai Eko Arisetiawan, Mas'odi  
STKIP PGRI Sumenep, Indonesia

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**Abstrak**

Olahraga bolavoli banyak menggunakan energi anaerobik sehingga akan menimbulkan asam laktat yang banyak dan bisa menyebabkan kelelahan. Pemulihan merupakan faktor penting dalam meningkatkan prestasi atlet. Pemulihan pada saat latihan atau pertandingan ada dua macam yaitu pemulihan secara aktif maupun pasif. Tujuan dari penelitian ini adalah untuk mengetahui pengaruh modifikasi teknik pemulihan dengan cara menggabungkan teknik pemulihan aktif dan pasif yang dikombinasikan dengan massase setelah melakukan latihan fisik. Penelitian ini merupakan penelitian eksperimen dengan menggunakan desain eksperimen murni - Randomized Control Group Pretest-Posttest. Kesimpulan dari penelitian ini adalah adanya pengaruh yang signifikan pada perubahan VO2max setelah adanya perlakuan massase pada kelompok pemulihan aktif dan pemulihan pasif. Massase bisa menjadi tambahan teknik pemulihan saat latihan atau pertandingan.

**Abstract**

Volleyball uses a lot of anaerobic energy which can produce a lot of lactic acid that causes fatigue. Recovery is an important factor in increasing an athlete performance. The purpose of this study was to investigate the modification of recovery techniques by combining active and passive recovery techniques combined with massage. This research was an experimental study using a pure experimental design - Randomized Control Group Pretest-Posttest. The conclusion of this study is that there is a significant influence on changes in VO2max after the presence of massage treatment in the active and passive recovery groups. Massage can be an additional recovery technique during practice or competition.

## INTRODUCTION

Volleyball is a game played by most of people during their life, whether in backyard, beach, during having holiday with friends and family, or in an organized competition with other teams (Reynaud, 2011). The purpose of this game is simple, it is to keep the ball to be by your side at the field and to be given back through the net to the opponent's field. The team who successfully does this, will have a score. The team with the highest score at the end of the game will win the set, the team who wins most of the set will win the tournament.

Volleyball has a break in each round. The break time is usually used for the fast recovery. Volleyball game uses lots of anaerobic energy that produce lactic acid that could cause fatigue. The recovery is an important factor in improving an athlete achievement. The recovery during training or tournament includes active and passive recovery. From the two techniques, active recovery is faster in reducing lactic acid and fatigue of the athlete (Menziés et al., 2010).

Active recovery includes preserving the sub maximum work after tiring training with the purpose to keep the level of performance level in various events during training. It could increase the recovery mechanism in energy, muscle, and psychological aspect of the athlete. The active recovery should be conducted in different time, whether as the part of training session or during cooling down phase. In this case, it is usually started by other recovery method such as stretching and massage (Hausswirth & Mujika, 2013).

In sport, massage is usually given before competition. Massage is good for health for its ability to expediting blood circulation in human body (Monedero dan Donne. 2000; Weerapong et al., 2005). The improvement of blood circulation is believed to improve the performance by improving the oxygen and nutrition to cell, improving intramuscular temperature and blood buffering effect. The improvement of blood circulation will improve the oxygen level in blood. It would push the process of reducing the lactic acid faster.

The good recovery technique is a technique that could combine the recovery actively and passively (Monedero, dan Donne. 2000). Recovery is the most important part in improving an athlete performance.

The fast recovery technique will fasten the performance of an athlete. The fast recovery technique will fasten the process of an athlete endurance thus the athlete could follow the training optimally to achieve the accomplishment. Massage is also used for preparing the athlete before and after the competition with different technique including swedish massage, that could reduce the pain and give relaxation effect and also rehabilitation for the athlete to get a fast recovery (Purnomo, 2015). The similar research showed a result that active recovery and combination recovery could decrease the fatigue level on football athlete (Kumiawan & Elfarabi, 2018). However, the present research used different subject, the volleyball athletes.

The aim of this study was to investigate the modification of recovery technique by combining active and passive technique combined with massage. Hopefully, the result of this study could be used by the coaches as the consideration in selecting the main player in PORPROV VI championship year 2019.

## METHODS

### Type of the Study

This study is an experimental study using pure experimental design-Randomized Control Group Pretest-Posttest.

### Population and Sample

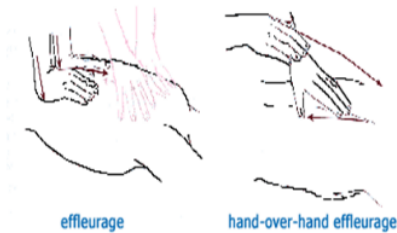
The subject of this research were the male volleyball teams in preparing the selection of Sport Week Event for Province Level (PORPROV VI) competition that consisted of 30 athletes. This research involved athlete aged 15 - 21 years. Therefore, the purposive sampling technique was needed. The purposive sampling is a technique of deciding samples with particular considerations (Sugiyono, 2010). The first group was the active recovery and massage. The second group was the passive recovery with massage. The third group was the control group. Each group consisted of randomized 10 athletes. The treatment was implemented after the athlete received physical training, then they received the treatment based on their group. During the selection of the athlete, the researcher was helped by a national licensed trainer and the process of the male volleyball athlete selection of PBVSI Sumenep during the re-

search was assisted by the research team to coordinate the samples.

**Data Collection Technique**

The data collection process was divided into several parts. The first phase was the subjects were informed about the purpose and the advantage of the research. The subjects who were willing to involve filled in the informed consent as an agreement until the end of the research. The second phase was the data collection of the first VO2max by using the MFT test. The third phase was the subject received the treatment according to their group.

The parts of body that get massage treatment include thigh and back of the calf by giving some main manipulations including efflurage, petrirage, walken, shaking, and tapotemen. Massage could have influences on recovering fatigue in children after sport (Nurul Janah, 2013).



**Picture 1.** The One of the effleurage massage techniques (The procedures for sports massage,2019).



**Picture 2.** Recovery jogging (Michael, 2017)

The active recovery treatment is conducted by doing jogging for 20-30 second with low intensity. According to the research of (Rasyid & Supriyanto, 2017) the jogging

technique could have impacts on reducing the level of lactic acid level on a badminton athlete.

The passive recovery treatment is conducted by doing sitting without other activities for 60 seconds. The researcher did the treatment process three times a week and the samples received the treatment based on their group. After 2 months, the researcher did the post-test data from all groups, experimental and control group.

**Data Analysis**

The research data were analyzed by using statistical technique T-Paired T-Test to investigate the effects on the three groups receiving treatment during research, they are the active recovery group with massage technique, passive recovery group with massage technique, and control group with significance level at 0,05.

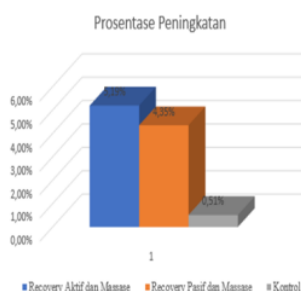
**RESULT**

The result of the study can be seen in Table 1. Table 1 shows that the score of VO2MAX from group 1, the group with active recovery with massage, is 37,98 (ml/kg/minutes) in pre-test and 39,95 (ml/kg/minutes) in post-test. The group two, the group with passive recovery with massage, gained 35,86 (ml/kg/minutes) in pre-test and 37,42 (ml/kg/minutes) in post-test. The third group, the group without treatment, gained 37,16 (ml/kg/minutes) in pre-test and 37,35 (ml/kg/minutes) in post-test.

**Table 1.** The Subjects' VO2MAX Result

Research Subject		VO2		Description
		Max (ml/kg/minutes)	Sig. (2-tailed)	
Group I	pre-test	37,98	0,003	Significant
	post-test	39,95		
Group II	pre-test	35,86	0,038	Significant
	post-test	37,42		
Group III	pre-test	37,16	0,474	Not Significant
	post-test	37,35		

The result of this study shows that each group gained improvement. It was the result of the six week of training. Group I and group II gained a significant improvement ( $p < 0.05$ ). However, the third group did not gain a significant improvement.



Picture 3. Percentage of Treatment Improvement

From the third post-test, the highest improvement is reached by the Group I, the group receiving active recovery with massage. The improvement shown in Figure 1 is 5,19% for Group I, 4,35% for Group II, and 0.51% for Group III.

## DISCUSSION

According Physical capacity of an athlete is an important element in sport achievements. It involves various different capacities, with aerobic capacity as the main component. The basic of an organism physical physiological capacity combines the organism functional capacity to improve the metabolism process level that suits the needed physical effort. Metabolism process in this definition means the chemical energy transformation into mechanic energy (Molik et al., 2017).

Endurance is a term that refers to two separated-related concepts: muscle endurance and cardiorespiratory endurance. Each of them has a unique contribution for athletic performance, they have different role for different athlete. Meanwhile, muscle endurance is specifically meant for individual or group muscles. The cardiorespiratory endurance is related to the ability to keep the dynamic and continuous training of the body

by using the major muscle. The endurance of mobile respiratory is related of the development of cardiovascular and respiratory system ability to keep the oxygen circulation to the working muscles during a long period training, and to use the energy aerobically (Kenney, Wilmore, & Costill, 2016). In this research, the active recovery with massage treatment and passive recovery with massage treatment on volleyball athlete showed a significant result during the two months of treatment with three times of training per week.

According to Figure 1, the result of the treatment during training shows that active recovery with massage has a higher improvement on the maximal endurance capacity (VO<sub>2</sub>MAX) of volleyball athlete PBVSI Sumenep (5,19%). It is relevant with the research involving different subjects conducted by (Musrifin & Bausad, 2013) that was aimed at measuring the effect of sport massage as a passive recovery in improving the maximum capacity of endurance (VO<sub>2</sub>MAX) of futsal athlete of IKIP Mataram. The sport massage as a passive recovery is better than the active recovery in improving VO<sub>2</sub>Max of futsal athlete of IKIP Mataram, 10,37 % (The Experiment Group, received sport massage method as a passive recovery) and 6,57 % (Control Group, received free movement active recovery). It is also in line with the result of the study of (Kurniawan & Elfarabi, 2018). The aim of the study was to prove the effectiveness of recovery technique to reduce the fatigue level of football athlete. The sample of the research were 24 football athletes aged  $15,54 \pm 2,2$  years and weigh  $55,25 \pm 10,92$  kg. The result shows that active recovery and the recovery combination could reduce the level of fatigue of football athlete. The combination of recovery has an average decrease of fatigue index level and lactic acid level  $2,59 \pm 0,44$  watt/s and  $3,03 \pm 0,21$  mmol/L, while active recovery has an average decrease of fatigue index and lactic acid index level for about  $3,66 \pm 0,42$  watt/s and  $2,2 \pm 0,25$  mmol/L. The result of this research is expected to be implemented in training or competition as an alternative recovery to decrease the level of fatigue of football players.

In team sport, such as volleyball, there is no relevant literature about periodization, a better distribution of training load, and an appropriate athlete recovery (Andrade, Fernandes, Miranda, Coimbra, & Filho, 2018). By using the technique explained previously, the

sport physiology expert could measure the number of energy spent by a person in various conditions. This session explains the level of energy expenses of the body, or the metabolism level, in resting condition, during sub maximum and maximum intensity training, and during the recovery period after sport competition (Kenney et al., 2016). The athletes and trainers continuously keep perfecting the training strategy to develop their competitive strength before competition. The use of therapy, thermal agent, electricity stimulation, and massage are often used for before tournament preparation. Besides the frequency of massage treatment, only some studies are found investigating the effect of massage on sport performance (Jason Brummitt, 2008), there are a lot of existing recovery methods developed overseas, but it is contrary with the condition in the level of regency level, especially related to the limited knowledge of trainers about sport coaching science.

However, there is a research shows that massage does not have a significant effect (Weerapong, Hume, & Kolt, 2005). Comparing the group receiving 10 minutes of massage before sub maximum training (80% from maximum heart rate) with control group arrives in the result that there was no differences for the measured variable during training (VO<sub>2</sub>, stroke volume, heart rate, blood pressure, cardiac output, and artery oxygen differential). Massage is not proven to have a significant effect on the frequency of treatment whether implemented for 30 minutes of sprint on population (Weerapong et al., 2005).

It is expected that the result of this research could be a reference for athletes and coaches for achieving the achievement in the future.

## CONCLUSION

The conclusion of this research is that there is a significant effect on the VO<sub>2</sub>max changes after the massage treatment in the active and passive recovery groups. Massage could be an additional technique during training or competition. The research suggests that the athlete and the coaches use this combination of recovery techniques, such as massage and jogging, for a fast and accurate recovery.

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