

Manipulation Analysis Sport Massage On Decreased Heart Rate After Swimming 100-Meter Freestyle

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Abstract

Swimming 100 meters freestyle could increase heart rate and blood pressure because the body needs to meet oxygen intake. Excessive increase in pulse rate could be harmful to health. This study aims to determine the difference in heart rate after swimming 100 meters freestyle, without manipulation, and after sports massage. This research was conducted using quantitative research methods in the form of comparative methods. Research data was collected through interviews and observations. The population in this study were students of the class of 2023 swimming course at the State University of Surabaya. Sampling was carried out using purposive sampling with inclusion criteria, namely 1) Male; 2) Age between 19-24 years; 3) 3 days before did not act eccentric exercise; 4) Carrying out a 100-meter freestyle swim at the research location to obtain 30 respondents. Data collection was carried out using a questionnaire and recording the results of pulse measurements using a pulse meter. The results show that there is a difference in the decrease in heart rate between the first measurement without manipulation and the second measurement with sports massage manipulation. The test results state that there is a significant effect between exercise massage and a decrease in the pulse rate of athletes swimming in the 100-meter freestyle with a P-value of 0.001.

Keywords : *Swimming, 100-meter freestyle, Massage, Sports, Heart Rate*

1. Introduction

Physical activity causes changes in blood flow circulation in the body due to increased metabolism in muscles resulting in intramuscular vasodilation to remove metabolic waste substances when muscles contract. As a result, the cardiovascular system will compensate by increasing heart rate and blood pressure to meet oxygen intake. An increase in pulse rate will have an adverse impact on health. This will increase the workload of the cardiovascular system. Heart rate recovery after exercise is a predictor of cardiovascular mortality and the effectiveness of a training program on cardiovascular function can be assessed from the changes in heart rate that occur. The recovery period is a complex process aimed at restoring the body's energy, repairing damaged muscle tissue after exercise, and starting the body's adaptation process to exercise.

Swimming is an individual or team racing sport that requires the use of one's entire body to move through water. This sport takes place in swimming pools or open water (for example, in the ocean or lake) (Amadea et al., 2023). Swimming is a type of sport that can be done by children and adults where the swimmer tries to float and lift the body so as not to drown. It can be done in freshwater or salt water (sea) so that the body can float on the water and can move (Rizkiyansyah & Mulyana, 2019).

Swimming is defined as an activity in which a person regularly practices sports to move as quickly as possible through the water thanks to the propulsive force generated by the arms, legs, and body that overcomes water resistance to move forward (Escalante et al., 2012). Swimming is also a cyclic sport where bioenergetic factors and biomechanical factors influence the fundamental role of performance (Sousa et al., 2014).

Swimming 100-meter freestyle is included in the glycogen-lactic acid system category, meaning it requires 2.5 mol ATP/minute and a maximum muscle activity time of 1-2 minutes. In this metabolic system, the first stage of glycolysis occurs without the help of oxygen (O₂) and glucose in the body is broken down into 2 pyruvic acids. If the second oxidative stage lacks oxygen in this metabolism, most of the pyruvic acid turns into lactic acid which will diffuse into the interstitial fluid and bloodstream (Hall & Hall, 2020). Swimming is a form of

aerobic exercise that means very minimal injury to those who do it on one condition, namely that we already know and clever how to swim well. Swimming includes the type of aerobics, namely swimming with style free and chest (Agus, 2012). Swimming 100-meter freestyle will cause VO₂ Max. VO₂ Max is energy at the maximum rate of oxygen use in aerobic metabolism. VO₂ Max can be interpreted as the product of measuring the difference in the volume of oxygen in the arteries and veins (measured in mL O₂/L) and maximum cardiac output (measured in L/min) (Espada et al., 2023). The difference in the amount of oxygen is measured using open-circuit spirometry where the individual breathes through a low-resistance valve. So far, VO₂ Max has been measured to determine the amount of oxygen and carbon dioxide that can increase lactate production, then the resulting excess lactate begins to accumulate in the blood and becomes one of the causes of increased ventilation activity in the body (Adi & Soenyoto, 2023).

According to (Permana, 2020), freestyle swimming is a swimming style that creates limbs to glide more quickly compared to other styles. Movement legs and arms that work like pedaling rotating alternately and legs that work breaking water is part of the freestyle movement. In freestyle, it produces movement that is faster but of all it requires practice which must be done regularly continuously, and directed. To achieve the objectives of the training, it is necessary to organize concepts or programs that lead to improving skills (Amansyah & Daulay, 2019).

If this is left without efforts being made to treat muscle injuries, it will cause pain and muscle damage. Physiologically, sports massage has been proven to reduce heart rate, increase blood pressure, improve blood and lymph circulation, reduce muscle tension, increase joint range of motion, and reduce pain (Sifaq et al., 2023). According to (Gholami, 2023), massage significantly prevented the increase of CK and LDH after 24 and 48 hours, which indicated the benefit of massage in young men after intense physical activity. LDH is also called lactic acid dehydrogenase. It is an enzyme. An enzyme is a protein that speeds up certain chemical reactions in your body. CK (Creatine kinase) is an enzyme that helps produce energy from muscles. These physiological benefits have been widely used by athletes both to support physical performance and for other purposes such as prevention, therapy, and rehabilitation of injuries and the negative impacts of sports. However, this needs to be proven by analyzing the manipulation of Sports Massage On Decreased Heart Rate After Swimming 100-meter Freestyle.

Sports massage one of the known ones is a technique or manipulation of Swedish massage which is usually used after activity or exercise in effleurage, petrissage, shaking, friction, and tapping (Einstein, 2022). However, until now it is not known what effect this will have on reducing the heart rate in someone who has done a 100-meter freestyle swim.

Therefore, this research aims to analyze manipulation sport massage which is often used as a passive recovery by measuring changes in heart rate. The urgency of this research is based on the fact that there is no proof that sports massage The Swedish technique can be used as a passive recovery which can reduce the pulse rate by measuring changes in pulse rate before and after manipulation sports massage.

2. Method

This research is quantitative research with a comparative method between the pulse rate before manipulation and after manipulation sports massage on Surabaya State University students after swimming the 100-meter freestyle. The population is all students who take swimming classes and have done the 100-meter freestyle which is included in the inclusion criteria. A sample of 30 students was obtained using a purposive sampling technique.

The inclusion criteria applied are 1) Male; 2) Age between 19-24 years; 3) 3 days before do not do any eccentric exercise; 4) Swim 100-meter freestyle at the research site. Samples were given an initial health examination, which was carried out by interview, and physical examination, and were willing to be measured with a pulse meter beforehand, and

then manipulated sports massage and measured again using a pulse meter. The average age of the sample was 20.24 years.

Data collection uses instruments in the form of questionnaires and measurements using a pulse meter. Filling out the questionnaire is done online using a Google form containing biodata. The instrument and pulse meter measurement results used have a good level of validity with a reliability value of 0.847. The data analysis technique uses quantitative descriptive analysis and comparative analysis with the Mann-Witney test using SPSS version 26.

3. Results and Discussion

Data was obtained using instruments from 30 students who were sampled to find out whether there was a decrease or significant difference in pulse rate. The data was then processed using SPSS version 26.

a. Results of descriptive data analysis of respondents

The data obtained was then analyzed to determine the characteristics of the respondents in the research sample including age and pulse meter measurement results. The results of this data analysis can be seen in Table 1.

Table 1. Heart Rate Measurement Results

Number of Respondent	Heart Rate (Non Massage Treatment)	Training Heart Rate (100 m Free Style Swimming)	Heart Rate (Massage Treatment)
1.	66	124	72
2.	70	120	74
3.	65	130	70
4.	67	125	73
5.	75	130	76
6.	73	120	80
7.	76	102	80
8.	78	120	80
9.	68	128	72
10.	77	124	80

Number of Respondent	Heart Rate (Non Massage Treatment)	Training Heart Rate (100 m Free Style Swimminn)	Heart Rate (Massage Treatment)
11.	70	100	70
12.	66	126	73
13.	72	116	74
14.	66	110	74
15.	68	124	70
16.	66	128	74
17.	70	122	76
18.	65	110	72
19.	63	100	66
20.	67	105	70
21.	80	122	78
22.	68	115	70
23.	65	120	70
24.	75	130	78
25.	68	122	72
26.	64	125	70
27.	70	112	74
28.	66	110	70
29.	67	115	68
30.	70	112	70

Source:Data Processing

Based on the results obtained in Table 1, 30 respondents met the inclusion criteria. The average age of respondents who took part in this research was 20.24 years with a participant age range of 19 – 24 years. Based on the research results, it is known that there

is a difference in pulse measurements before and after the manipulation of sports massage. The facts show that all students measured experienced a decrease in pulse rate.

b. Results of statistical analysis of pulse measurements before and after manipulation sports massage in students who swim the 100-meter freestyle.

Table 2. Descriptive statistical results of heart rate measurements

	N	Minimum	Maximum	Mean	Std. Deviation
Heart rate non-treatment	30	63.00	80.00	693.667	448.356
swimming heart rate	30	100.00	130.00	1.182.333	895.076
Heart rate after treatment	30	66.00	80.00	732.000	383.631
Valid N (listwise)	30				

Source: Data Processing

Based on the results of Table 2, it can be seen that the standard deviation of the pulse rate before manipulation is 4.48356, while the standard deviation of the swimming pulse rate is 8.95076, and the standard deviation of the pulse rate after manipulation is 3.83631. After that, the data was tested to determine whether it was normally distributed or not, as in Table 3 below:

Table 3. Normal Distribution Test Results

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Heart rate non-treatment	.186	30	.009	.910	30	.015
swimming heart rate	.178	30	.016	.926	30	.039
Heart Rate after treatment	.165	30	.037	.918	30	.023

Source: Data Processing

a. Lilliefors Significance Correction

From Table 3, the results obtained show that the data was not normally distributed because the p-value < 0.05, therefore it was continued with the homogeneity test and the Mann-Witney statistical test. Results of the homogeneity test. Homogeneous data is normal because the p-value is > 0.05, but the Table is not shown here. Continue with the Mean Witney statistical test which can be seen in Table 4 below

Table 4. Mann-Witney Rank statistical test results

	Grou p	N	Mean Rank	Sum of Ranks
Heart Rate pre-post	1.00	3 0	22.73	682.00
	2.00	3 0	38.27	1148.00
	Total	6 0		

Source: Data Processing

Table 5. Mann-Witney Statistical Test Results for Pre-After Heart Rate Sports Massage

	Heart Rate pre-post
Mann-Whitney U	217.00 0
Wilcoxon W	682.00 0
Z	-3.473
Asymp. Sig. (2-tailed)	.001

Source: Data Processing

From Tables 4 and 5, it can be concluded that there is a difference between pulse rate before and after exercise massage with a p-value (asyp. Sig (2-tailed)) < 0.05. This research proves that there is a difference in heart rate before and after sports massage.

Based on the research results obtained, it is known that there was a significant decrease in pulse rate as a result of manipulation with sports massage. From the data, it was found that there was a difference between the pulse rate before and after manipulation. Based on the research results, it was found that there was a difference between pulse rate before and after massage with p-value (asyp. Sig (2-tailed)) < 0.05. The results of this study found that there was a difference between the pulse rate after swimming 100-meter freestyle compared to that between unmanipulated, and manipulated sports massage. This is by research from (Rasooli et al., 2012) who stated that there was a significant effect between massage and reducing the pulse rate of swimming athletes with a P-value of 0.001, which in their research was mentioned as a tool for recovery in swimming athletes.

(Benjamin, 2005) in their book says Sports massage After swimming, light compression, pressure, mobilization, and stretching of joints can make certain areas more relaxed and calming. Slow massage can facilitate the body becoming more relaxed so that the pulse becomes lower and stable. Meanwhile, a massage that shifts and rotates will make the blood circulation redder and smoother. massage can help athletes' physical and mental condition on the sidelines of competitive matches.

Swimming is one of the sports that includes Exercise-induced muscle damage or muscle damage. This is because swimming is a sport that has movements with high intensity and fast duration, and also involves the aerobic system. This also has the effect of increasing your heart rate during swimming. A fast pulse rate is related to a faster heart rate, due to stress on the aerobic system (RADNOVICH, 2005). Recovery techniques for athletes are needed to be able to compete or be able to train again at an appropriate level. One recovery technique is to use Sports massage. (Halsen, 2013).

The results of this study are also in line with research (Weinberg et al., 1988), which states that sports massage swimming consistently affected respondents in terms of increasing positive mood and significantly reducing tension, confusion, fatigue, anxiety, depression, and anger.

4. Conclusions and Recommendations

Based on the results obtained, it can be concluded that it can be seen from the results that swimming 100-meter freestyle can cause the measured pulse rate to get faster, Sports massage has the effect of lowering the heart rate. It was also found that all respondents' pulse rates dropped after the manipulation of sports massage when compared to without manipulation. In this study, there was a significant difference between the decrease in heart rate after swimming 100-meter freestyle without manipulation sports massage-with what sports massage. The difference can be seen in a decrease in pulse rate and faster relaxation.

Based on the research results obtained, it is recommended that athletes who have done the 100-meter freestyle swim should immediately receive manipulation sports massage so that the pulse rate drops quickly and relaxes. Further research can be carried out regarding the types of manipulation sports massage which can have a significant effect on reducing heart rate.

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