

# The Effect of Breaststroke Swimming Exercise to Increase the value of Peak Expiratory Flow

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**Abstract**—The purpose of this study is to investigate the influence of breaststroke swimming exercise to improving the peak expiratory flow. Methode: This study used 17 students of men aged 19-21 years, APE values measured before and after the study. Style swimming workout done in accordance with a program that has been made. Result: Value of peak expiratory flow in male students obtained on average before exercise ( $530 \pm 15$  811) liters / min and after doing the exercises ( $540.59 \pm 17$  092) liters / minute. Paired t-test showed  $t = -6.446$  and  $p = 0.000$ , which means there are differences in peak expiratory flow values before and after exercise swimming breaststroke. Conclusion: The conclusion is the breaststroke swimming exercise can be improving of peak expiratory flow.

**Keywords**—breaststroke, peak expiratory flow

## I. INTRODUCTION

PHYSICAL exercise has a reciprocal relationship with the respiratory system. In person the right to do physical exercise and regularly will improve the function of respiratory and cardiovascular system. Instead of good respiratory system will increase the resilience of someone in physical exercise [1].

In sports, especially swimming exercise like breaststroke, at the moment of inspiration, making breathing through the mouth and on expirasi out through the mouth in the water. Meanwhile, during the process of taking a second breath to contract from the front arm towards your chest so that the resulting head went up to the process of taking a breath through your mouth, then straightened arm forward again, causing his head down to the water, in water expiratory process occurs slowly through the mouth. As inspiration, the chest cavity increases in diameter in three directions namely anterior posterior, laterally and vertically due to contraction of diaphragm and mm.intercostalis externa. On inspiration, m.pectoralis minor and m. sternocleidomastoideus was instrumental in increasing the volume of the chest cavity due to increase muscle anteroposterior chest diameter, while the quiet expiration is a passive process of the lung and the chest after a stretch during

the process of inspiration. At the expiration of, um. Intercostalis internus contracts and assisted by the muscles of the abdominal wall so that the volume is reduced and air out your chest [2]. The process of exchange of oxygen and carbon dioxide concentration in the blood affect and stimulate the respiratory center located in the brain to increase in respiratory rate resulting in taking oxygen and carbon dioxide spending more [3]. To see the changes in pulmonary ventilation function and chest wall because of breaststroke swimming exercise regularly lung function test is required. Lung function test can be done by checking the value of peak expiratory flow (APE) / Peak Flow Rate (PFR) by Peak Flow Meter (Wright McKerrow Meter) made by Clements, inc. (England). Changes in lung function due to regular exercise training would affect the value of Peak Expiratory Flows [1].

The background of the above, can be formulated problem is there breaststroke swimming exercise influence on improving the peak expiratory flow, whether there are differences in the time before exercise and after exercise to increase the peak expiratory flow.

The benefits of this research, if proven whether there is a difference before exercise and after exercise swimming breaststroke on improving peak expiratory flow.

## II. METHODE

We check the 30 students who volunteered to man as research samples. They must be in good health, have no sick with coughs and shortness of not having a diagnose illness (astma bronchiale). After preliminary examination only 17 students can take the data. This is because some students are not doing well inspection and compliance in following research.

Type of quasi experimental study, because the same treatment on the same object taken the data before and after the study.

Examination conducted in a state of standing and the results are taken 3 times the highest results and examination of age, height and weight. The tools used are Wright peak flow meter for peak expiratory flow values and scales for weight and height using SMIC (China).

How to research work, prior to the study of data taken APE, after which the subjects were treated breaststroke swimming exercise 3 times a week for 2 months with a distance of 400 meters (8 times), APE data taken after completion of the study.

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How to capture data APE: 1) The subjects stood upright with its own tool holding Peak Flow Meter, 2) Subject to the maximum inspiration slowly through your nose until no longer able to inhale and peak flow meter device is inserted into the mouth, 3) Then with quick release exhaled breath with a strong (ekpirasi maximum) through the mouth and there should be no air coming out through the nose (nose closed), 4) View and record peak flow values Ekspirasi, 5) measurement was done 3 times per subject, interspersed with 5 minute break between examinations The first and second. 6) From the examination made of the highest results, 7) Every will change the subject, diseterilkan tool with 70% alcohol.

### III. RESULT

Examination of Peak Expiratory Flow on students aged 19-21 years at the time before exercise showed an average rate ( $530 \pm 15$  811) liters / minute and at peak flow rate after exercise ekspirasinya be ( $540.59 \pm 17$  092) liters / minute.

Test data peak expiratory flow rate before treatment and after treatment in this study were given a normal distribution of data using the Kolmogorov Smirnov test, thus the data were analyzed using parametric statistical tests.

TABLE I  
THE VALUE OF PEAK EXPIRATORY FLOW

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	Sam	Age	Weight	Height	APE I	APE II	Delta
	-pel	(year)	(kg)	(m)	(lt/mn)	(lt/mn)	APE
X	17	19.41	59.88	1.6859	530	540.59	10.59
S.D	-	0.618	12.644	0.3392	15.811	17.092	6.774

Description: lt/mn = liter/minute, APE I=peak flow rate before exercise, APE II peak flow rate after exercise

TABLE II  
THE RELATION OF AGE, HEIGHT AND WEIGHT TO APE

Variabel	r	p
Age and APE	-0,315	0,281
Height and APE	-0,066	0,800
Weight and APE	-0,255	0,323

Description table 2;

- 1) Age and APE = relation of the ages of the subjects and peak expiratory flow. There was no significant relationship between age and the value of peak expiratory flow. The value of negative correlation means that the older the age the lower the value of peak expiratory flow.
- 2) Height and APE = relation of height and peak expiratory flow. Significance value is greater than 0.05 which means there is no significant correlation between body height with the peak current value ekpirasi. A negative correlation value means that the higher one's body the lower the peak current value.
- 3) Weight and APE = relation of weight and peak expiratory flow. There was no significant relationship between body weight and peak expiratory flow values, whereas a negative correlation value indicates the greater the person's weight, the lower value of peak expiratory flow.

TABLE III  
RESULT OF PAIR T-TEST (N=17)

Variable	t	p
Pre and post	-6,446	0,000

Description for table 3, showed that significant it is mean any a difference between before treatment breaststroke swimming exercise and after treatment breaststroke swimming training on peak expiratory flow ( $p = 0.000$ ).

### IV. DISCUSSION

The results showed that there was no significant relationship between age, weight and height in a given sample breaststroke swimming exercise for 3 weeks with a frequency of 3 times a week with peak expiratory flow values. That means the older person, the peak expiratory flow rate is lower, so the weight is greater then the peak expiratory flow rate decreases, as well as the height, the higher a person's height the lower the value of peak expiratory flow.

Difference test showed that the treatment given training prior to swimming the breaststroke and after being given a breaststroke swimming practice there are significant differences. The differences are not entirely from the factor treatment and control variables that have been inspected prior to conducting research while also control over the variables that influence the experiment is not completely controlled, such as activities undertaken in addition to exercise swimming breaststroke, food eaten, and so forth.

Physical exercise will give effect to the working organs of the body. In people who are trained, more efficient organ work and maximum work capacity of the body will increase [1].

The increase in peak expiratory flow rate is caused by various factors: 1) increased respiratory muscle strength every respiratory muscle work effectively in people who are trained will produce pressure sufficient inspiration to make maximum ventilation so that respiratory function will increase [6]. 2) Increase tidal volume, occurred either by the addition of reserves and additional inspiration volume expiratory reserve volume. That limits the tidal volume is vital capacity, but only rarely increase tidal volume exceeds 50% vital capacity. In addition, the respiratory frequency is limited by the speed of the system neuromuskuler set alternating movements [4]. 3) The relationship between the factors that also regulate breathing during work / during the workout looks: 1) the direct influence of respiration by cortex Senta cerebri, 2) direct stimulation of proprioceptors which are all factors neurogen. Apart from that there is another humoral factor that helped set the following: 1) CO<sub>2</sub> concentration, 2) the concentration of ions H, 3) the concentration of O<sub>2</sub> [5]. 4) The factors that limit the functionality of O<sub>2</sub> for breathing is the need of respiratory muscles themselves are in a resting state requires a 0.5 to 1 ml O<sub>2</sub> / liter of ventilation. With increasing ventilation for respiratory muscle O<sub>2</sub> demand increases progressively until it reaches 10% of the total number of O<sub>2</sub> was taken [4].

### V. CONCLUSION

Breaststroke swimming exercise influence on the peak expiratory flow increased in men aged 19-21 years.

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REFERENCES

- [1] Yunus F. 1997. *Faal Paru dan Olahraga*. Jurnal Respiratologi Indonesia. Page 17.
- [2] Marieb Elaine. 2001. *Human anatomy & physiology 5<sup>th</sup> edition*. United States of Amerika: Benjamin Commings Publishers.
- [3] Syaifuddin. 1997. *Anatomy Fisiologi untuk siswa perawat*. Jakarta: EGC
- [4] Hasjim Efendi, Prof. Dr. 1983. *Fisiologi Kerja dan Olahraga serta peranan tes kerja (Exercise test) untuk diagnostic*. Penerbit alumni: Bandung
- [5] Guyton. 2001. *Buku Ajar Fisiologi Kedokteran*. Jakarta: EGC
- [6] Surjadha Adrianta. 2004. *Laju Puncak Ekpirasi Mahasiswa Pria Sehat*. Jakarta: Majalah Kedokteran Indonesia.