The Contribution of Limb Muscle Strength and Height Towards the Speed of 40 Meter Freestyle Swimming

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ABSTRACT

The low speed of freestyle swimming of SMK N 5 Padang students was the matter of research. This study aims at determining of contribution of leg muscle strength (X1) and height (X2) towards the speed of 40 meter freestyle swimming(Y). This quantitative research used ex post facto type. The population was the students of SMK N 5 Padang 2014-2015 academic year, while the sample was 50 male students. The sampling technique used was is purposive sampling. The data was collected through measuring the leg muscle strength by means of dynamometer Leg while the height was measured by Rool meter. Furthermore, the speed of freestyle swimming was measured through conducting 40 meters swimming test. The data were analyzed using descriptive statistics by using product moment correlation test. The result shows that 1) there is significant contribution of the leg muscle strength toward freestyle swimming speed of 40 meters at (66.3%), 2) there is significant contribution of height to the speed of 40 meters freestyle swimming (76.4%), and 3) there is significant contribution of leg muscle strength and height altogether toward the speed of 40 meters freestyle swimming (78.0%).

Keywords: Limb muscle, 40 meter freestyle swimming

1. INTRODUCTION

Physical education, sports, and health as part of education have the same role as education itself, as mentioned by the Ministry of Education (2006) that: Physical education, sports and health are media to encourage physical growth, psychological development, motor skills, knowledge and reasoning, appreciation of values (mental-emotional-sportsmanship-spiritual-social attitudes), and healthy lifestyle habits that lead to stimulate the balanced growth and development of physical and psychological qualities.

Physical education, sports, and health can be used as a tool to achieve educational goals. Through sports and game activities that contain a lot of positive values in it, it is expected to help students to develop cognitive and effective abilities, not just psychomotor abilities. In accordance with the objectives of penjasorkes in the standards of competence and basic competence.

In order to produce skilled sports education personnel as expected, students are equipped with various branches of sports science and some supporting sciences that are closely related to improving sports. All of this is given in the form of theory and practice, according to the burden of subjects in sports.

One branch of sports given to students is swimming, where in swimming there are several styles of swimming such as freestyle swimming, chest, butterflies and back style. Freestyle is a suitable swimming style given to students who are just learning to swim because is considered easy. Besides, philosophically, it also has a series of movements that are almost similar to walking every day.

Tyler (2008:14) say that freestyle swimming is the fastest swimming of all the most popular styles and styles used in recreational swimming and matches. Freestyle swimming is one of the styles found in swimming where the style is a style that is often used by children and adults.

Thomas (2000:19) argues that: "freestyle is a force that performs hand movements over the surface and allows it to move in water faster than other forces. Chalid (1999:34) states that freestyle swimming is a suitable style given to children who are just learning to swim, otherwise it also has a series of movements that are almost similar to daily walking activities.

In reality in the field, most students seem to have difficulty in practicing freestyle. When they swim, they often make mistakes and wrongly perform the appropriate technique, such as the position of the body is not parallel to the surface of the water, breathing is irregular, the inefective movements of arms and legs that waste the energy. Those mistakes lead to fatigue and any other inefficient problems. This situation overwhelmed the students when they are instructed to do freestyle swimming within a certain distance.

Students' success in swimming is influenced by two factors, internal and external factors. Internal factors physical abilities, techniques, tactics, and mental abilities. External factors are such as teachers, coaches, climate and weather, nutrition, facilities and infrastructure, organizations, friends, family and so on. In addition there are other factors that influence, namely prime physical abilities, good techniques and strong mental abilities and external factors, namely teachers, friends, climate and weather, nutrition, infrastructure, and socio-economic factors. One of the external factors that greatly influences swimming is the teacher because they have to be able to provide the correct and proper explanation to improve swimming abilities, especially for 40 meter freestyle swimming.

Based on the situation mentioned above, the researcher considers that this problem due to the lack of good swimming technique skills, low physical abilities possessed and height possessed by students.

To support the success of freestyle swimming speed capabilities, each student must swim properly, have good physical condition, and an ideal height which determine the success rate of the freestyle swimming speed within certain distance. In addition, the strength of the leg muscles and the ideal height are dominantly determining the speed of freestyle swimming.

The strength of the leg muscles is one component of the physical condition that is very decisive in freestyle swimming performance, especially in swimmer's foot movements. If the foot movement is stronger so that it produces strong thrust power to move the body's speed quickly and when used within 40 meters it will have more speed than the other forms of movement.

In swimming, a person taking part in a race will certainly take a certain distance, therefore a swimmer to reach that distance will involve his body length and length associated with height, so that a tall body swimmer will reach a distance faster than those who short body. Because the height associated with the length of the arms and long arms will expand the stroke area and will accelerate the pace forward. The role of the arm here can be seen clearly when doing the stroke (Thomas: 2000).

Due to the importance of these two, the researcher is likely to know how much they contribute to the speed of freestyle swimming. Thus, the purpose of this article is to describe the contribution of each Xs variables to the Y variable.

2.   METHOD

This was a quantitative resrach using ex post facto type. The sampling technique used in this study was purposive sampling. The data were the results of leg muscle strength measured by leg dynamometer and height measured by a rool meter tool as well as the results of a 40 meter freestyle swimming speed performed by students of SMKN 5 Padang.

The data was analyzed by using simple correlation and multiple correlation statistical analysis techniques. However, before carrying out the hypothesis testing, the normality test and reliability test were conducted.

3.   RESULTS AND DISCUSSION

Based on the results of leg muscle strength using the leg dynamometer, the maximum score obtained was 179.5 and the minimum score was 57.0. Besides the mean value (average) was 93.89 and standard deviation was 22.07.

Based on the measurement of 50 samples, 5 people (10%) had leg muscle strength ranging from 57-76 repetitions, 25 people (50%) had leg muscle strength ranging from 77-96 repetitions, 18 people (36%) had Leg muscle strength ranged from 97-116 repetitions, 2 people (4%) had leg muscle strength ranging from 157-176 repetitions. Besides, the average leg muscle strength was 93.89 repetitions.

In addition, the height was measured by rool meter units of cm, to measure from the sole of the foot to the upper head. The highest sample was 177 and the shortest was 149. Besides, the mean was 163.50 and standard deviation was 6.75.

Based on the measurement above, 5 people (10%) had height ranging from 149-154, 6 people (12%) had height ranging from 155-159, 16 people (32%) had height ranging from 160-164, 13 people (26%) had height ranging from 165-169, 8 people (16%) had height ranging from 170-174, 2 people (4%) had height ranging from 175-179. Thus, the average height of the sample was 163.50 cm.

Moreover, based on the results of 40 meter freestyle swimming speed test performed, the maximum score = 1.2772 and the minimum score = 0.2917, besides the mean value (average) = 0.6470 and standard deviation = 0.3015.

Based on the test results, 15 people (30%) had a 40 meter freestyle swimming speed ranging from 0.2917-0.4408, 21 people (42%) had a 40 meter freestyle swimming speed ranging from 0.4409 -0,5899, 2 people (4%) have a 40 meter freestyle swimming speed ranging from 0,8882-1,0372, 12 people (24%) have a 40 meter freestyle swimming speed ranging from 1,0373-1,1863 , From the 40 meter freestyle swimming speed data obtained from 50 samples, the average swimming speed was 0.6470.

Test Requirements Analysis

The normality of the data was tested through Liliefors testing ($\alpha = 0.05$). it was found that Lo score = 0.121 (n = 50) while Ltab ($\alpha = 0.05$) was 0.125 which is greater than Lo. Thus, it can be concluded that the scores obtained from leg muscle strength is normally distributed.

Furthermore, the height test results (X2), Lo score = 0.072 (n = 50) while Ltab (α = 0.05) was 0.125 which is greater than Lo. Hence, it can be concluded that the scores obtained from the height are normally distributed.

Then the results of 40 meter freestyle swimming speed (Y) show that Lo score = 0.124 (n = 50) while Ltab (α = 0.05) was 0.125 which is greater than Lo so it can be concluded that the scores was normally distributed.

Based on the description above, it turns out that all the variables (X1, X2, and Y) data were spread normally, because each Lo score was smaller than the Ltab (α = 0.05).

Hypothesis testing

This study has three hypothesis to be tested.

First hypothesis

The first hypothesis states how much the contribution of leg muscle strength to 40 meter freestyle swimming speed. The results show that rcounted 0.864 and rtable (α = 0.05) was 0.279. Thus, rcounted> rtable. It means that there is significant relationship between leg muscle strength and 40 meter freestyle swimming speed. To determine the magnitude of determination of leg muscle strength coefficient on freestyle swimming speed is to square the value of correlation coefficient (r) multiplied by one hundred (r2 x 100%) from the results of statistical analysis performed obtained value (K) = 0.7464. It means that leg muscle strength contributes to the freestyle *swimming speed as much as 74.64%. Therefore the first hypothesis in this study is accepted empirically.*

Second hypothesis

The second hypothesis states how much the contribution of leg muscle strength to 40 meter freestyle swimming speed. The results show that rcounted was 0.874 and rtable (α = 0.05) was 0.279 thus rcounted> rtable. It means that there is a significant relationship between height and 40 meters freestyle swimming speed. To find out the magnitude of the determination coefficient of height for freestyle swimming speed is to square the value of correlation coefficient (r) multiplied by one hundred (r2 x 100%) from the results of statistical analysis performed obtained value (K) = 0.7638. It means that the height of the body contributes to the freestyle swimming speed as much as 76.38%. Therefore the second hypothesis in this study is accepted empirically.

Third hypothesis

The third hypothesis is how much is the contribution of limb muscle strength and height together towards 40 meter freestyle swimming speed. Based on the calculation, it turns out that Fcounted (54.27)

> Ftable (3.19) then Ho is rejected and Ha is accepted. It means that there is significant relationship between X1 and X2 towards Y.

Besides, It can be seen that from the statistical analysis that rcounted was 0.883 and rtable (α = 0.05) was 0.279, thus rciunted> r table. It means that there is significant relationship between limb muscle strength and height together towards a 40 meter freestyle swimming speed.

To find out the magnitude of the contribution of limb muscle strength and height together to the 40 meter freestyle swimming speed is to compare the correlation coefficient value (r) multiplied by one hundred (R12y2 x 100%), from the results of the test the significance of multiple correlations is obtained Fcount = 54.27> Ftable 3.19, then Ho is rejected and Ha is accepted, meaning that there is a relationship which means between X1 and X2 toward Y.

Furthermore, the strength of the relationship calculated by multiple correlations (Ry. 2.2) was 0.883 and the coefficient of determination was 0.779, thus, it can be seen the contribution between leg muscle strength and height to the 40 meter freestyle swimming speed with the formula 0.8332 x 100% = 0.7796. In other words, the contribution of limb muscle strength and height together to the 40 meter freestyle swimming speed is 0.78%.

Based on the above hypothesis, it can be concluded that limb muscle strength and height altogether have significant contribution to 40 meters freestyle swimming of SMK N 5 Padang 2014-2015 academic year students.

Contribution of Leg Muscle Strength to the Ability of 40 meter Freestyle Swimming Speed

The results of the research proved that leg muscle strength as one of the physical conditions significantly contributes to the 40 meter freestyle swimming speed with a contribution rate of 66.3%. Based on the results of the first hypothesis testing it is known that leg muscle strength contributes significantly to the 40 meter freestyle swimming speed ability of Padang Vocational High School 5 students. The higher leg muscle strength students have, the higher the freestyle swimming speed ability possessed by Padang Vocational High School 5 students.

The strength of the limb muscles possessed by these students will be better and stronger with the exercises provided such as exercises without tools or weight training, the most important thing is that the exercise can increase leg muscle strength because the stronger leg muscle strength is owned, the better the result of the 40 meter freestyle swimming speed that is owned.

Swimmers who have strong leg muscle strength will be able to do strong foot punch movements and can affect the swimmer's appearance against freestyle swimming speed. This is an advantage for a swimmer.

Due to the good and strong leg muscle strength that is possessed, a swimmer is easier to be able to do a foot stroke in freestyle swimming movements to be able to produce high speeds. Therefore the contribution of leg muscle strength to the 40 meter freestyle swimming pool is large.

Body Height Contribution To Ability Of 40 meter Freestyle Swimming Speed

The results of the research conducted proved that height contributes to the 40 meter freestyle swimming speed with a contribution rate of 76.4%. Based on the results of testing the second hypothesis, it is known that height gives a significant contribution to the freestyle swimming speed ability of Padang N 5 Vocational School students. The higher the student's body, the higher the freestyle swimming speed ability of SMK N 5 Padang students.

In exercising other than the factors of physical, technical, tactic and mental conditions there is one more thing that needs to be considered is natural factors that are genetic or decreased such as a person's height because according to Sajoto (1995: 2) Biological aspects in the form of body structure and posture like height is one determinant of achievement in sports.

In swimming sports, a person taking part in a race will certainly take a certain distance, therefore a swimmer to reach that distance will involve his body length and length associated with height, so that a tall body swimmer will reach a distance faster than those who short body. Because the height associated with the length of the arms and long arms will expand the stroke area and will accelerate the pace forward. Therefore, the contribution of height to the 40 meter freestyle swimming pool is large.

Contribution of Leg Muscle Strength and Height Together to the Ability of 40 meter Freestyle Swimming Speed

This study proves that there is a contribution of limb muscle strength and height together to 40 meter freestyle swimming speed with a contribution rate of 78.0%, meaning that limb muscle strength and height together have an important role in which both contribute to 40 meter freestyle swimming speed.

The ability of freestyle swimming speed depends on leg muscle strength and height possessed, the stronger the leg muscle strength a person has, the better the swimming speed produced, as well as height because with the ideal height that is owned, the better the swimming speed which are owned.

Based on the results of testing the third hypothesis it is known that leg muscle strength and height together contribute significantly to the ability of 40 meter freestyle swimming speed of Padang Vocational High School 5 students. The higher the leg muscle strength of students and supported by adequate height, the

higher the ability of 40 meter freestyle swimming speed possessed by Padang N 5 Vocational School students.

To optimize a person's swimming speed becomes better and faster, then a swimmer must have an element of strong leg muscle strength and ideal height and also by doing exercises. In essence freestyle swimming speed requires leg muscle strength and height, with good and strong leg muscle strength and supported by the ideal height that is owned, a swimmer is easier to be able to do strong foot punch and do hand stroke with a range that is deep in freestyle swimming movements so that it can produce a high speed.

4. CONCLUSION

The conclusion of this research are shows that 1) there is a significant contribution of the leg muscle strength toward freestyle swimming speed. 2) There is a significant contribution of height to the speed of 40 meters freestyle swimming. 3) There is significant contribution of leg muscle strength and height altogether toward the speed of 40 meters freestyle swimming.

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