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PHYSICAL FITNESS AND LEG LENGTH CONTRIBUTIONS TOWARD CRAWLSWIMMING STROKE ABILITY

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Abstract

Swimming is one of sporting workout activity that able to increase physical fitness. Crawl swimming stroke is the stroke that easy and common to be taught to beginners. The purpose of this research was to observe the influence of physical fitness and length of leg towardsthe crawl-swimming stroke ability of the students in Faculty of Sport Science, Padang State University. This research had been done to the male students which have completed their study on 50 meters crawl-swimming stroke course, and were not a swimming athlete. The research population consists of 60 students from PGSD study program majoring physical education. The sampling technique was done by using quota random sampling technique. The amount of research samples decided was 50% of the population that was 30 persons. Data were processed using inferential statistic with computerize regression analysis. The results of this research were: 1) There were physical fitness contributions towards 50 meter crawl-swimming stroke ability. 2) There were leg length contributions towards 50 meter crawl-swimming stroke ability. 3) There were both physical fitness and leg length contributions altogether by 41% towards 50 meters crawl-swimming stroke ability.

Keywords: Physical Fitness, Leg Length, Crawl-swimming stroke ability

Preface

The faculty of Sport Science Padang State University (FIK UNP) as a formal educational institution that produced educator in the field of sport and health education demanded to be able to produce graduates who were professional in their fields. These was implied from the vision of the faculty that is to produce graduates which have knowledge, attitude, professional skill in sport, moral, national vision, high work ethic, and also virtuous, Buku Pedoman UNP (2010). Besides, it would also produce the reliable and professional training instructors in various sport fields.

Basically physic education was an integral part of overall educational systems. Therefore, physic education implementation has to be headed to reach that purpose. Physic education has an important role in intensify the education implementation as a process of human development that last a lifetime.

During their education, the students of FIK UNP were gathering various courses and practices, so that after they graduated they could be professional educators in their fields. One of the must to take courses was swimming. All of the students in FIK UNP must take this course either they were majoring Sport Education, Health and Recreation, or Training Education. Swimming course always been provided every semester.

Based on the information and survey retrieved by writer on field have been found that the learning outcomes of the students on basic swimming course in FIK UNP were still not maximal yet. Data retrieved from the lecturer who taught swimming in FIK UNP and from Puskom UNP was the students who enrolled swimming course on July-December 2010 term by 620 persons and been taught by 6 lecturers. The learning outcomes from 620 students were only 62 persons or around 10% obtained an A, 248 persons or around 40% obtained a B, 186 persons or around 30% obtained a C, 30 persons or around 5% got BL, and 114 persons or around 15% have failed.

From the data above were still many students who enrolled swimming course in FIK UNP have failed, and still a view who obtained an A. Thus, the learning outcomes of the students on basic swimming course in FIK UNP were still not maximal yet. To develop the learning outcomes of the students, it is necessary to do some efforts, such as doing a research to observe what factors that able to influence learning outcomes and students ability on swimming like crawl-swimming stroke, because crawl-swimming stroke is a basic swimming stroke that taught to someone when learning swimming.The success of someone mastering this basic swimming ability might be influenced by some factors, such as technic factor, physical condition and the body shape.

Swimming ability is the level of basic skill of the students on current time or when the test is being held. Kirkendall, translated by James Tangkudung *et.al* (1997) stated that ability is the level of basic skill or the current status, for example a student able to achieve the score7 on basic gymnastic training. This case describes the achievements of someone when measurement was taken. The results of this measurement were able to be retrieved from a test. Nurhasan (2001) added that measurement activities about the ability of students were an initial step in the evaluation process of the ability of students. The data which retrieved from measurement can be used to determine the ability of students as a result of the assessment in learning. On a swimming course, the examination of crawl stroke ability done by some items, one of them is 50 meter crawl stroke ability test.

The level of physical fitness is oneof the important components of the success of National development in all fields. In order to work effectively and efficiently someone need to have a good level of physical fitness. According to Giam (1993), someone who had a good physical fitness is someone who could do the daily activities full of power and preparation without undue exhaustion and also had enough energy, so that they can enjoy their spare time.

There are some tests to find out the quality or level of physical fitness of students, such as; 1) the strength of hand and shoulder, measured by pull ups ability; 2) the strength and endurance of back, measured by sit ups ability; 3) Speed and changing direction ability measured by

shuttle run; 4) leg power measured by standing board jump; 5) leg power and run speed measured by 50 yard run; heart and lung endurance measured by 12 minutes run and flexibility measured by sit and reach ability.(Johnson, 1979)

Crawl-swimming stroke is a stroke that suitable to be taught to a person who just learning to swim, moreover this stroke also has range of motion that almost similar to daily walk activity. Besides, crawl-swimming stroke is the fastest stroke of all strokes in swimming championship. Therefore, the fastest record is from crawl-swimming stroke(Colwin, C. M, 1992).

To obtain a good result from crawl-swimming stroke is really depend on technic and physical fitness, but body shape is also an important factor. This could be seen on swimming world champions, they were tall and big. The research of Syahrastani (2000) found that leg length and the strength of leg muscle played a role on the student's ability on crawl-swimming stroke.

To be able to obtain a good ability on crawl-swimming stroke having a good physical fitness is also a very important factor besides having a good technique. One of the important elements of physical fitness is speed, physiologically defined as the ability that based on flexibility of respiratory system and muscles to do the motions within a certain rules of time.

Speed is really depends on strength, because without strength speed could not be developed. When athletes wanted to develop their maximum speed they have to develop their strength. Therefore the speed obtained depends on the impulse strength which was a product of body mass and speed of the body itself.

In addition a crawl stroke swimmer should have muscles endurance and also it was very beneficial to have long legs. This case can be proved on world class swimmers generally have a higher posture with a longer leg than our best nation swimmers. Legs have an important function on crawl-swimming stroke which is to push forward as fast as possible. So when a crawl stroke swimmer had long legs and had good muscle strength endurance certainly would had better swimming achievement than the others who had short legs.

Thus, it can be concluded that the leg length of crawl stroke swimmer would greatly affect crawl-swimming stroke achievement, because a long leg would able to push the body farther and faster. So if a swimmer could glide fast by just one move it is certainly his swimming performance would be better because it would shorten up the time to reach the finish line in a swimming championship. Results of research showed that the leg length had a relation with swimming performance. There was relation between leg length and crawl-swimming stroke performance of an athlete (Maidarman, 1990).

The speed of crawl-swimming stroke is one of the assessment items on basic swimming course in FIK UNP. Considering the importance of physical fitness and body shape (body proportion) of the swimmers in giving push forward or speed in crawl-swimming stroke, then a research about physical fitness and leg length contributions toward the 50 meters crawl-swimming stroke ability to the students of FIK UNP Padang had been done.

Research Purposes

1. To determine the physical fitness contributions toward the 50 meters crawl-swimming stroke ability.
2. To determine the leg length contributions toward the 50 meters crawl-swimming stroke ability.
3. To determine both the physical fitness and leg length contributions toward the 50 meters crawl-swimming stroke ability.

Hypothesis

1. There were physical fitness contributions toward the 50 meters crawl-swimming stroke ability.
2. There were leg length contributions toward the 50 meters crawl-swimming stroke ability.
3. There were both physical fitness and leg length contributions altogether toward the 50 meters crawl-swimming stroke ability.

Research Methodes

1. Research Places and Time

This research took placesatTeratai Swimming Pool Padang and at Major Sport Science and Recreation Laboratory FIK UNP Padang.

2. Type of Research

Type of this research is correlational research. There were two independent variables: physical fitness and leg length, whereas dependent variable was the 50 meters crawl-swimming stroke ability.

3. Research Design

The design of this research was correlation between independent variables and dependent variable. The independent variables of this reasearch was physical fitness and leg length, whereas dependent variable was the 50 meters crawl-swimming stroke ability.
Explanation:

$X1$ = physical fitness
$X2$ = leg length
Y = the 50 meters crawl-swimming stroke ability.

4. Data Types and Source

a. Data Types
    The type of data was primary data, which were:
    1) Physical fitness measurements
    2) Leg length measurements
    3) The 50 meters crawl-swimming stroke ability measurements

b. Data Source
    The data source was the students of FIK UNP who enrolled swimming courses on January – June .

c. Research Instruments

This research needed some following instruments to retrieve the data:

1. The tools required to obtaindata of leg length werea measuring tape which was calibrated and a form to record the results.
2. The tools required to obtain data of physical fitnesswere asingle barrier running track, a measuring tape, a stopwatch, a clean floor, and a tool to record the results.
3. The tools required to obtain data of 50 meters crawl-swimming stroke ability were a stopwatch, a form to record the results, and a swimming pool.

5. **Population and Sample**

a. Population

The population of this research consists of 60 male students from PGSD study program FIK UNP who have graduated from 50 meters crawl-swimming stroke course, and were not athletes.

b. Sample

The sampling was done by using quota random sampling technique. The amount of samples on this research was 50% of the population that was 30 persons.

6. **Data Collection Procedures**

Data needed in this research obtained by test and measurement techniques with the following implementations:

a. To obtain the data of leg length were done by asking the testy to stand up perpendicular then measuring his height and then recorder to centimeters, then asked testy to sit leaned close to the wall with a straight horizontal leg position on the floor and then measuring his height while sitting in centimeters. Then the leg length obtained by subtracting the result of height measurement while standing with the result of height measurement while sitting. The leg length result then recorded.

b. To obtain the data of physical fitness of the students were done by some tests; 1) the strength of hand and shoulder, measured by pull ups ability; 2) the strength and endurance of back, measured by sit ups ability; 3) Speed and changing direction ability measured by shuttle run; 4) leg power measured by standing board jump; 5) leg power and run speed measured by 50 yard run; heart and lung endurance measured by 12 minutes run and flexibility measured by sit and reach ability.

c. To obtain the data of 50 meters crawl-swimming stroke ability, the testy had to swim within 50 meters of range using crawl-swimming stroke technique. The implementation of recording the time of the maximum speed of crawl-swimming stroke of the students starts from start cue until finish and recorded in seconds. The results in time format then transferred to number format by using t-score.

Data Analysis Tecniques

The obtained data then processed using inferensial statistic with computerize regression analysis.

Research Results

Research took places at swimming pool and Major Sport Science and Recreation Laboratory FIK UNP Padang. The research time adjusted with courses time and Laboratory schedules.

1. Research Subjects

The subjectsof this research were the students of FIK UNP who enrolled swimming courses on January-June 2011 term. The population of this research consists of 60 healthy male students, and neither a local athletes nor national athletes.

All of the students who qualified to become population were had a same chance to become samples. Sampling technique was done by quota random sampling technique. The amount of samples on this research was 50% of the population that was 30 persons.

2. Data

After doing a research towards samples, then from the obtained data would put forward the result of descriptive and inferential analysis. From the obtained data would be able to answer the hypothesis. The following would describe descriptively.

Descriptive Analysis

The following table would describe the results of the research about physical fitness and leg length also 50 meters crawl-swimming stroke ability

Table 1. Highest scores, lowest scores mean and deviation standard that had been processed with t-scores

VARIABLES	HIGHEST SCORES	LOWEST SCORES	MEAN	DS
PHYSICAL FITNESS	415.59	303.13	52.4040	29.2209
LEG LENGTH	63.65	30.73	354.6657	8.25.40
50 METERS CRAWL-SWIMMING STROKE	71.51	38.81	50.0010	10.0001

Based on Table 1. can be seen that on leg length data the highest score was 63.65 and the lowest was 30.73, the mean was 52.4040 and deviation standard (DS) was 29.2209, next, on physical fitness the highest score was 415.59 and the lowest was 303.13, the mean was 52.4040 and DS was SD 29.2209, on 50 meters crawl-swimming stroke data which have converted to t-scores found that the highest score was 71.51 and the lowest was 38.81, the mean was 50.0010 and deviation standard was 10.0001.

Inferential Analysis

After the collected data analyzed with computerize regression analysis, the correlation between independent variables and dependent variable can be seen on the following table:

Tabel 2. The correlation between independent variables and dependent variables

VARIABEL	S E	R	F	R^2 [%]
X1 – Y	8.6580	0.526	10.687	27.6
X2 – Y	8.9457	0.477	8.240	22.7
X1, X2, – Y	7.9591	0.640	0.0001	41

X1 = Leg length
X2 = Physical fitness
Y = 50 meters crawl-swimming stroke ability

On Table 2. can be seen that between leg length variable (X1) and 50 meters crawl-swimming stroke ability (Y) found error standard by 8.6580 with r = 0.526, this indicated that there was a significant correlation, because r count was bigger than r table (r count 0.526 > r table 0.463 sig 1 %) with F = 10.687, which was leg length just affected by 27.6% on 50 meters crawl-swimming stroke ability.Then, between physical fitness variable (X2) and 50 meters crawl-swimming stroke ability (Y) found error standard by 8.9457, with r = 0.477, this indicated that there was significant correlation, because r count was bigger than r table (r count 0.526 > r table 0.463 sig 1 %) with F = 8.240, which was physical fitness just affected on 50 meters crawl-swimming stroke ability by 22.7%. Between independent variables X1 and X2 with Y, there was significant correlation which was r = 0.640 and F = 0.001. Besides, independent variables X1 and X2 altogether affected 50 meters crawl-swimming stroke ability (Y) by 41%. To be more clear the result of regression analysis can be seen on attachment.

By considering the above result of data analysis so it can be stated the hypothesis as the following:
1. There were physical fitness contributions toward the 50 meters crawl-swimming stroke ability, accepted.
2. There were leg length contributions toward the 50 meters crawl-swimming stroke ability, accepted.
3. There were both physical fitness and leg length contributions altogether toward the 50 meters crawl-swimming stroke ability, accepted.

Discussion

Based on the data analysis between leg length variable and 50 meters crawl-swimming stroke ability found r = 0.526 with significant F= 10.687. This showed that there was significant correlation between muscle strength endurance and 50 meters crawl-swimming stroke ability, because r count was bigger than r table (r count 0.526 > r table 0.463 sig 1 %).The contributions of leg length toward crawl-swimming stroke ability were by 27.6, whereas 50 meters crawl-swimming stroke ability affected by another factors.

So the stated hypothesis can be accepted, this showed that a crawl stroke swimmer who had a long leg could swim faster, because to produce push forward energy the strong leg muscles is needed besides having a long leg. Leg had very important functions for crawl stroke swimmer as a motor to push forward as fast as possible. By having a long leg would be able to produce a bigger push power and it would be more efficient on the deployment of energy. This can be proved in physics: "the longer the arm the smaller the burden of the load and vice versa" (Imam 1994).

Based on the data analysis which have been done to the contributions of physical fitness variable (X2) with 50 meters crawl-swimming stroke ability (Y) found an error standard by 8.9457, with r = 0.477, it showed that there was a significant correlation, because r count was bigger than r table (r count 0.526 > r table 0.463 sig 1 %) with F = 8.240, which was physical fitness just affected on 50 meters crawl-swimming stroke ability by 22.7%, whereas 50 meters crawl-swimming stroke ability affected by another factors.

So, the higher someone's physical fitness the stronger his leg muscles, because leg muscle strength was part of physical fitness element. A crawl stroke swimmer who had a good leg muscle would produce the faster crawl-swimming stroke ability.The strength of leg muscles were a very important component because the strength of muscles were a motor power for every physical activities. With the strength, someone would push harder, run faster, swim faster, and also help to strengthen the joins. According to Clarke (1984) the strength was a major determinant in sport achievements, and the other elements were a supporting element which formed simultaneously in the improvement or formation process of strength. According to Maglischo (1993) Muscular power can be increased by improving muscle size and strength and improving muscle fiber recruitment pattern during swimming.

In sports most of the strength combined with another physical qualities, such as speed and endurance. Greenberg (1989) stated that endurance is a time in contraction when the muscles are under pressure. Fox (1993) stated that the muscles endurance is a capability of a muscle or groups of muscles which contracted repeatedly on a long period of time.

Based on the data analysis which had been done to the collected data the hypothesis can be accepted, which is: there were physical fitness and leg length contributions toward 50 meters crawl-swimming stroke ability, where R = 0.640 with significant F=0.0001. It showed that there was a significant correlation between leg length, leg muscle strength, foot width and 50 meters crawl-swimming stroke ability. Besides, it also showed that leg length and physical fitness altogether contribute to50 meters crawl-swimming stroke abilityby 41%whereas 50 meters crawl-swimming stroke ability affected by another factors.

The leg muscle strength and physical fitness in crawl-swimming stroke were needed when the leg doing a push and body pressure to be able to produce push power and sliding forward speed. If someone had a good or strong leg muscle strength so that the possibility to produce impulse farther and faster was bigger, and vice versa.

According to Syahrastani (2000) on crawl-swimming stroke, 1) leg was a major strength to moving forward, the leg strength was much bigger than arm strength, 2) the flat area on leg was bigger than on arm, so it can swing harder, 3) legs placed on the rear side, so it was beneficial to push forward.

Besides, to be able to deploy big energy to push the body forward on crawl-swimming stroke, it also needed a long leg and leg muscle strength endurance, because on crawl-swimming stroke, the percentage for leg blow by 75% and hand's pull contribute by 25 % (Councsilman, 1977). So, a swimmer had to have good leg muscle strength to achieve best performance.

Conclusions

Based on the data analysis and discussion which stated before can be concluded that:
1. There were physical fitness contributions toward the 50 meters crawl-swimming stroke ability.
2. There were leg length contributions toward the 50 meters crawl-swimming stroke ability.
3. There were both physical fitness and leg length contributions altogether toward the 50 meters crawl-swimming stroke ability by 41%, whereas 50 meters crawl-swimming stroke ability affected by another factors besides leg length and physical fitness.

Advices

Based on the result of the research, on the last part of this research will be stated some advices which might be useful as consideration materials for the related parties in the future. The advices were:
   a. To the sport lectures and teachers and also swimming coaches to consider the factors that affected the crawl-swimming stroke ability such as leg muscle strength endurance and leg length, also foot width.
   b. Expected to be able to conduct another research to observe the other factors which affected crawl-swimming stroke ability.
   c. So that the lecturers, teachers and swimming coaches considering the dominant variables that affected crawl-swimming stroke ability to obtain a better result.

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