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The Power Contribution of Arm Muscle Strength and Eyes-Hand Coordination to Volleyball Set Up Passing Skill

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Abstract

The problem in this research is students' less capability of passing in volleyball. This study aimed to determine the contribution of the arm muscle strength endurance and hand-eye coordination to passing skill n volleyball. This was a correlational research. The populations in this research consisted of students who took basic volleyball course with the total number of 142. The sample was selected by purposive sampling technique. The size of the sample in this study was 30. To measure the strength of arm muscle endurance a push-up test, and eye-hand coordination using Und-Fangen Ballwerfen test and passing skill in using top passing skills tests were used Data were analyzed by product moment correlation followed with multiple correlation. The result showed that 1) there was a 15% contribution of the arm muscle strength endurance to passing skill in volleyball; 2). There was a 22% contribution of the hand-eye coordination to passing skill in volleyball; and 3) there was a 30% contribution of the arm muscle strength endurance and hand-eye coordination jointly to passing skill in volleyball.

Keywords*: Strength, Coordination, Skill*

1. Introduction

To improve Indonesian human resources especially in sports, a basic strategy which can be done is by focusing and orienting development for the young generation through sport education. This should be done from elementary school to university. Faculty of Sport Science of State University of Padang has three departments, i.e., Department of Sport Education, Department of Coaching and Health Recreation Department, which produce professional graduates in accordance with the goals of each department. Department of Sport Education has the vision and missions as stated in academic manual (Buku Pedoman Akademik, 2004: 84) as follows: the vision of study program "Capable of producing qualified physical and sports graduates who are intellectually, morally, scientifically and technically responsible for science and technology, and have responsibility for developing the sports for the benefit of global society". While the missions are: a) to organize academic and professional education process in the field of sports, b) to produce professional graduates who are effective and efficient in the field of sports and can compete in an international scale, c) to carry out research and community service in the field of sports.

Based on the vision and missions of the program studied above, it can be concluded that the study program should be able to produce professional physical education personnel and sports effectively and efficiently in the field of sports and can compete in an international scale.

Based on observations of the authors in the field, and information from some lecturers who teach volleyball basic courses, there are still a lot of students who are less able to do set up pass in basic volleyball courses. On the other hand, the students must be able to master the basic techniques of volleyball and theories such as the history and rules of the game. This is supported by the data of 120 students who took the basic volleyball courses with the final exam results showing that about 70% or 84 students have not had the good and true skills of set up pass.

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One of the techniques that must be mastered by students is the technique of set up pass. A student can master set up pass skills with many factors influencing it. Among the factors affecting the set up pass skills are physical condition factors such as endurance of arm muscle strength, hand-eye coordination, finger muscle strength, movement coordination, agility and controlling sensitivity of the ball. In addition of physical condition ability, several factors influence set up pass skills in the right and continuous training, student motivation, mastery of techniques, training methods, arm and hand control, views, lecture environment, supporting facilities and infrastructure such as equipment, field, net and ball available.

Volleyball is a familiar sport in the community. Volleyball is a team game or group, each team consists of six players. According to Erianti (2011) the basic idea of the game is "enter the opponent's ball into a rope or net and try to win the game by turning the ball on the opponent. Volley means to play / bounce the ball into the air before the ball touches the floor ". Suherman (2016: 9) argues that "The important and dominant aspect of learning volleyball is mastery of motion" Various basic techniques are known in volleyball and to be able to play volleyball one must really master these basic techniques first. Mastery of the basic techniques of the volleyball also determines the winning or loses of a team in the game in addition to physical and mental conditions. Each sport has its own tactics and techniques, including volleyball. One of the basic techniques of volleyball is passing. Permatasari & Kartiko (2016: 333) argues that "in volleyball games the basic technique used from service, down pass, up pass, smash and block is a technique that every player in the game needs to use, so that when it comes to match situations the player can master and does not find any difficulty ".

Passing technique is the most basic technique of many basic techniques that exist. In this research the passing technique to be studied is set up pass. The mastery of a good passing technique will determine the success of a team to build a good attack let alone be done in a variety of ways, and then the whole potential for team attack can be utilized.

Endurance of arm muscle strength is one of the factors of physical condition that affects the skills of the top passing technique in volleyball game. (Mujahid, 2011: 61) stated that "cardiovascular endurance is a person's ability to play in a long game" Factors that limit the ability of endurance depends on the ability of heart function, circulatory system, body metabolism, neural system, the ability of organs, the coordination of movement and motivation. Permatasari & Kartiko (2016: 565) suggests that "if the muscle strength increases, then the power used in doing the movement becomes more efficient, because the energy that is distributed when it is arranged in accordance with the required. It will provide some benefits to the movement of the arm muscles.

Endurance muscle strength is one of the basic components for everyone in physical activity, including in exercising. All movements in the exercise are possible for the cooperation of all movements consisting of bones, skeletal muscles, tendons, ligaments and the nervous system. Skeletal muscle as the motor of the body contracts because of the chemical energy produced by a process of energy metabolism in the body that is controlled through the nervous system. Mass endurance is also a combination of strength and endurance. Further endurance can also be defined as the ability of muscles to maintain or overcome fatigue caused by strength loading in a long time. This is consistent with what is stated by Harsono (2007) that strength endurance is "the ability of all organisms of the body to overcome fatigue during activities that require strength for a long time".

Leonard D. White states "Coordination is a self-adjustment of each part, and the effort to clutter and operate parts at the appropriate time, so that each section can contribute

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the most to the whole results ". Furthermore Harsuki (2003: 54) suggests that coordination is "the ability to produce new performance as an ingredient of varying motion as a result of a harmonious nervous system and muscles". Further Wahjoedi (2001: 61) states that "coordination is the ability to perform the movement precisely, carefully and efficiently". The same opinion expressed by Kiram (1994: 12) on coordination is a reciprocal relationship between the central nervous system with the means of motion in regulating and controlling impulses and muscle work for the implementation of a movement".

2. Methods

This type of research is correlation followed by calculating the amount of free variable contribution (predictor) endurance of arm muscle strength and hand-eye coordination to the dependent variable (criteria) passing skill of volleyball students. The population in this study was all students of the Department of Sport Education who took the basic volleyball courses totaling 142 students, with of 120 male and 22 female students. Sampling was done by purposive sampling technique in which only the male students were selected with consideration of ability of male with female execution of test. The sample in this study consisted of 30 students. Data Collection Techniques and Tools:

1. Set Up Passing Skills, the implementation procedures are:

a. Testee stands in front of the wall, behind the 0.912 m, facing the target wall.
b. On hearing the "Go" command, testee throws the ball on the target wall or wall.
c. The ball reflections that are thrown the next testee volleys the ball repeatedly towards the target wall for 30 seconds.
d. If the testee cannot control the ball, and the ball bounces away from the target area, then the testee can hold the ball, and then immediately throws the ball into the target plot and volley repeatedly.

How to score is:

a) The first pitch of the volleyball to the target wall cannot be counted as a volleyball score. Score starts to be calculated since the ball is thrown into the target wall, the ball bounces and is volleyed by the testee towards the target wall, b) Each movement of the testee volleyed the ball and entered the target area, or concerning the lower border of the target, which was done from behind the line 0.912 m then the testee obtained a score of one, c) While when the volleyball-tested ball was not on the target as proposed, the testee score was zero (0), d) The result of test scores was the best score of 2 experiments; each experiment lasted in 30 seconds.

2. Endurance Muscle Arm Strength

To measure the endurance of arm muscle strength used Push-Up Test. This test was chosen because it was representative for the endurance test of arm muscle strength.

1. The goal was to measure, endurance of arm muscle strength.
2. The reliability coefficient of Push-Up is 93 the validity coefficient was 72.
3. Equipment that held no floor, or directly on the floor.
4. The procedure of the exercise was: a) the testy takes a prone position, the leg straight back, straight arms open shoulder width apart, b) lower body until the chest touches the mat or floor, then push back up to the original position (1 count), c) do as much as possible without interspersed breaks.
5. Next way to score the endurance of arm muscle strength is to calculate the number of movements that can be done correctly without interspersed breaks. The movement does

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not count if: a) the chest does not touch the floor or mat, b) when pushing up the arm is not straight, c) the body is not straight (curved or angled).

3. The Eye-Coordination Test

To measure eye-hand coordination use Ballwerfen und-FangenTest. The test procedure is ready to take the throwing position behind the throw line 2 meters from the target wall with the tennis ball on the throwing hand, b) the testee throws the tennis ball to the wall quickly after the "Yes" command during 15 seconds, c) throwing one hand over the shoulder and then catching the reflection of the ball with the other hand and the foot should not step on the throwing line or the mat during the capture.

In the implementation only 1 time trial was done. The way to score students` eye-hand coordination is the number of counts of the ball caught correctly by the testee (student) is for 15 seconds.

The analysis technique used was Pearson Product Moment correlation technique (PPM). Correlation was proposed by Karl Pearson in 1900. Its use is to know the degree of relationship between independent variables (independent) with dependent variable (dependent). Pearson Product Moment (PPM) correlation analysis and multiple correlation techniques.

3. Results And Discussion

Results

Table 1. Description of the Result

	X_1	X_2	Y
Maximum	44	15	28
Minimum	13	3	8
Range	31	12	20
Mean	24,10	10,53	18,83
Standard Deviation	9,43	2,64	4,88
Median	21,5	11	19

Notes:

X_1 = Endurance of Muscle Arm Strength

X_2 = Hand-eye Coordination

Y = Set Up Pass

Table 2. Output Distribution of Endurance Data on Arm Muscle Strength

Interval Class	Absolute frequency	Relative frequency
38 - 44	3	5
31 – 37	3	5
24 – 30	8	26.67
17 – 23	6	20
10 – 16	10	33.33
Total	30	100

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Based on Table 2 above, it can be seen that of 30 students, 10 (33.33%) had scores at the interval class 10 - 16, 6 (20%) at the interval class 17 - 23, and 8 (26.67%) at the interval class 24 - 30.. While 3 (10%), respectively for the interval classes 31 - 37 and 38 - 44.
Based on the results of the data presented above, it can be concluded that the score above average for arm muscle strength was obtained by 13 students (43.33%) and only 1 person (3.33%) who had the score in the average group. As for the score below the average was obtained by 16 students (53.33%).

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Tabel 3. Distribution of Hand-Eye Coordination

Score	Absolute Frequency	Relative frequency
13 – 15	5	16.67
10 – 12	19	63.33
7 – 9	3	10
4 – 6	2	6.67
≤ 3	1	3.33
Total	30	1.00

Based on the results of data in Table 2, it can be seen that 1 student (3.33%) had a score at the interval class ≤3 for hand-eye coordination variable and 2 (6.67%) at the interval class 4-6. While 3 (10%) at the interval class 7 - 9. Furthermore, 19 (63.33%) at interval class 10- 12 and 5 (16.67%) at the interval class13 - 15..

Based on the result of data which has been stated above, it can be concluded that the number of students who have eye-hand coordination with scores above average and below average was 11 (36.67%) and the number of students who are in the flat group was 8 (26.67%).

Table 4. Distribution of Set Up Pass Result Data

Score	Absolute Frequency	Relative frequency
24 – 28	6	20
19 – 23	10	33.33
14 – 18	10	33.33
9 – 13	3	10
≤ 8	1	3.33
Total	30	1.00

Based on Table 4 above, it can be seen that only 1 student (3.33%) had a score at the interval class ≤ 8 and 3 (10%) at the interval class 9 - 13 . While the interval class 14 - 18 and 19 - 23 was respectively occupied by 10 students (33.33%). Furthermore, 6 students (20%).

Based on the description of the data on skill passing variable in volleyball, it can be concluded that 14 students (46.67%) had above average scores for passing skill in volleyball and 2 students (6.67%) had the scores in the average group.

Hypothesis Testing

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Table 5. Summary of Hypothesis Testing

Variable	t_{count}	t_{table}	Conclusion
X_1 dan Y	2.21	1.70	Significant
X_2 dan Y	2.83	1.70	Significant
X_1, X_2,Y	5.73	3.35	Significant

First Research Hypothesis Test

The first hypothesis proposed in this research was that there is a contribution of endurance of arm muscle strength to passing skill of volleyball students of Sport Education Department Faculty of Sport Science State University of Padang. The magnitude of correlation coefficient was measured by product moment correlation analysis and to test the significance of the correlation coefficient the t-test was used. The result of correlation analysis between endurance of arm muscle strength and passing skill in volleyball shows that r_{obs}. 0.385> $r_{c.v.}$ =0.361, there is a significant relation between arm muscle strength and passing skill in volleyball among the students of Sport Education Department Faculty of Sport Science , Universitas Negeri Padang. To test for the significance of the coefficient of the strength of the correlation of arm muscle strength and passing skill in volleyball, the t-test was conducted.

Based on the data in the the table of summary of hypothesis testing, $t_{obs.}$ = 2.21> $t_{c.v.}$ 1.70. Thus it can be concluded that the proposed hypothesis that there is a significant relationship between endurance of arm muscle strength and the passing skill of the students who learned volleyball at the Department of Sport Education Faculty of Sport Sciences State University of Padang is accepted.

Furthermore, to know the extent of thecontribution of endurance variable of arm muscle strength and the skill of passing up determinant formula r2 x 100% was used. Thus, 0.385 2 X 100% = 15%. This means that the strength of the contribution of arm muscle strength to upper passing skills is 15%. While the rest is caused by other variables.

The Second Research Hypothesis Test

The second hypothesis proposed in this study is that there is a significant relationship between hand-eye coordination and the passing skill was empirically accepted. To test the magnitude of the correlation coefficient of the second hypothesis Product Moment Correlation Analysis was done and to test the significance of the correlation coefficient , t-test was conducted. The result of correlation analysis between hand-eye coordination (X2) and passing skill in volleyball (Y) is obtained $r_{obs.}$ 0.471> $r_{c.v.}$ 0.361, meaning that there is a significant relation between hand-eye coordination and passing skill of volleyball of the students of Sport Education Department Faculty of Sport Sciences State University of Padang. To test the significance of the correlation coefficient between hand-eye coordination and passing skill of volleyball the students of Sport Education Department Faculty of Sport Science State University Padang the t-test was conducted.

Based on the data in the summary table hypothesis test, it $t_{obs.}$ = 2.83> $t_{c.v.}$ 1.70. Thus it can be concluded that there is a significant relationship between hand-eye coordination of passing skill and volleyball skill of the students of Sport Education Department of Sport Faculty at State University of Padang above.

Furthermore to know the extent of the contribution of the variable of endurance strength of arm muscle and volleyball skill of set up pass determinant formula t r2 x 100% was used.Thus, 0.471 2 X 100% = 22%. It means that the contribution of endurance of arm

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muscle strength to the passing skills of the volleyball is 22%. While, the rest is caused by other variables.

Third Hypothesis Testing

The third hypothesis is proposed and formulated as follows: There is a significant relationship between endurance of arm muscle strength (X1) and hand-eye coordination (X2) simultaneously on passing skill of the students who learned volleyball in Department of Sport Education Faculty of Sport Science State University of Padang. The third hypothesis testing is done by using multiple correlation. Based on the results of the calculation of multiple correlation analysis it is obtained that $F_{obs.}$ = 5.73> $F_{c.v.}$ 3.35, thus, Ho is rejected and Ha accepted and the result of the multiple correlation analysis calculation it is obtained that $r_{obs.}$ = 0.546> $r_{c.v.}$ 0.361, thus, Ho is rejected and Ha accepted. This means that there is a significant relationship between endurance of arm muscle strength (X1) and hand-eye coordination (X2) simultaneously and passing skill of volleyball (Y) the students of Sport Education Department Faculty of Sport Science State University of Padang.

Furthermore, to know the extent of the contribution of the variables of endurance of arm muscle strength and hand-eye coordination together to the skill of set up pass determinant formula r2 x 100% was used. Thus, 0,546 2 X 100% = 30%. This means that the strength contribution of arm muscle strength to passing skill in volleyball is 30%. While the rest is caused by other variables.

Discussion

The results of the first hypothesis testing proposed in this study that is the contribution of endurance muscle strength arm (X1) to passing skills on volleyball (Y) students of the Department of Sport education Faculty of Sport Sciences State University of Padang.

Endurance of arm muscle strength is a condition of the body, especially arm muscles that are able to work for a long time, without experiencing excessive fatigue after completing the work. Factors that limit the ability of endurance depend on the ability of heart function, circulatory system, metabolism, nervous system, organ abilities, and movement coordination. Further strength endurance can be interpreted that ability to be able to maintain the performance of strength in a certain time or ability to maintain the achievement of power reduction as small as possible.

Based on the analysis of the correlation coefficient of determination of the relationship of the variable strength of arm muscle strength (X1) to the set up pass skill variable (Y) is accepted empirically, the contribution of the arm muscle endurance variable (X1) to the upper passing skill variable (Y) is 15%. While the rest is influenced by other variables, such as: eye-hand coordination, agility, arm and hand attitude control, sight, movement coordination, ball-controlling sensitivity, methods, facilities and infrastructure, student motivation, technical mastery, lecture environment in one meeting.

The result of the second hypothesis testing proposed in this study is: there is the contribution of hand-eye coordination (X2) to the passing skills of volleyball (Y) of the students of the Department of Sport Education Faculty of Sport Sciences State University of Padang.

Eye-hand coordination is the integration between the eyes as the main function followed by the hand as a function that performs a certain movement. For example, in doing the passing up, both eyes tell when the ball is in a point so that the hands do the movement push the ball forward up with precise and accurate and with the height of the ball.

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Based on the analysis of the correlation coefficient of the large determination of the hand-eye coordination relationship (X1) to the passing skill of the volleyball (Y) is accepted empirically, the contribution of hand-eye coordination (X1) to the passing skills of the volleyball (Y) is 22%. While the rest influenced by other variables.

The third hypothesis proposed in this research is: there is contribution of endurance of arm muscle strength (X1) and hand-eye coordination (X2) simultaneously to passing skill of baseball (Y) student of Sport Education Department Faculty of Sport Sciences State University of Padang. Based on the strength of the relationship obtained from the double correlation (Ry.12) is 0.546 and the coefficient of determination 0.2981 can be seen the contribution of endurance of arm muscle strength and hand-eye coordination of passing skills in the volleyball of the students of Sports Education Department with the formula r2 × 100% = 05462 × 100% is 30%. While the rest is influenced by other variables, such as agility, arm and hand attitude control, vision, movement coordination, ball controlling sensitivity, methods, facilities and infrastructure, student motivation, mastery of technique, lecture environment, and number of students in one meeting.

Based on the result of the testing of the three hypotheses and the analysis and the known contribution and contribution, it can be interpreted that in order to improve passing skills there should be exercises that can increase the endurance of arm muscle strength and hand-eye coordination with proper and systematic training based on the principle of exercise. The systematic training process is done repeatedly with increasing load. Efforts and efforts that can increase the endurance of muscle strength of the student arm include giving forms of exercises such as push-ups, weight training, encouraging exercises with friends, and others. While exercises that can be done to improve hand-eye coordination such as football tennis tossing, tennis ball with friends, and others.

4. Conclusions

Based on the results of data analysis it can be concluded that: 1) The contribution of endurance of arm muscle strength to passing skill of volleyball of the students of Sport Education Department Faculty of Sport Science State University of Padang is 15%. 2) The contribution of hand-eye coordination to passing skill of volleyball of the students of Sport Education Department of Sport Faculty of State University of Padang is 22% .3) The contribution of arm muscle strength strength and hand-eye coordination simultaneously to passing skill of volleyball of the students of Department of Sport Education Faculty of Sport Science State University of Padang is 30%.

Based on the conclusions in this study, it is suggested to: 1) lecturers to improve the exercises that can improve endurance of arm muscle strength and hand-eye coordination of students in volleyball course so that the passing skills of the students is better in accordance with what is expected by the lecturers and students concerned. 2) The students should pay more attention and improve both factors that influence volleyball set up pass. 3) the Faculty should add and complete the facilities and infrastructure, so the students' volleyball skills can be improved.

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