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The Contribution of The Strength of Leg Muscle and Eye-Hand Coordination Toward The Ability of Free Throws in Basketball

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Abstract

In playing basketball, a factor that has been ignored by the students is the effect of the strength of leg muscle and eye-hand coordination in shooting free throws. This research aims to know the contribution of the strength of leg muscle in the ability of free throws, the contribution of eye-hand coordination to the ability of free throws, as well as the contribution of leg muscle and eye-hand coordination in the ability of shooting free throws. This method used was the correlation method with product moment statistics and double correlation. The results of this research are: the contribution of the strength of leg muscle (X1) toward free throws (Y) gained 32,49%; the contribution of eye-hand coordination (X2) toward free throws (Y) was 40,96%; and the contribution of the strength of leg muscle (XI) and eye-hand coordination (X2) reached 51,84%. Based on the findings, it can be concluded that there are the contribution of the strength of leg muscle and eye-hand coordination toward free throws done by the students from 4th semester in Department of Physical Education Health and Recreation in Universitas Bengkulu when playing basketball.

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INTRODUCTION

Basketball is basically played by five people in every team. The winner of this games is determined with a lot of points produced by every team in certain period. There are a lot of basic techniques that should be mastered by basketball players. One of the techniques is called shooting free throws which aims to gain more points from this action (Wissel,H, 2012). (Nanda & Dimyati, 2019) explain that basketball is a sport that is popular with various circles of society. To apply this technique successfully, the players should be supported with appropriate basic technique.

In basketball, players should master basic technique such as passing, dribbling, and shooting. This is supported by Amber, (2008) who states that basic techniques in playing basketball such as handling, passing, dribbling, shooting, securing, and jumping. In order to get more points, shooting is needed in playing basketball.

Shooting in basketball is one of ways to put as many balls as possible. In shooting, there is one technique called free throws which is defined as a shot of punishment given to a player in a penalty area without any protection from the opponents. This is in line with the opinion from Perbasi, (2012) which mentions that free throw is an opportunity given to a player to get points while not being guarded by other players behind the free throw line in a semicircle.

When doing a free throw, the player will make a shot position by advancing one of the same feet with their hands used to shoot. Maulana, F, (2015) In doing free throw shooting is still a lot of students tend to throw the ball, not the elbow position 90 ° (mostly lower hand positions), lack of focus at the time of shooting, in the process of free throw shooting drills.Then, the player bends both knees and places the hand to shot under the ball, whereas other hand is next to the ball in the middle of the ring besides the player's eye position. This makes the player focus on the target of the shot.

The players who have good shots usually have good physical condition. The parts of their body that play important roles in carrying out shots can be the strength of arm muscle, leg muscle, and eye-hand coordination. According to Kosasih, (2008) there is a term related to shooting techniques in basketball that needs to be introduced to players, namely BEEF: (1) B (balance); the movement always starts from the floor when catching the ball with knees and ankles in a balanced position, (2) E (eyes); shooting becomes accurate when the player focuses on the target, (3) E (elbow); maintaining the position of elbow would make the movement of arm vertically, (4) F (follow through); it is started by locking your elbows and releasing the arm movements of the fingers and wrists toward basketball hoop. If a player can fulfil all these aspects well, the player will not have difficulty in shooting free throws.

Bending your legs will provide additional power to the player when making a shot and basic balance to control the movement. Retnowulan & Purnama, (2017) points out that leg muscle strength has an important role in almost every sport. It is started from individual or team sports with various games. Wahyuningsih, M & Raharjo, (2015) Leg muscle strength is the ability of the leg muscles to move the ability to produce maximum results As a result, it has a big contribution to gain achievement. In addition to have good strength in leg muscle, concentration and arm muscles need to have good eye and hand coordination when doing free throws.

When shooting free throws, eye and hand coordination of each player must be good because the main function of such things is to directly throw the ball in a straight line close to the ring as the main target of shooting. According to Widiastuti, (2011) coordination is the ability to do movements appropriately and efficiently. Purnomo, A, A (2015) hand eye coordination is the ability to coordinate movements between the eyes and hands to manipulate tools or objects.Wening & Agung, (2017) assert that coordination is the ability of combining several abilities with right and controlled rhythms to produce effective and efficient motion.

Based on the observation and experience of the researcher, the interest of university students in basketball was still less than other sports. It makes many students still have difficulty in practicing basic techniques of basketball. Also, there were still students who make mistakes when doing free throw shooting. When shooting, there were students who did not point straight at the ball ring. This could be due to the lack of coordination of eyes and hands of the students. As a result, the eyes and hands cannot properly address what is seen as the goal which makes the result not being maximal. The next mistake made by the students was that there were least students who made shots with right foot position so that they got less encouragement from the foot and it produced weak shots. This made the ball only hit the lip of the right or even did not reach the ring. Hermawan & Rachman, (2018) revealed that basketball extracurricular activities at Junior high school 2 Sumpiuh were still not optimal, especi-

ally regarding shooting skills due to the lack of hand-eye coordination training, physicality and different characteristics of each student.

Regarding such problems, the researchers wished to conduct a study with the title "the contribution of the strength of leg muscle and eye-hand coordination toward the ability of shooting free throws of penjaskesrek students from 4th semester of Universitas Bengkulu in playing basketball."

METHODS

This research was conducted by using quantitative research. Then, the design in this study was to use a non-experimental research design with a qualitative approach because the researcher wanted to examine the contribution of strength of leg muscle and eye-hand coordination on the ability of shooting free throws of the mentioned students.

The study was conducted within one month in February 2016. The place of the research was done in basketball court in air sebakul, Universitas Bengkulu.

The population in this study were 58 male students. They were in their 4th semester who studied in Department of Physical Education Health and Recreation, Universitas Bengkulu. The sample in this research use a method of total sampling **Table 1.**

Table 1. Data of Male Students from 4th Semester in Universitas Bengkulu

Population	Sample
28 students	28 students
30 students	30 students
58 students	58 students

The technique of data collection used by the researcher was a one – shot – model approach. The approach applied for one-time data collection. To measure the strength of leg muscle, the researcher performed tests of leg muscle strength with a back-leg dynamometer. Whereas, data collection for eye-hand coordination was measured by using a target ball throwing test on the wall and free throws were measured by using a free throw test conducted in 1 minute.

The technique of analysing data in this study were. It is used to find out the relationship between two variables such as free and bound variables. In this study, the free variable was the balance of body and the strength of leg muscle and the bound variable was the ability of heading. The test applied such formula by using pearson product moment.

$$r_{xy} = \frac{n\sum xy - (\sum x)(\sum y)}{\sqrt{(n\sum x^2 - (\sum x)^2)(n\sum y^2 - (\sum y)^2)}}$$

rxy = Correlation between X and Y
n = Number of samples
X = Independent variables
Y = Bound variables
$\sum X$ = Total score of X
$\sum Y$ = Total score of Y
$\sum X_2$ = Amount of squared score of X
$\sum Y_2$ = Amount of squared score of Y
XY = X multiples Y
Sugiyono, (2018)

Multiple test of correlation

It is used to find out relationship between balance (X_1), by looking at the strength of leg muscle (X_2) together with the ability of heading (Y). It is used a formula such as:

$$Ryx_1x_2 = \sqrt{\frac{r^2yx_1 + r^2yx_2 - 2r_{yx1}r_{xy2}r_{x1x2}}{1 - r^2_{x1x2}}}$$

Notes:
Ryx_1x_2 = correlation between x_1 and x_2 together with Y
Ryx_1 = moment of product correlation between x_1 and Y
Ryx_2= moment of product correlation between x_2 and Y
Ryx_1x_2= moment of product correlation between x_1 and x_2
Sugiyono, (2018)

It is used to know how many percentages of the connection given by variable X against variable Y. The formula used is:

(K= r^2×100 %)

Notes:
K = Coefficient Determination
rxy = Coefficient Correlation
% = Presentage
Sugiyono, (2012).

RESULTS AND DISCUSSION

Contribution of the strength of leg muscle toward free throw

Table 2. Summary analysis of the sterngth of leg muscle strength with shooting free throw ability

Type	Calculate Value	Table Value	Explanation
r-test	0,57	0,254	Significant
t-test	5,18	1,671	Significant

In this study, **Table 2** the researcher was looking for the contribution of the strength of leg muscle toward the ability of free throw. As mentioned in findings, it could be seen that rresult is bigger than rtable, in which r-result = 0,57 > r-table = 0,254. Therefore, there has been significant contribution of the strength of leg muscle with the ability of free throw.

The next test was done by the researcher such as finding the contribution of the strength of leg muscle in the ability of free throw in penjaskesrek students from 4th semester at Universitas Bengkulu. It appears that KD = = $r^2 \times 100$ %= $(0,57)^2 \times 100$ % = 0,3249×100 % = 32,49%. Thus, it can be concluded that the contribution of the strength of leg muscle toward the ability of free throw in the participants was 32,49% and the remaining was affected by other factors.

The researcher gained 51,84% as the result from the contribution of the strength of leg muscle toward the ability of free throw. Concerning to the percentage, the strength of leg muscle has significant contribution toward the ability of free throw. Such thing is caused by the players who do starting position to shoot. This would give more power in their legs to shoot at the target.

According to Saputro, (2016), leg muscle functions as the main support in doing certain general and specific movements in dealing with shooting. Wissel, (2012) also supports that a player who does not fold their legs while shooting would possibly fail to get the ball into the ring.

Folding the legs can help the players to have great chance in performing better shots. When shooting, their legs positions themselves at the first stage followed by the pushing them away. Consequently, the position of the legs would be straight. Then, it will be followed by hand movements in shooting the ball. In this stage, the legs would give more power in shooting the ball. This statement is supported by Wissel, (2012) who mentions that weak muscle in leg for beginner players or players who are already tired often fail to make free shots because of the lack of energy to throw the ball up with their foot.

In basketball, the strength of leg muscle acts as a support for the torso. It is because the strength is based of all shooting movements. Concerning the results of the research and the opinion from experts, the strength of leg muscle has fundamental contribution in helping the success of free throw shots.

Contribution of eye-hand coordination in free-throw ability

Table 3. Summary of Analysis Coordination the eyes-hands with ability shooting free throw

Type	Calculate Value	Table Value	Explanation
r-test	0,64	0,254	Significant
t-test	6,23	1,671	Significant

In the results **Table 3** of the second data processing, it shows that there is a significant relationship of eye-hand coordination in the ability of free throw shots. It can be seen that rresult is greater than rtable when r-result = 0,64 > r-table = 0,254. Based on the data, it can be simply meant that there is a significant relationship of eye-hand coordination in the ability of free throw shots.

The next test was conducted by the researcher to find out the contribution of eye-hand on the ability of free throw on students of 4th semester at Universitas Bengkulu. It shows that KD = r^2 x 100% = $(0,64)^2$ x 100% = 0,4096 x 100% = 40,96%. Thus, it can be concluded that the contribution of eye-hand coordination on the students' ability of free throw gained 40,96% and the remaining is affected by other factors.

Eye-hand coordination has an important role in free throw shots. This is because in a shot, the player must be able to watch the basketball ring properly while adjusting the position of the ball that will be shot. As a result, it becomes a straight line when shooting. This opinion is added by Amber, (2008) states that the motion of shooting is not just throwing the balls, but also includes directing and trying to get the ball to fall right in the target.

Hidayat, (2014) also believes that coordination is the ability from the body to assemble a number of movements into one whole motion. (Laksono & Rachman, 2014) explained that eye coordination with kicking skills affects success in playing soccer. Thus, it can be concluded that eye-hand coordination has an important role in carrying out free throw shots. (Orlando, 2017)

showed hand eye coordination together have a relationship significant with the ability of shooting under basketball PORPROV (National Sports Week) basketball athletes Kerinci City. This can be seen from the amount of contribution given at 40.96%. And, it can also be stated that by having good eye-hand coordination and regular training, an athlete will have good accuracy in throwing the ball. This can be seen from the results of evaluating throws in basketball, especially shooting numbers.

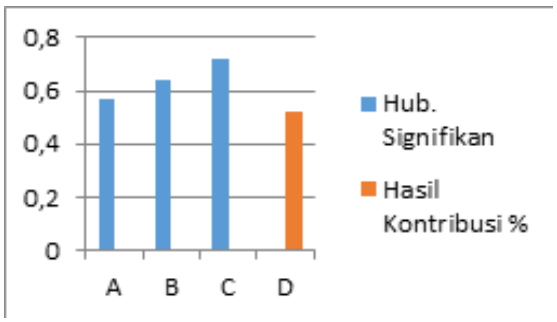
Contribution of the strength of leg muscle and eye-hand coordination on the ability of free throw.

Table 4. Summary of analysis of the strength of leg muscle and eye-hand coordination on the ability of free throw.

Type	Calculate Value	Table Value	Explanation
r-test	0,72	0,254	Significant
t-test	29,79	1,671	Significant

This study **Table 4** looked for the contribution of the strength of leg muscle and eye-hand coordination toward the ability of free throw. According to what have been researched, this study gained the result stating that r-result is greater than r-table where rresult = 0,72 > r-table = 0,254. Based on these data, it can be interpreted that there is also a significant impact between the contribution of the strength of leg muscle and eye-hand coordination toward the ability of free throw.

The next test was conducted by the researcher to find out the contribution of the strength of leg muscle and eye-hand coordination toward the ability of free throw on students of 4th semester at Universitas Bengkulu. It shows that KD = r^2 x 100% = $(0,72)^2$ x 100% = 0,5184 x 100% = 51,84%. Thus, it can be concluded that the contribution of the strength of leg muscle and eye-hand coordination toward the ability of free throw gained 51,84%.



Graph 1. Contribution of Leg Muscle Strength and Hand Eye Coordination to Free Throw Shooting Ability

The strength of leg muscle and eye-hand coordination can be seen directly as it gains 51,84%. It indicates that when doing a free throw, the first step that the player does is to see the ring as the target and bends his legs to take a shot. After that, the player raises the ball and shoots it to the ring by pushing their legs and strengthening their arms.

Wanena, (2018) mentions that leg muscle influences the ability of free throws. The function of leg muscle is to support body to produce the early power to do movements. Besides, the physical condition of eye and hand coordination also affects the performance of the players in practices or even in matches. Thus, it could be said that the coordination of both eyes and hands is the necessary requirement in achieving the highest goal for somebody who does free throw shots in basketball.

The shooting movement is a complex movement in basketball to encourage players to gain the success when shooting the ball. The shots of the players need the power of leg muscle and eye-hand coordination. This is also supported by Wissel, (2012) who adds that shooting requires the synchronisation of legs, waist, shoulders, wrist, and fingers. All of them should be supportive each other. If one aspect is not there, the shooting would not perform maximally. And Wissel, (2012) states that bending your legs will provide the vital force to the core and the rhythm of the shot must be from the movement up your feet. This is due to the strength of the leg muscles as a producer of balance, energy and control.

Wanena, (2018) The importance of arm muscle strength and leg muscle explosive power as well as the coordination of hand movements in free throws because shooting is a complex movement involving all interrelated physical components that support one another.

CONCLUSION

Concerning the result of this study, it can be implied three considerations as stated as follows: There is a positive and significant relationship of the strength of leg muscle (X_1) with the ability of free throw (Y) on students from 4th semester at Universitas Bengkulu. And, there is 32, 49% of the contribution of leg muscle toward the ability. There is also a positive and significant impact regarding the eye-hand coordination (X_2) and the ability of free throw (Y) on students from 4th semester at Universitas Bengkulu. And, there

appears 40,96% of the contribution in this section. There is a positive and significant effect concerning the strength of leg muscle (X_1) and eye-hand coordination (X_2) toward the ability of free throw (Y) on students from 4th semester at Universitas Bengkulu. And, it contributes 51, 84% of the total section.

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