

Contribution of Leg Muscle Explosive Power and Flexibility on Lay-Up Shoot in Basketball

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Abstract—the purpose of this research was to understand the 1) contribution of leg muscle explosive power (X1) to the skill of lay-up shoot in basketball (Y) for extracurricular activity students in Junior High School 9 Pekanbaru; 2) contribution of flexibility (X2) to the skill of lay-up shoot in basketball (Y) for extracurricular activity students in Junior High School 9 Pekanbaru; 3) contribution of the combination of leg muscle explosive power (X1) and flexibility (X2) to the skill of lay-up shoot in basketball (Y) for extracurricular activity students in Junior High School 9 Pekanbaru. The analytical technique used was a double correlation analysis, because of its ability to find the magnitude of the effect of relationship between two or more independent variables (X) simultaneously together with the dependent variable (Y). The total population in this study amounted to 41 people. The sampling technique used in this study was the Total Sampling method. The result of this research revealed that 1) there is a significant contribution of leg muscle explosive power (X1) to the skill of lay-up shoot in basketball (Y) for extracurricular activity students of Junior High School 9 Pekanbaru; 2) there is a significant contribution of flexibility (X2) to the skill of lay-up shoot in basketball (Y) for extracurricular activity students in Junior High School 9 Pekanbaru; 3) there is a significant contribution of the combination of leg muscle explosive power (X1) and flexibility (X2) to the skill of lay-up shoot in basketball (Y) for extracurricular activity students in Junior High School 9 Pekanbaru.

Keywords—leg muscle, explosive power, flexibility, lay-up shoot

I. INTRODUCTION

Sport is very important in an effort to improve the quality of human resources. Sports cannot be separated from human life, because human life consists of two aspects that cannot be separated namely physical aspects and spiritual aspects. If both aspects develop and grow in harmony, a harmonious life will emerge during the process. The harmony of physical and spiritual life in humans can be achieved through exercise. Thus, sports have a goal to maintain and improve fitness and can instill noble and moral values, sportsmanship, and so on in humans.

Many things must be done in order to have a healthy and fit body, of which sporting activities is a critical part. Basketball is an example of such sporting activities. Basketball is a team game played by five (5) people in a team. The purpose of a basketball game is basically to get a score by putting ball into a basket as many times as possible and preventing other teams from doing the same thing over a period of time given. Basketball game consists of two rounds divided into four quarters, where each quarter is allocated

twenty minutes. Generally, there are three kinds of techniques in basketball, namely dribbling, passing and shooting.

Basketball is a branch of the big ball game that is very interesting to watch with certain characteristics. Attempting to put the ball into the opponent's basket and preventing the opposing team from entering the ball into your basket is the orientation and every action in the basketball game is directed towards that. Basketball games have certain values that are universal. In the basketball game, it is required that the ball be put into the opponent's basket, and this can be done using shooting technique. To be able to play basketball, it is necessary to master these good basketball techniques. Shooting techniques are dominant and play a vital role in basketball games. So, it is natural that they are used as the main focus of exercise in basketball trainings. One type of shooting that must be trained on is lay-up shoot.

The technique of lay-up shoot is a very fundamental technique in basketball games because the points generated from lay-up shoot are the highest compared to other types of shooting such as free throw or three points shoot. For this reason, long training is needed to continue to master the basic technical skills of the Lay-up shoot. Lay-up shoot is an attempt to put the ball into the basket or basketball basket with two steps and jump to get points. Lay-up shoot can also be called a floating shot.

The requirement for physical condition components for each sport varies according to the specifics or characteristics of the particular sporting branch and it is directed at the demands of the sports branch. Leg muscle explosive power is a component of physical condition that cannot be ignored, one of which is the power of leg muscles (power). The power of the leg muscles (power) is the result of a combination of strength and speed to do maximum work within a very short time. In this case, the explosive force of the leg muscles is required when performing a basketball lay-up shoot or determining when we insert the ball into the opponent's basket.

Anatomically and physiologically, the foot has a muscle structure that is larger and longer when compared to the other muscles. The foot is the part of the body with the most abundant muscle and is a barrier to the body's weight. It is one of the organs that functions as a balance for the body. Based on this, the very strong repulsion or foot support function is needed when performing lay-up shoots. Not only strong repulsion is required in performing lay-up shoots, but affecting the speed of the foot in repulsion resting on leg extension or in other words muscle explosive power.

Besides these factors there are other things that must be considered, for example flexibility. Flexibility is a person's ability to move his body as broadly as possible without experiencing injury in the muscle joint and it is said to be selective. Flexibility is one of the movements that are used when playing basketball, another one is making jumps like the lay-up shoot movement. At the time of movement, lay-up, the factor of flexibility is one of the dominant things, namely when delivering the ball to the ring, with the movement of the feet and hands with a flexible movement. With a wide or good flexibility, chances are that the ball is thrown better, likewise, with other physical conditions, such as coordination.

Extracurricular activity students exist in Junior High School 9 Pekanbaru, one of the schools that conduct sustainable basketball training from year to year. Basketball coaching for extracurricular activity students in Junior High School 9 Pekanbaru is also supported by the availability of adequate facilities and infrastructure, such as the availability of a basketball court which is quite good and has complete facilities. The training of basketball is done three times a week. Extracurricular activity students in Junior High School 9 Pekanbaru are also actively participating in extracurricular activities of the school.

From the observations of the researchers on basketball extracurricular students of Junior High School 9 Pekanbaru, there were still many students who did basketball lay-up shoots with rudimentary movements. To do lay-up shoots, it is not only movements that had to be improved but also physical condition factors. In doing lay-up shoot, movement is also supported by the explosive leg muscle power factor, that is when the students deliver the ball to the ring. From the results of the observations of the students, the weaknesses that are still visible include students who lack the basic technical skills of lay-up shoots. This was observed from the various matches they participated in, at the time of the first step the movement was made and the final step of the lay-up shoot movement, there was lack of concentration of the students when delivering the ball to the opponent's ring.

In addition, when doing lay-up shoots students cannot reflect the ball to the board first. This can be because students do not have hand-eye coordination. Furthermore, the trainer gives less motivation during training and this can lead to self-distrust in students during training. From the problems that arise, it encourages researchers to examine more about the effect of leg muscle explosive power, flexibility, on basketball lay-up shoot skills for basketball extracurricular students in Junior High School 9 Pekanbaru.

II. THEORY

A. Lay-up Shoot

Skills are understood as indicators of the level of proficiency and mastery that require gesture. They are competencies practiced by someone in carrying out a job with the achievement of a specific goal. Skills in terms of sports are a process/movement in proving the value of practice in completing the sport. In basketball, skill is a person's ability to use basketball techniques effectively and precisely according to the situation and conditions in playing. To be able to play basketball well, the most dominant aspect that

needs attention from a teacher or trainer is the basic technical skills of the player himself.

Shooting is a basic technique that must be used as a benchmark in the execution of high pressure. For this reason, every player must practice continuous shooting skills so as to be able to create skills that have been automated. [1] shows that the success of a team in the game is always determined by its success in shooting. To be able to succeed in a shot, it is necessary to apply good and correct technical techniques. According to [2], shooting drills can be inserted at any time during the practice. The shooting drills may be used after a high-intensity drill. Quick release, one timers and getting to position to score are keys in scoring goals.

[3] Argues that "shooting is the most important skill in basketball". Basketball games consist of several forms of skills, in which lay-up shoot is a form of shooting technique that is very effective in basketball games. Lay-up shoots are movements that consist of jumping, stepping, jumping and shooting. Attempts to get as close as possible to the opponent's basketball hoop are characteristic of the form of lay-up shoot skills.

According to [4], lay-up shoots are things that must be learned in basketball. In a competitive situation, this type of shot must be performed by players both right and left. In line with [5], the lay-up shoot technique is one of the most widely used shooting techniques by basketball players and this makes it the easiest technique among other techniques. This shot starts from catching the ball while floating, holding one foot, stepping the other foot forward, holding one foot, jumping as high as possible or as close as possible to the opponent's basket. Usually this shot is done from the side (left or right) of the basketball court and the ball is reflected first to the ring wall board. This method is the easiest to do, the angle of reflection of the ball and the strength of the hand when releasing the ball must be put into consideration.

The principles of lay-up shoot according to [6] are as follows: (1) when dribbling towards the opponent's ring at speed, protect the ball, (2) use correct footwork (right-handed lay-up: step right and then left, (3) after taking the second step, take the ball towards the basket with two hands and gain as much height as possible, (4) whilst in the air, place the right hand behind the ball and with outstretched arms, push the ball off the top the corner of the small square near the basketball. This means that in performing a lay-up shoot the player must pay attention to the principles that can help conducive basketball games.

The following are the steps of lay-up shoot using the right hand as presented by [7] "The right-hand layup is the most fundamental of shots and the one that results in the highest percentage of scores. All players must be able to execute this shot using the correct hand movements and footwork. 1) Begin the approach to basketball on the right side, using your right hand to dribble the ball. Keep the ball protected from the defense. 2) Keep your head up and your eyes focused on the target. 3) As you approach the three-second lane, begin to finish your dribble while still protecting the ball on the right side of your body. 4) Step first onto your right foot. At the same time, move the ball up to the shooting position above the

right shoulder. 5) The next step is with your left foot. Keep your eyes focused on the target and raise the ball above your right shoulder. 6) Use your two steps to get you near the basketball as possible. Jump off your left foot, as high as you can, up towards the basketball to release the ball. 7) Extend your elbow and snap the wrist of your (right) shooting arm and shoot to the ball softly off the backboard. Aim for the top corner of the small black square on the right side of the rim”.

To achieve success when doing lay-up shoot movements, some basic techniques should be considered and right steps must be taken to get maximum results. Therefore, it is necessary to have the right movement process and the right techniques and carry out continuous, planned and repetitive exercise implementation that is repeated and progressive (gradual) in improving lay-up shoot skills.

B. Leg Muscle Explosive Power

Explosive power is a bio motor component in a sport, because the power or explosive power of the leg muscles determines how well a person can hit and kick, how far a person performs a stretch and how fast a person runs. Leg muscle explosive power is a combination of elements of strength with speed. [8]. Strength can also be combined with other factors such as speed and endurance. Strength and speed result in power, or the rate at which an individual can generate force. Furthermore, according to [9], power is then related to both strength and speed. In childhood, power depends on size and maturity of the neurological and musculoskeletal systems.

Explosive power is the ability of the muscles to overcome the load in high speed in an intact motion. One element of physical conditions that has an important role in sports activities, both as a supporting element in a particular movement and the main element in the effort to achieve the perfect motion technique is explosive power. Explosive power is required in various sports, for example in basketball. This game makes use of explosive power or explosive power of leg muscles like jumping during lay-up shoots.

According to [10], “explosive power is the ability of the muscles for a group of muscles to contract explosively in a very short time”. Muscle explosive power is affected by the strength and speed of muscle contraction. According to Bompa [11], “The scope of the power phase is to transform gains in strength into power”. Power exercises have performed quickly and forcefully to increase the discharge rate of the nervous system and the contraction of the muscles performing the technical moves of the sport in which it is applied. Judging from the pattern of lay-up shoot movement, the explosive power of leg muscles plays a role in lay-up shoot, especially when stepping, rejecting and jumping. For a successful leap to the maximum level, it must be supported by a good starting point and proper coordination between repulsion and prefix steps. Getting a leap and success when flying in the air requires the explosive power of the leg muscles, the right steps and the right and perfect support.

C. Flexibility

Determination is the freedom of joint movement. [12] points out that "flexibility is reflected by a person's ability to move through spaces without being restricted by a

musculoskeletal system". The greatest usefulness of flexibility is to prevent the possibility of injury. Flexibility is used by all players to perform various body joint movements within a specified width.

According to [13], "flexibility is the ability to make movements in the joint space." [14] points out that flexibility is one of the components of physical conditions which are used in performing many movements which involve the body joints over the body such as ankle, knee, fingers, elbow, shoulder, spine, hip to the nape of the neck. Injuries occur when the hands and feet are forced to move beyond their normal range. So, increasing flexibility reduces this from happening. The range of movement increases when the joints and muscles are forced. [15] shows that "flexibility training can help reduce the risk of injury by increasing the range of joint motion." Stretching exercises are very successful after a few warm up but before a hard effort. Stretching after exercise, during periods of cooling, can help reduce aftershocks.

Basically, flexibility is the freedom of movement in movements, most importantly in the joints. Flexibility ensures that muscle does not experience stiffness and allows free movement without any significant interference. In this case, the movement in the exercise of flexibility must be adjusted to the nature of the joint motion.

According to [16], "improving flexibility is a fundamental element of a young athlete's training program because good flexibility enables the athlete to perform various movements and skills easily and helps prevent injury".

Determination is a physical component needed in increasing speed. Therefore, flexibility must be trained diligently and systematically. Stretching in basketball is very important where there is a need to warm up through body movements both statically and dynamically, especially the muscles of the arms, body, leg as well as muscles in the joints. Tendon arrangement depends on the range of motion and muscles.

The following will explain the factors that determine the flexibility according to [17]: "1) Joint structure - the type of joint will dictate how many planes of motion are possible. Ball-and-socket joints enable motion in three planes, whereas the hinge joints predominantly allow motion in one plane. 2) Muscular imbalance - muscle strength and length imbalances reduce flexibility. Unequal pull by antagonist muscles or hypertonic (shortened) muscles reduce flexibility. 3) Muscular control for some movements (hip abduction from a lying position), a certain degree of strength and balance is needed to reach a certain level of ROM. A lack of strength and balance can decrease flexibility. 4) Age - flexibility decreases with age. Older, sedentary individuals lose motor units and muscle fibers while fibrous CT expands. 5) Gender - women tend to be more flexible in some areas than others, especially in the hips. Anatomical, structural, and hormonal (estrogen, progesterone) differences between genders account for flexibility differences. 6) CT-tendons, ligaments, fascia, joint capsules, and skin affect flexibility. Collagen and elastin elasticity and plasticity CT content affects CT plasticity training. 7) Bulk increase in muscle bulk or percent body fat can limit joint ROM and decrease flexibility scores. The

additional tissue mass acts as an obstruction to the joint motion limiting bony movement segment with a high degree of ROM. Elite bodybuilders may have less elbow flexion ROM most of the elbow extensors. 8) Training in a limited ROM training (especially the [RT] resistance training) in a limited ROM can reduce flexibility over time. Training in a full exercise-prescribed ROM is recommended. 9) Activity - active individuals tend to be more flexible than sedentary adults ".

III. METHOD

The research method employed in this research is a correlational method which aimed to find and investigate the extent to which the predictor variables contribute to the predicted variables based on the correlational coefficient. Correlational research has to do with finding out how much the independent variables contribute to the dependent variable and the magnitude of the relationship that exists between them.

The analytical technique used is multiple correlation analysis. This is because of its abilities to find the magnitude of the influence of the relationship between two or more independent variables (X) simultaneously together with the dependent variable (Y). Population is the subject of research. The target population (Target Population) in this study were all extracurricular activity students in Junior High School 9 Pekanbaru, amounting to 41 people. Because of the small size of the sample selected, all the participants are subjected to research. In other words, the sampling technique applied in this study was Total Sampling. The collection techniques used in this research were (1) instrument of lay-up shoot skills (process and results), (2) instrument of leg muscle explosive power through the use of a standard test, such as vertical jump (modified Sargent jump), and (3) rigidity determination instrument using flexibility.

IV. CONCLUSIONS

The results of the field research carried out proved that leg muscle explosive power (X1) has significant contribution on lay-up shoot skills (Y). The value of leg muscle explosive power for lay-up shoot skill is 0.888. The coefficient of determination of the table is $R^2 = 0.788$ which means that 78.8% of lay-up shoot skills feel the effects of the explosive power of the leg muscles.

Leg muscle explosive power has contribution in supporting lay-up shoot skills in accordance with the intensity given in training. In performing lay-up shoot, muscle explosive power functions as a jump during the delivery of the ball to the ring. Students with good leg muscle explosive power will be able to master the lay-up shoot movement because explosive power is supported by two factors: strength and speed. It can be discovered that there is a significant correlation between leg muscle explosive power and basketball lay-up shoot skills for basketball extracurricular students in Junior High School 9 Pekanbaru.

The results gathered from the field study showed that leg muscle explosive power (X2) has significant contribution to lay-up shoot skills (Y). The r value of flexibility for lay-up

shoot skills is 0.795. The coefficient of determination of the table is $R^2 = 0.633$, which means that 63.3% of lay-up shoot skills are affected by flexibility.

The importance of determination cannot be underestimated in almost all sports, especially in sports that require and demand joint movements such as basketball. "Determination can help reduce the risk of injury by increasing the range of motion of the joint". In doing lay-up shoot, hand-defined movement is necessary. The better the determination, the better the results of the basketball lay-up shoot. Flexibility can be done through muscle stretching exercises and expansion of the joint space. It can be carried out using static stretching, dynamic stretching, passive stretching, and stretching relaxation contractions.

The results from the field study showed that the combination of leg muscle explosive power (X1) and flexibility (X2) have significant contributions to lay-up shoot skills (Y). With respect to leg muscle explosive power, the joint flexibility of lay-up shoot skills is 0.934. The coefficient of determination of the table is $R^2 = 0.873$. This shows that 87.3% of the lay-up shoot skills is affected by the explosive power of the leg muscles and flexibility.

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