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The Contribution of Leg Muscle Explosiveness and Flexibility on the Ability to Kick *Dollyo Chagi* in Padang Taekwondo

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***Abstract*— This study aims to determine the relationship between leg muscle explosive power and flexibility on the ability of *dollyo chagi* kick in Padang *taekwondo* athletes. The type is that this research is correlational. There were 32 *taekwondo* athletes Padang as the population in this study. The population was taken by using a *saturated sampling technique*. To measure the leg muscle explosive power, the standing board jump test instrument was used. To measure the flexibility used the sit and reach test instrument. To measure the *dollyo chagi* kick, the PSS (Protector Scoring System) instrument is used. In analyzing the data, the researcher using simple and multiple correlation analysis techniques. The results of this study: (1) the contribution of leg muscle explosive power and the ability to kick *dollyo chagi* in *taekwondo* athletes, Padang with 45%. (2) the contribution of flexibility and the ability to kick *dollyo chagi* in *taekwondo* athletes Padang of 32%. (3) the contribution of leg muscle explosive power and flexibility together with the ability to kick *dollyo chagi, taekwondo* athletes in Padang of 49%.**

Keywords*— *Dollyo Chagi, Leg Muscle Explosive Power, Flexibility

I. INTRODUCTION

Nowadays, sport can be said as an activity that is a necessity for humans who want to live healthy both physically and spiritually. This accordance with the Law and Sports System No. 3 Year 2005, which explains: National sports aims to maintain and improve health and fitness, achievements, human qualities, instill moral values and noble morals, sportsmanship, discipline, strengthen and foster national unity, strengthen national resilience, and elevate the nation's dignity, dignity, and honor.

Taekwondo is one of Korea's martial arts sports. *Taekwondo* consists of 3 words: *tae* means to destroy feet with kick technique, *kwon* means hand / hit and defend with hand technique, and *do* means art / how to discipline yourself. So if interpreted as a whole, *Taekwondo* is a way of self-discipline / martial arts that uses the technique of feet and bare hands.

The three most important materials in practicing Taekwondo, namely: 1) *Poomsae* is a basic technical movement of attack and self-defense carried out to fight the enemy. 2) *Kyukpa* is a technique that uses the target / object of inanimate objects to measure the ability and accuracy of the technique, in other words *Kyukpa* is a technique of solving hard objects. 3) *Kyourugi* or battle is an exercise applying the *poomsae* movement by means of two people practicing mutual attack and self-defense techniques.

Taekwondo is one of the most popular martial arts sports in the world, including in Indonesia. This martial art has developed into one of the sports that are popular with the layers of society; this is evident from the many clubs or taekwondo dojangs in Indonesia with various expected goals. One of them is to achieve achievements. *Taekwondo* requires its athletes to attack to win and defend themselves so as not to be defeated, so every *taekwondo* athlete is required to have a variety of technical skills and tactics in addition to excellent physical condition. "*Taekwondo* also demands technical creativity, courage and confidence to win every match. All activities in *taekwondo* martial arts are carried out with three basic components, namely: punch, kick, rebuttal, evasion, and avoidance" [1].

Taekwondo martial arts sports generally emphasize the kick rather than the punch. The kick technique becomes very important because its strength is far greater than the punch although kick technique in general is more difficult to do than the punch. But with good and right practice will significantly improve the quality of the kick. To do the kick technique required: 1) Speed so that the kick is not easy for the opponent to deflect. 2) Strength, so that the kick taken can produce points. 3) Flexibility, to get fast and strong kicks, a *taekwondo* athlete must have good flexibility, because basically flexibility is one of the good or bad factors, success or failure of someone in a kick. 4) Excellent balance, if there is no good balance when kicking, a taekwondo athlete will not be able to adjust the direction of the target kick that he did.

"Explosive power depends on muscle strength and body speed" [2]. So, to kick in addition to the four components above, a taekwondo athlete also requires leg muscle explosive power, where if the leg muscle explosive power is good, then the strength and speed of the kick will be good too. In addition, mastery of distance and timing are also required in order for the kick to be effective. Some important guidelines in performing kick techniques.

"Maximizing kick strength with knee strength and flexibility, maintaining concentration and sight on the target and adjusting the distance and timing, after making a kick, the foot must be immediately withdrawn and again ready to kick or next movement" [3].

"Good physical condition is very necessary when doing a kick, therefore a taekwondo athlete also has to do program training. Principle exercise is a process of change for the better, namely to improve the physical quality of the functional abilities of the body's equipment and the psychological quality of the trainees" [4]. From the explanation above, it can be concluded that training is an activity that gives a change to the physical and technique of an individual and athlete. If the training is programmed, then technical and physical mastery will also affect both during practice and competing. There are several kinds of kick or *chagi* techniques, including: "1) *Ap Chagi* or forward kicks, 2) *Dollyo Chagi* or oblique kicks, 3) *Yeop Chagi* or sidekicks, 4) *Dwi Chagi* or back kick, and 5) *Naeryo Chagi* or hoe kick" [3].

However, in *taekwondo*, "body parts that are targeted, there are 3 mains of body parts: 1) *Eolgol* or the upper part (head and face). 2) *Momtong* or middle part (body) which includes this part is the navel boundary area up to the shoulder blades. 3) Area or body part that includes this part is from the navel down covering the groin" [5].

In the *taekwondo* match, the match is divided into 3 rounds with 2 minutes in each round. Each round the athlete will try to score as many points as possible. In order for an athlete to gain maximum performance, a taekwondo athlete must have good physical, technical and tactic skills. To get good techniques, athletes must have good explosive and flexibility, it can be said that there is only the explosive power of leg muscles and flexibility is the most important thing when making a kick.

Padang is one of the training places for taekwondo athletes to compete in representing of the Padang such as the Provincial Sports Week (PORPROV), Regional Championship (Regional Championship), and other championships. For its own achievements, in West Sumatra the Padang City *taekwondo* has good achievements, and some of the Padang City *taekwondo* athletes also represent West Sumatra for higher championships, but for the national championships the city of Padang athletes fall many to the point of not being able to provide satisfying achievements.

Taekwondo matches from year to year always have a change from the match system, one of them from the body protector, previously only using the Decision Support System (DSS) where the decision to go through a remote held by the referee, and will be connected to the game operator's computer, but since 2012 body protector changes to the Protector Scoring System (PSS). Which in certain parts will be given a sensor and when it comes to the sensor section then can score points? So, really in a taekwondo match now requires good physical and technical in order to get maximum points.

The phenomenon that occurred in the field when competing at the West Sumatra POPROV event held in Padang in 2016, most of the ability to kick *dollyo chagi* athletes in Padang *taekwondo* is still not good, this is seen when athletes release kicks. The kick that was released was still not right on target, and was not well controlled, it could be said that the possibility of getting points for releasing a *dollyo chagi* kick was very little. And also for the 2018 PORPROV preparation, at the time of training it was also seen that the athlete was still not good, the kick was not right on target and as expected.

If this continues, it will cause a decline in the achievements of the Padang City *taekwondo* athlete. Although the *Dolly Chagi* kick is one of the basic techniques in *taekwondo* martial arts, it is also an attack technique that generates points so that athletes can achieve maximum performance.

II. RESEARCH METHOD

This type of research is correlation research, this is in accordance with what was stated by the aims of this research is to find whether there is a relationship the two elements and how closely and whether or not the relationship is meaningful. "The independent variables in this study are leg muscle explosive power (X_1) and flexibility (X_2), while the dependent variable is the ability to kick *dollyo chagi* (Y). This research was conducted at the GOR H. Agus Salim self-defense building, where Padang taekwondo athletes do training.

The populations in this research are all *taekwondo* athletes who are registered or actively participate in training in the GOR H. Agus Salim Martial Arts Building, there were 32 people, consisting of 16 male and 16 female. The sampling technique used is "*saturated sampling*". The research instrument used in this study were the Standing Board Jump test, Sit and Reach Test, and Protector Scoring System) through the *Dollyo Chagi* kick ability test. Then, the data will be analyzed using the multiple correlation method.

Scale Formula 5A
A = M + (1.5 X SD)
B = M + (0.5 X SD)
C = M – (0.5 X SD)
D = M – (1.5 X SD) [11]

Correlation product moment

$$rxy = \frac{n.\Sigma xy}{\sqrt{(n.\Sigma x^2 - (\Sigma x}}$$

Note:
rxy= the product moment correlation r number
Σx = the number of data X value
Σy = the number of dala Y value
n = number of data
Σxy = the number of multiplication rates between x and y

Multiple correlation

$$ry_{12} \sqrt{\frac{r^2y1 + r^2y2 - 2.(ry1)(ry2)(r12)}{1 - (r^2 12)}}$$

Note:
Ry_{12} = Multiple Correlation coefficients
ry_1 = Coefficients correlation between X_1 and Y

ry_2 = Coefficients correlation between X_2 and Y
r_{12} = Coefficients correlation between X_1 and X_2

III. Research Result and Discussion

After measurement, the data obtained from each research variable is obtained. The leg muscle explosive power variable is measured using a standing board jump test instrument, the variable is measured by the sit and reach test, and the *dollyo chagi* kick ability data obtained through the *dollyo chagi* kick capability is measured using PSS (Protector Scoring System). For more details, it can be seen in the data description of each research variable as follows:

1. The correlation between leg muscle explosive power and the ability to kick *dollyo chagi taekwondo* athletes in Padang

The hypothesis by using the correlation coefficient between the independent variable and the dependent variable that is the relationship between leg muscle explosive powers (X_1) as the independent variable on the ability of the *dollyo chagi* (Y) kick as the dependent variable. The results of the variable correlation are presented in the following table:

Table 1.Correlation of Leg Muscle Explosion Power (X_1) with Kick Ability of Dollyo Chagi (Y)

Variable	N	r_{obs}	t_{obs}	t_{table}	Note
$X_1 \rightarrow Y$	32	0.67	4.98	1.697	Significant

With α = 0.05 and dk = n-2, the got t_{table} = 1.697, from 1-α or 0.95 as dk numerator and n-2 (30) as dk divisor. The criteria of the test is, if $t_{obs}>t_{table}$, Ho which states there is no relationship between variable is rejected, the opposite if $t_{obs}<t_{table}$ Ho accepted.

Based on the count results, it got t_{obs}(4.98) >t_{tabel} (1.697) so Ho is rejected and Ha is accepted. Therefore, it can be concluded that there is a relationship between leg muscle explosive power (X_1) with the ability of kicks *dollyo chagi* (Y). This means that the better of leg muscle explosive, the better kick ability of *dollyo chagi.*

Furthermore, to determine the magnitude of the relationship between leg muscle explosive power (X_1) and the kick ability of *Dollyo Chagi*) (Y), first determine the coefficient of determination. By looking at the value of r count = 0.67, the coefficient of determination = 0,45. Thus the contribution coefficient (K) = x100%, then 0,45 x 100% = 45%. This means that the leg muscle explosive power variable (X1) contributes a very significant 45% to the kick ability of *dollyo chagi* (Y).

Muscle explosive power is also called the maximum ability produced by the leg muscles, because the anaerobic work process that requires fast time and strong energy. “In sports activities, muscle strength is an important element to move the organs of the body” [6]. Without great muscle strength, maximum achievement will not be achieved.

“Explosive power is the ability of a muscle or group of muscles to overcome load resistance at high speed in an intact motion” [7]. In explosive power taekwondo absolutely must be possessed by every athlete, because during a match athletes are required to run, kick, jump left and right which all require very large muscle work, especially work on the leg muscles. With a good leg muscle explosive power will prove that the ability to kick *Dollyo Chagi* is needed this element.

“In *Kyorugi* (battle), kicks are the main weapon in carrying out attacks to get victory points” [8]. One of the kicks that is very often used is the *dollyo chagi* kick. *Dollyo Chagi* kick is one of the basic kicks and is most often used by *taekwondo* athletes in attack (attack) and counter (counter attacking opponents). Leg muscle explosive power, because "Power is something different. “Power = strength + speed", meaning that the explosive power comes from strength and speed” [9].

Based on the results of the study concluded that there is a relationship between leg muscle explosive power with the ability to kick *dollyo chagi* athletes in the city of Padang taekwondo, with a percentage of 45%. Based on these conclusions it can be interpreted that the success of a *taekwondo* athlete doing a *Dollyo Chagi* kick properly and correctly by 45% is the role of the leg muscle explosive power possessed by the athlete, the better the leg muscle explosive power, the better the ability of *Dollyo Chagi* kicks. Given the enormous contribution of leg muscle explosive power to the ability of the *Dollyo Chagi* kick, it is recommended that taekwondo trainers improve and develop the leg muscle explosive power conditions of their athletes.

2. The correlation between flexibility and the ability to kick *dollyo chagi taekwondo* athletes in Padang.

The hypothesis by using the correlation coefficient between the independent variable and the dependent variable that is the relationship between flexibility (X2) as the independent variable on the ability of the dollyochagi (Y) kick as the dependent variable. The results of the variable correlation are presented in the following table:

Table 2. Flexibility Correlation (X2) With The Kicks Ability of Dollyo Chagi(Y)

Variable	n	r_{obs}	t_{obs}	t_{table}	Note
X2 → Y	32	0.57	3.80	1.697	Significant

With α = 0.05 and dk = n-2, then got ttable = 1.697, from 1-α atau 0.95 as dk numerator and n-2 (30) as dk denominator. The criteria of test is if tobs> ttable, Ho which states there is no relationship between variables is rejected, the opposite is if tobs< ttable Ho accepted.

Based on the calculation results, it can be tobs (3.80) > ttable (1.697) then Ho is rejected and Ha is accepted. Thus, it can be concluded that there is a relationship between flexibility (X2) with the kick ability of *dollyo chagi* (Y). This means that the better the leg muscle explosive power, the better the kick ability of *dollyo chagi*.

Furthermore, to determine the magnitude of the relationship between the flexibility (X2) to the ability to kick dollyo chagi (Y), first determine the coefficient of determination, By looking at the value of r arithmetic = 0.57, then the coefficient of determination = 0,32. Thus the contribution coefficient (K) = x100%, then 0,32 x 100% = 32%. This means that the variable variable 32% made a very significant contribution of 32% to the kick ability of the *dollyo chagi* (Y).

Flexibility can be defined as the ability of joints and muscles, as well as the joint strap and its surroundings to move freely and comfortably in the maximum space expected "[7].

"Determination is one element of the physical condition that determines learning movement skills, preventing injury, developing strength, speed, endurance and coordination abilities" [9]. Based on the opinion, the general flexibility is the ability of the body's maximum joint space when performing a physical activity or movement. Moreover, "specifically the flexibility is the ability of certain joints in the body that is able to perform its functions optimally when performing a movement / skill" [10].

There are several important guidelines in performing kick techniques, including: a. Maximizing the strength of the kick with the strength of knee kicks. b. Maintain concentration and sight on the target and adjust distance and timing. c. After making a kick, the foot must be pulled back immediately ready for the next kick or move. d. Arrange the balance as well as possible, because to do a quick kick requires a good balance and to maintain a good balance requires kick speed. e. "Coordinate all body movements especially with waist rotation, so as to produce maximum energy" [5].

Based on the results of the research it can be concluded that there is a correlation between the ability to kick the Dollyo Chagi athletes in taekwondo Padang, with a large percentage of 32%. Based on these conclusions it can be interpreted that the success of a taekwondo athlete doing dollyo chagi training properly and correctly by 32% is the role of the body's flexibility possessed by the athlete. Given the enormous contribution of body flexibility to the ability of the Dollyo Chagi kick, taekwondo trainers are advised to improve and develop the conditions of athletes' flexibility. Without having good flexibility conditions, this can limit the athlete's space to move when doing a Dolly Chagi kick.

3. The correlation between the leg muscle explosive power and flexibility together with the ability to kick *dollyo chagi taekwondo* athletes in Padang

The third hypothesis was carried out by a multiple correlation test conducted to see how the big relationship between leg muscle explosive power (X_1) and flexibility (X_2) together with the ability to kick *dollyo chagi*. To determine the relationship between the results of the measurement of leg muscle power and joint flexibility on the ability of the *dollyo chagi* tendency, a multiple correlation analysis was performed and gave the following description:

Table 3. Summary Results of Leg Muscle Explosion Correlation Analysis (X1), Flexibility(X2) with DollyoChagi Kick Ability (Y)

Variable	N	r_{obs}	F_{obs}	F_{table}	note
X1X2 → Y	32	0.70	5.43	3.33	Significant

By using the double correlation formula Ry.12 = 0.70 with n =32 dan α = 0.05 k = 2 as dk numerator and (n-k-1) 32-2-1 = 29 as dk denominator, then in the distribution F, the F_{table} value is equal to 3,33. So F_{obs} (14,23) > F_{table} (3,33). Then Ho is rejected and Ha is accepted, thus it can be concluded that there is a significant relationship between leg muscle explosive power (X_1) and flexibility (X_2) together with the ability to kick *dollyo chagi* (Y), empirically accepted the truth.

Then, to find out the magnitude of the relationship between leg muscle explosive power (X_1) and flexibility (X_2) together against the *dollyo chagi* kick(Y) with the determinant formula r^2 x 100% = 0.70^2 x 100% = 49%. This means that the relationship of leg muscle explosive power (X_1) and flexibility (X_2) together to the ability to kick *dollyo chagi* is 49%, the rest is influenced by other variables.

Based on the results of the study it was concluded that there was a contribution of leg muscle explosive power and flexibility together to the ability of the *dollyo chagi* kicks of Padang *taekwondo* athletes, with a large percentage of 49%. Based on these conclusions it can be interpreted that the success of a *taekwondo* athlete doing a *dollyo chagi* kick properly and correctly by 49% is the role of leg muscle explosive power and body flexibility possessed by athletes. Given the enormous contribution of leg muscle explosive power and body flexibility to the *dollyo chagi* kicking ability, *taekwondo* trainers are advised to improve and develop the leg muscle explosive power conditions and the athletes' flexibility. Without having good leg muscle explosive power and flexibility, this can limit the athlete's space to move when doing a *Dollyo Chagi* kick.Thus 61% of the success of a *taekwondo* athlete doing a *Dollyo Chagi* kick comes from other factors. This means that to achieve a 100% success rate of *Dollyo Chagi* kicks, the athlete must have supporting factors from other factors, other factors meant one of which is balance, training programs, timings, and others. Furthermore "Given the importance of sports activities to improve physical fitness, it is necessary to empower sports as early as possible both at school and to the wider community" [11].

IV. CONCLUSION

Based on the data analysis, the following conclusions are obtained:

1. There is a 45% of contribution to the leg muscle explosive power of the kick ability of the *dollyo chagi taekwondo* athlete in Padang.

2. There is a 32% of contribution to the flexibility of the ability *dollyo chagi* kicks in the Padang *taekwondo* athletes.
3. There is a contribution of leg muscle explosive power and joint flexibility of 49% to the ability of the *dollyo chagi* kick in *taekwondo* athletes in Padang.

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