

The Correlation of Reaction Time between Explosive Power of Legs and Crescent Kick Speed on the Athletes of Empat Banding Budi Institution in Pekanbaru

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Keywords: Reaction Time, Explosive Power of Legs, Speed Crescent Kick.

Abstract: This research aims to investigate the correlation of reaction time between explosive power of legs with speed crescent kick on the male athletes of Empat Banding Budi Institution Pekanbaru. The form of this research was a correlation study. The participants in this research were the athletes of Empat Banding Budi Institution Pekanbaru, and the sample in this research consisted of six athletes in Empat Banding Budi Institution Pekanbaru. The calculation of the first analysis between reaction time (x1) and speed crescent kick (y) shows r table at the significant level, $\alpha (0,05) = 0,811$, meaning that r obtained (0,482) < r table (0,811). It means that the hypothesis is rejected and there is a medium correlation between reaction time and speed crescent kick. The second analysis of the correlation between explosive power of legs (x2) and speed crescent kick (y) shows r table at a significant level $\alpha (0,05) = 0,811$, meaning that r obtained (0,687) < r table (0,811). It means that the hypothesis is rejected and there is a strong correlation between explosive power of legs and speed crescent kick. The analysis of three correlation of reaction time (x1) and explosive power of legs (x2) with speed crescent kick (y), shows r table at significant level $\alpha (0,05) = 0,811$, meaning that r obtained (0,690) < r table (0,811). It means that the hypothesis is rejected and there is a strong correlation of reaction time and explosive power of legs with speed crescent kick.

1 INTRODUCTION

The rise of Asian martial arts is a clear example of authentic cultural products in a global environment. Globalization introduces martial arts through cinema so as to create a degree in their martial history (Barry, 2016). The surprising evolution of the martial arts popularity is through television and film, increasing the regional economy. Besides, it rose as a global financial center with the famous local martial arts culture (Neil, 2019). Martial arts are one of valuable sports (Peter, 2016).

In the world of sports, martial art no longer sounds classic but it serves as a sport inviting many athletes to compete (Wojciech, 2006). Pencak silat is a traditional martial art originating from Indonesia. In other words, it can be said that pencak silat is one of the Indonesian national cultures in the field of sports that has experienced tremendous development and has even been accepted as one of the sports contested at multi-event level (Johansyah Lubis, 2014). The term pencak silat is designated from two words; pencak means performing arts and

silat means battle. Thus, pencak silat is a martial art that sometimes involves the use of weapons such as swords or sticks (Margaret, 2011). Many martial art participants believe that martial arts are able to make positive benefits to the physical and mental conditions for them (Min et al, 2015).

To become a fighter, we must possess and master various basic techniques of pencak silat, including horses, tide attitudes, step patterns, grooves, avoidances, defenses and attacks (Johansyah, 2014). One type of attack is foot attack. Some types of foot attacks are straight kicks, T kicks, back kicks and crescent kicks. A crescent kick is a semicircular crossing kick, targeting all parts of the body by using the back of the foot sole or the fingers of the foot sole (Lubis, 2014). In order to do a good kick technique, the adequate physical and mental readinesses are also needed. Physical activity is an activity that is determined by the duration, frequency, and intensity of movements (Torben, 2009). The elements of the physical condition involve some components including: 1. strength; 2. endurance; 3. muscular explosive power; 4. speed; 5.

flexibility; 6. balance; 7. coordination; 8. agility; 9. accuracy; and 10. reaction (Sajoto, 1995).

The physical components that can make a good kick technique are muscle explosive power and reaction time. In the sport of pencak silat, the ability to create and transfer leg muscle explosive power is a key element of success in gaining victory (Michael et al, 2005). Explosive power is defined as a combined product of strength and speed (Street et al, 2011). Developing a method of leg muscle explosive power in school-age athletes can increase the speed of leg muscle explosive power in relatively short time and effort (Kerimov & Goncharova, 2014). The jumping affects the leg development and increase the speed and strength in the leg muscles (Nining & Lalu, 2006). Explosive force is the ability of a muscle or a group of muscles to carry out explosive movements. In pencak silat, this explosive power is used to carry out punches or kicks (Joko Subroto, 1996). Speed of movement and quick reactions are important requirement in athletics. Reaction time is often doubted and this element is usually not used in athletic selection (Gavkare et al, 2013). Reaction time is the ability of a person to immediately act as quickly as possible in response to stimuli caused by senses, nerves or other feelings, such as anticipating an attack from the opponent that must be avoided (Sajoto, 1995). The duration of the movement affects the reaction time of fraction component (Donald, 1986).

Reaction time is the time that passes between the beginning of the stimulus and the person's response to the stimulation received through the muscles (Todd, Katrina, and Vickilyn, 2012 in Joko Subroto, 1996). It is also said that reaction time is an element of physical condition that plays an important role in pencak silat; one of them is when responding to a kick attack or a blow as quickly as possible. The reaction time is largely dependent on the level a person receives stimuli from his/her hearing and vision sensors to the muscular system in a fast time (Ana, 2008).

However, based on observations in the field, the authors found a problem in male athletes from Empat Banding Budi Institution, Pekanbaru in the match especially at the City Championship in Pekanbaru. The Empat Banding Budi Pekanbaru in the competition sent male athletes in several classes, including class A, B, C, D, E, F, G, H, and class I. Based on the interview result with the pencak silat trainers at the college, it was found that in the competition, only the male athletes in class A and I won the match, while the athletes from class B, C, D, E, F, G, and H did not win the match because they did not compete optimally. In the competition, crescent kicks were the most dominant kick used by

the fighters. Obviously, the skill of the male athletes of Empat Banding Budi, Pekanbaru in doing the crescent kick was still slow. Therefore, it was easier for the opponents to fend off, to catch legs and make falls. The reaction time when responding to the opponent's movements to do counterattack was also very slow and it allowed the fighter to easily be dropped.

The author expects the male athletes of Empat Banding Budi have a good reaction time and explosive power in the leg muscles that result in a hard-crescent kick speed and maximum kick speed. Thus, it is difficult for the opponent to do fist and catch.

2 METHOD

This research was conducted by using a correlational research design that aims to investigate how far the variables on a factor related to other factors. Correlation is a study designed to determine the relation level of different variables in a population and aims to find out how much the relationship between independent variables and dependent variables (Suharsimi Arikunto, 2006). Population is the whole research subject (Arikunto, 2006). There were 6 male fighters of Empat Banding Budi as the population in this study. Guided by the description in the population, the sampling was determined by taking the entire population into samples (total sampling). Arikunto (2006) states that if the population is less than 100 people, then all samples are better taken. Thus, the numbers of samples in this study were 6 people. Instrument

The data needed in this study was the data in the form of reaction time, leg muscle explosive and kick crescent speed tests. The instruments used to collect the data in this study were: 1. reaction time test (whole body reaction time meter) according to Ismaryati (2008), 2. skip far without the prefix (standing broad jump) according to Johansyah (2014) in the book of martial arts, 3. crescent kick speed test according to Johansyah (2014) in the martial arts book.

3 RESULT

3.1 Reaction Time

The measurement of reaction time was carried out using a whole-body reaction time meter test for 6

samples. The fastest score was 0.225 second; the lowest score was 0.276 seconds; the mean was (0.26); the standard deviation was 0.02. The data from this test can be seen in Table 3.1.

Table 1: Distribution of reaction time frequency (X1).

No	Interval Class	Frequency	
		absolute (F1)	relative (%)
1	0.225– .242	1	16.67 %
2	0.243–0.260	0	0%
3	0.261– .278	5	83.33 %
	Amount	6	100%

Based on the frequency distribution table above, it turned out that out of 6 samples, 1 sample (16.67%) had the agility result with a value range of 0.225 - 0.242. Thus, there was not any sample in the value range of 40.66 - 50.66 and 5 samples (83.33%) had the agility results with a value range of 0.261 - 0.278. The more detailed result can be seen in the histogram below.

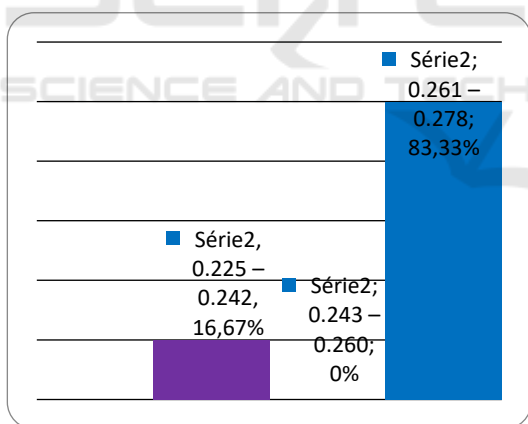


Figure 1: Reaction time histogram (X1).

3.2 Explosive Power of Leg Muscles

The measurement of leg muscle explosive power was carried out by using standing broad jump test on 6 samples. The furthest score was 231cm. The closest score was 200cm. The mean was 217.83. The standard deviation was 13.41. From the data on this test, the frequency distribution table can be seen in Table 2.

Table 2: Frequency distribution of leg muscle power (X2).

No	Interval Class	Frequency	
		absolute (F1)	relative (%)
1	200 – 212	2	33.33
2	213 – 225	2	33.33
3	226 – 238	2	33.33
	Amount	6	100%

Based on the frequency distribution table above, it turned out that from 6 samples, 2 samples (33.33%) had jumps with a value range of 200 - 212, 2 samples (33.33%) had jumps with a value range of 213 - 225, and 2 samples (33.33%) had jumps with a value range of 226-238. The more detailed result can be seen in the histogram below.

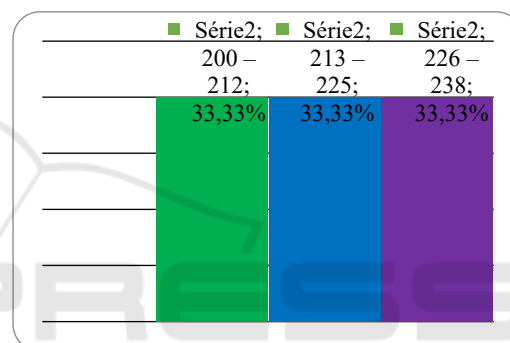


Figure 2: Muscle explosive power histogram (X2).

3.3 Crescent Kick Speed

Data obtained from crescent kicks were measured using the Crescent Kick Speed Test (Lubis, 2014). Out of 6 samples, it was found that the highest score was 40. The lowest score was 30. The mean score was 35.83 and the standard deviation was 3.82. From the data from the results of this test, a frequency distribution table can be seen in Table 3.

Table 3: Variable distribution of crescent kick speeds (Y).

No	Interval Class	Frequency	
		absolute (F1)	relative (%)
1	30 – 33	1	16.67%
2	34 – 37	3	50%
3	38 – 41	2	33.33%
	Amount	6	100%

Based on the distribution table above, it turned out that out of 6 samples, 1 sample (16.67%) had

crescent kick speed with a range of values of 30-33, 3 samples (50%) had a crescent kick speed with a value range of 34-37, and the last 2 samples (33.33%) in a range of 38 – 41. The more detailed result can be seen in the histogram below.

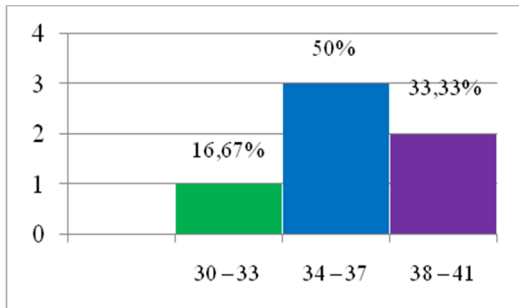


Figure 3: Crescent kick speed histogram (Y).

Table 4: Norms of crescent kick speed (Lubis, 2014).

Category	Woman	Man
Very Good	>24	>25
Good	19-23	20-24
Average	16-18	17-19
Fair	13-15	15-16
Poor	<12	<14

Based on the crescent kick speed test data obtained an average of 36 kicks, so it can be concluded from the Table 4 above that the speed of the crescent athlete's kick of Empat Banding Budi was in the very good category.

4 DATA ANALYSIS

Analysis of the data normality test was carried out by using Liliefors test. The results of the analysis from the normality test of each variable are presented in the form of the table below, and the complete calculations can be seen in the appendix.

Table 5: Data normality with liliefors test.

No	Name	Lo	L table	Notes
1	Reaction Time	0.1711	0.319	Normal
2	Explosive Power of Leg Muscles	0.2499	0.319	Normal
3	Crescent Kick Speed	0.1401	0.319	Normal

On the table above, it can be seen that the results of the variable reaction time, Lo, leg muscle explosive power variables, and crescent kick speed variables are smaller than L table. Thus, it can be concluded that the data are normally distributed.

The results of simple correlation coefficient calculations can be seen as follows.

- The result of the calculation of the correlation coefficient value of X1 to Y was 0.482.
- The result of the calculation of the correlation coefficient value of X2 towards Y was 0.687.
- The result of the correlation coefficient count of X1 and X2 was -0.627.
- The result of the correlation coefficient count of X1X2 against Y was 0.690.

4.1 Hypothesis One Testing

On the first hypothesis test, there is a relationship between the reaction time and crescent kick speed. Based on the analysis, the average crescent kick skill was at 35.83, having standard deviation at 3.82. The average reaction time obtained was 50.00 with a standard deviation of 10.00. From the information above, a correlation analysis between reaction time and crescent kick speed was obtained, in which the r tab at a significant level α (0.05) = 0.811 meaning that r obtained (0.482) < r tab (0.811). Therefore, the hypothesis is rejected. The detailed data can be seen in the table below.

Table 6: Correlation analysis between reaction time and sickness kick speed (X1-Y).

N	R obtained	R table	Notes
6	0,482	0,811	Ha Rejected

Table 7: The interpretation of the correlation coefficient r value (Sugiyono, 2003).

Interval Coefficient	Relationship Level
0.00 – 0.19	Very Low
0.20 – 0.399	Low
0.40 – 0.599	Average
0.60 – 0.799	Strong
0.80 – 1.000	Very Strong

The results of the correlation analysis state that there is a moderate but not significant relationship between reaction time and crescent kick speed, because at a significant level α = 0.05 proves that r obtained (0.482) is smaller than r table (0.811).

4.2 Hypothesis Two Testing

On the second test hypothesis, there is a relationship between the leg muscle explosive power and crescent kick speed. Based on the analysis carried out, the average crescent kick ability was at 35.82, having a standard deviation of 3.82. The average reaction time obtained was 50.00 with a standard deviation of 10.00. From the information above, a correlation analysis between reaction time and crescent kick speed was obtained in which the r table at a significant level α (0.05) = 0.811 means r obtained (0.687) < r table (0.811). Hence, the hypothesis is rejected. The detailed data can be seen in the table below.

Table 8: Correlation analysis between leg muscle explosive power and crescent kick speed (X2-Y).

N	R obtained	R table	Notes
6	0,687	0,811	Ha Rejected

Table 9: Interpretation of the correlation coefficient r value (Sugiyono, 2003: 231).

Coefficient Interval	Correlation Level
0.00 – 0.19	Very Low
0.20 – 0.399	Low
0.40 – 0.599	Average
0.60 – 0.799	Strong
0.80 – 1.000	Very Strong

The results of the correlation analysis state that there is a strong but not significant relationship between leg muscle explosive power and crescent kick speed because at a significant level $\alpha = 0.05$ r obtained (0.687) is smaller than r table (0.811).

4.3 Hypothesis Three Testing

On the third hypothesis, there is a relationship between reaction time and leg muscle explosive power with crescent kick speed. Based on the analysis carried out, the correlation analysis between reaction time and explosive muscle leg strength with crescent kick velocity is as follows.

Table 10: Analysis of correlation between reaction time and leg muscle explosive power with crescent kick speed (X1, X2 - Y).

N	R obtained	R table	Notes
6	0.690	0,811	Ha Rejected

Table 11. Interpretation of the correlation coefficient r value (Sugiyono, 2003: 231)

Coefficient Interval	Correlation Level
0.00 – 0.19	Very low
0.20 – 0.399	Low
0.40 – 0.599	Average
0.60 – 0.799	Strong
0.80 – 1.000	Very Strong

The results of the correlation analysis show that there is not any significant relationship between reaction time and leg muscle explosive power with crescent kick speed because at a significant level $\alpha = 0.05$ r obtained (0.690) is smaller than r table (0.811).

5 DISCUSSION

5.1 Reaction Time

Reaction time is an important aspect in responding to something. The athlete's reaction time in sports is more needed by open and closed sports skills (Leila et al, 2013). In the sport of pencak silat, reaction time is needed when carrying out attacks. Having good ability in managing reaction time, the fighters can quickly optimize the results of good kicks. Remember that the speed of reaction time is caused by the increasing uncertainty in the direction of movement and the push when receiving a response (Sanderson, 1983). Athletes who have good speed tend to have fast movement coordination, because coordination is a kind of collaboration between the central nervous system and the muscles. The muscles are used in kicking movements.

From the results of the analysis, it can be concluded that there is not any significant relationship between the reaction time and crescent kick speed of the Empat Banding Budi Pekanbaru athletes. The hypothesis was rejected because the number of samples in this study was very small and when conducting the research, they did not take the test seriously and properly so that the results obtained were not optimal. Some complications of mental elements can also affect the reaction time, besides the human physiological factors (Thomas, 2013). The level of strength possessed by athletes will certainly be better if the factors that can affect the speed of crescent kicks are ignored.

Based on the results obtained after the athlete's ability were analyzed, it is clear that improving the ability of physical conditions such as reaction time will indirectly increase the ability of the crescent kick speed. This is an evident from neuroscience research that has identified differences in the response time mechanism of reactions under normal circumstances in humans and those reactions constantly become quicker in a competition (Thomas, 2013). This is an evident that there is a relationship of the reaction time in supporting the athlete's crescent kick speed, although there are still many determinants that may increase this ability. Reaction time can be increased by anticipation. Anticipation in question is an athlete's strategy to minimize the response time to stimuli and guess or anticipate when the stimulus comes (Ana, 2008).

5.2 Explosive Power of Leg Muscles

Explosive power plays an important role in carrying out movements in crescent kicks. In pencak silat sport, the ability to generate and transfer explosive power to the kick is an important element of gaining points from opponents (Michael et al, 2005).

Explosive power is a crucial element in determining a decisive attack when kicking your opponent. On the other hand, explosive power also determines the quality of the athlete, because if the athlete's limbs are very weak, it is easier for the opponent to catch and respond to the kick movement.

From the results of the analysis, it can be concluded that there was a relationship but not significant between the explosive muscle power of the limbs with the speed of the crescent kick in the Empat Banding Budi Pekanbaru athletes. The hypothesis was rejected because the number of samples in this study was so small. In addition, when conducting the research, they did not take the test seriously and properly so that the results obtained were not optimal. The level of strength possessed by athletes will certainly be better if the factors that can affect the speed of crescent kicks are not ignored. Based on the results obtained after analyzing the data from the athlete's ability, it is clear that improving the ability of physical conditions such as explosive power would also indirectly increase the ability of the crescent kick speed. This is an evident that there is a relationship of the leg muscle explosive power in supporting the athlete's crescent kick speed, although there are still many determinants that may increase the kicking ability. Future research should determine the biological age of athletes rather than chronologically to see changes

in leg muscle explosive power as a function of opportunities that occur during athletes' growth (Bennett et al, 2019).

5.3 Leg Muscle Power and Reaction Time and with Crescent Kick Speed

One of the factors needed in pencak silat is reaction time and explosive power. Reaction time is one of the important technical parts to achieve an achievement. When competing, athletes are required to carry out attacks quickly and strongly so as to produce the optimal kick, involving all parts of the body to receive stimuli and make fast and strong movements when kicking.

From the analysis, it can be concluded that there is not any significant relationship but not significant between reaction time and leg muscle explosive power with crescent kick speed at the Empat Banding Budi Pekanbaru athletes.

The hypothesis was rejected because the number of samples in this study was very small and when conducting research, they did not take the test seriously and properly, so the researchers repeated a large number of tests. Thus, the results were not optimal because the athletes were already exhausted. The level of reaction time and explosive power of an athlete will certainly be better if the factors that can affect the speed of crescent kicks are not ignored.

The physical component has a positive contribution to the results of kicks in the sport of Pencak Silat (Nusufi, 2014). This means that some factors can increase the crescent kick ability, such as reaction time and leg muscle explosive power. However, researchers only connect to the two forms of physical condition. Actually, there are still many physical components that can improve crescent kick abilities such as agility.

6 CONCLUSIONS

Based on the results of the research that the author described in the previous chapter; the conclusions can be taken as follows.

1. There is a moderate relationship between reaction time and crescent kick speed, in which at a significant level α (0.05) r obtained (0.482) is smaller than r table (0.811).
2. There is a significant correlation between leg muscle explosive power and crescent kick speed, in which at a significant level α (0.05) r obtained (0.687) is smaller than r table (0.811).

3. There is a strong relationship between reaction time and leg muscle explosive power with crescent kick speed, in which a significant level of α (0.05) r obtained (0.690) is smaller than r table (0.811).

7 RECOMMENDATION

Based on the conclusions above, the researchers can provide recommendations as follows.

1. The trainer/ teacher should pay attention to the reaction time and the explosive power of the leg muscles with the speed of kicking of Empat Banding Budi Pekanbaru athletes.
2. The trainer/ teacher should direct the exercise of the physical component that can affect the optimal kick.
3. The athletes/ students should pay attention and improve the practice of reaction speed and explosive power with crescent kick speeds. For other researchers, it is recommended to examine other factors related to martial arts.

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