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The Effect of Training Methods and Explosion of Limb Muscles on Pencak Silat Kicking Skills

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Abstract The purpose of this study was to determine the best training method between plyometrics, circuit training methods, and continuous training methods, which had more effect on improving the results of Pencak Silat kick skills training. The method used in this study is an experimental method (comparative quantitative) with a 3 x 2 factorial design. The number of samples in this study was 56 students of the Health Sports Education Study Program of STKIP Setia Budhi Rangkasbitung in the Pencak Silat course, with a generalization level of students and athletes who have the same population characteristics and attributes. The summary of the results of the calculation analysis (ANOVA) on the variation of the average row, the significance level = 0.05 obtained Fo = 15.49 and Ft(1.54) = 4.02, thus Fo> Ft so that Ho is rejected. In the column mean variation, the significant level value = 0.05 obtained Fo = 8.97 and Ft(2.54) = 3.17, thus Fo > Ft so that Ho is rejected. In the interaction variation, the significant level value = 0.05 obtained Fo = 57.39 and Ft(2.54) = 3.17, thus Fo> Ft so that Ho is rejected. It was concluded that (1) overall there was a significant difference in the effect of training methods and high and low leg muscle explosive power on pencak silat kick skills. (2) there are differences in the average results for the three training methods. (3) there is an interaction between the explosive power of the leg muscles and the training method on the results of pencak silat kick skills.

Keywords Plyometric Training, Circuit Training, Continuous Training, Leg Muscle Explosive Power, Pencak Silat Kicks

1. Introduction

Pencak Silat is a legacy of the ancestors that has existed for generations. which has elements of sports, martial arts and arts. This is as quoted by Wile (2019) that ". from the inherited ancestors that have existed for generations which has elements of sport and art". It is not known with certainty since when the word Pencak Silat was used, but it is believed that the term came from the language used by the community. PENCAK means Search, SILAT means Gathering, when the two meanings of the word are combined, Pencak Silat means Searching for Gathering and then develops in various directions. The history of Banten Province explains that pencak silat is a favorite sport, this is evidenced by the making of Pencak Silat as a local content (mulok) as a compulsory subject in schools and even universities and always gets a very positive response from the community in every match held in each region.

However, behind these developments, it has not been matched by the optimal performance of the Banten province Pencak Silat athletes. This statement is supported by the quote from Latif, Hakim and Indardi (2015) that, "serve as local content in schools and always get a very positive response from the community in every match held in each region". Failure after failure in various national championships such as in PON XVI in Pelembang in 2004, PON in Kalimantan XVII in 2008 and PON XVIII in Riau province in 2012, as well as other national championships, Banten fighters in their history have never won a gold medal, especially in the competition category. This is clear evidence that cannot be denied, this fact is very contradictory when it is associated with Banten culture which is thick with customs, one of which is pencak silat whose preservation efforts are passed down from generation to generation. It is natural that the achievements of Banten fighter "should" dominate in these various national championships. The achievements of Banten fighters in various national events range from the National Student Sports Week (POPNAS), National Student Sports Week (POMNAS), National Sports Week (PON) which is the embodiment of the achievement of the Banten province target to enter the top 10 rankings in the national sports arena.This has not materialized until now. The failure after failure of Banten fighters to win at national events has never been achieved, since the separation from the expansion of the West Java province in 2000 until now, no Banten fighter has ever won a gold medal.

The failure of the Banten fighters could be caused by technical or non-technical factors. This is supported by the quote from Hidayatullah, Rahayu and Wahyudi (2019) that, “the training material only on experience as if it seems boring and runs monotonous, athlete nurseries are not well programmed, training is only incidental and not continuous, obtained is not optimal, and has not used many more modern training methods based on studies. scientific studies coaching". As for the non-technical factors, among others, the attention of the management who is still considered less than optimal in carrying out the program, unprofessional management and the lack of funds for sports which have been a classic problem in Banten province. The explanation for this obstacle is similar to Guni's (2016) quote, “the attention of the management who is still considered less than optimal in carrying out the program, unprofessional management and the lack of sports funds for the common good”. Advances in science and technology have clearly had a broad impact on the development of training theories and methodologies in the province of Banten. Existing training so far still uses traditional models. Not infrequently Pencak Silat coaches are only based on the sign of a higher "belt" level which is considered to have more knowledge, coaches only teach what kind of training they used to get from teachers or warriors who have more traditional elements raised, as well as from former athletes who do not have the appropriate

educational background in the world of sports. The explanation is supported by a quote from Wiraatmadja (2014) that, "considered to have more knowledge, coaches only teach what kind of training they used to get from teachers or warriors who have more traditional elements raised athletes".

The main factor that can spur the development of achievement in sports is an increase in the quality of training and coaching. Improvements in training and coaching can be achieved by applying scientific and technological disciplines. This is as quoted by Vlachos and Researcher, (2019) that, "creasing achievement must be through training carried out with a scientific approach to related sciences such as exercise psychology, biomechanics, and exercise physiology". Efforts to improve achievement must go through exercises carried out with a scientific approach to the related sciences. Various sciences related to sports include exercise psychology, biomechanics, and exercise physiology. With the support of these various disciplines, good training theories can be developed, so that sports performance can increase, especially in the province of Banten.

Efforts to develop training programs to improve performance must pay attention to 4 (four) aspects, namely (1) technical aspects, (2) physical aspects, (3) tactical aspects (4) mental aspects. These four aspects must be trained in the right way and method so that each aspect can develop optimally. This is supported by the quote from Ghafur (2017) that "tactics are conditioned because they have experience in learning and developing mental skills as reflected in self-confidence, aggressiveness, and the need for achievement". Judging from the technical aspect, Pencak Silat techniques and tactics do not encounter significant obstacles, because they already have experience in learning and developing these skills.

The mental aspect is reflected in self-confidence, aggressiveness, and the need for achievement. However, when viewed from the physical aspect, it seems that it still needs to be developed further. The limited number of instruments in the sport of Pencak Silat can be seen from the lack of reference books related to physical condition training. For example, the physical needs and the right energy system for the sport of Pencak Silat are not yet known. The description is as quoted by Ghafur (2017), “mental aspects of self-confidence, aggressiveness, and need for achievement, physical aspects are still limited with instruments in the sport of Pencak Silat with physical condition training exercises”. Deepening the physical needs of Pencak Silat is done by looking for similarities or proximity to other martial arts sports. However, in reality, there are differences between Pencak Silat and the characteristics of the sport. Wile (2019) states that training must be specific, aimed at the energy system used and specifically for movement patterns that are in accordance with the sports skills. Explanation is as quoted.

The physical aspect is a very basic component to

determine the ability of an athlete to complete an exercise program, as well as excellent physical conditions in a match. The training methods recommended by Bompa in developing and improving muscle explosive power include: isotonic, isometric, isokinetric, circuit training, ballistic, power-resistin, plyometric methods (Bompa, 1999). The explanation is as quoted by Caglayan and Ozbar (2017), "physical movement is the result of the cooperation of energy, speed, duration of activity, and complexity. Individuals have strength, endurance, and speed, flexibility is not a natural ability that needs to be considered in training". In general, almost all physical movements are the result of the cooperation of energy, speed, duration of activity, and individual complexity. Naturally, each individual has strength, endurance, and speed. Flexibility is not a natural ability, but rather is an anatomical quality of organs that needs to be considered in training. As a sport that requires physical aspects to carry out its activities, Pencak Silat also develops the relationship of the three components of strength, endurance and speed to become the main components.

From this explanation, we can conclude that to be a winner in a Pencak Silat match, it is very necessary to have stamina or strong physical conditions besides that it requires a wealth of competing techniques and a high mental fighting spirit to win the match. Athletes who have complete techniques will be able to face opponents with any specifications, and will be able to deal with the type of opponent's game with different characters. This opinion is in line with the quote from Benton and Woodward (2013), "a strong physical condition requires a wealth of competitive techniques and a high mental fighting spirit to win the match. Someone faces an opponent with any specifications, and will be able to deal with other types of games".

Punches and slams, kicks are one of the attack techniques used in Pencak Silat in the sparring category. In the PERSILAT regulations, it is explained about the Competition Rules, the meaning of match categories: Pencak Silat competition categories featuring 2 (two) fighters from different camps. Both face each other using elements of defense and attack, namely parrying / dodging / hitting / attacking the target and knocking down the opponent; the use of competitive tactics and techniques, endurance, stamina, and fighting spirit, using rules and patterns of steps that take advantage of the wealth of techniques in getting the most points (Jakarta, IPSI; 1999:3). The explanation above is supported by the quote from Boke (2015), "competition category features 2 fighters from different camps, both of whom face off using elements of defense and attack and bring down the opponent". The consecutive attack techniques must be regularly sequenced in various ways and vary in dissimilar meanings.

Analysis of attack technique skills, kick is the most dominant component. In a Pencak Silat match, when

compared to a punch technique that is only worth one point, the kick has several advantages, including the kick has a fairly high value of 2 (two). The thing that exists is as quoted by Caglayan & Ozbar (2017), "compared to a punch technique that is only worth one point, a kick has the advantage of having a double value". In addition to a longer attack range and has a higher power when compared to other attack techniques. A good kick is a kick that is done quickly and hard because it is anticipated by the opponent.

Observations and direct observations in the field at several Pencak Silat matches in Banten province that the author did, obtained data on the average number of percentages of the types of attacks using the feet (kicks) in Pencak Silat matches. The data collected is 33% using sickle kicks, 27% front kicks, 20% side kicks, 5% back kicks, 10% circular kicks and the rest 5% sweeping down kicks. From the available power, it is said that the average Banten fighter in competing is more dominant using the sickle kick.

The observations that have been made have led to the opinion that the sickle kick is a kick technique that is relatively easy to learn and very easy to train, so many fighters use the sickle kick in the match, but if you do it not with a high speed technique, the sickle kick will be easily anticipated. and knocked down by the opponent. From the various principles that have been described, it is necessary to find a physical training model that is in accordance with the characteristics of the Pencak Silat sport. Understanding to describe the physical needs of athletes needs to observe and observe the performance of athletes in a competition atmosphere, because the results of the competition are a parameter. This is as quoted by Zhoe (2017), “it is necessary to find a physical training model that is in accordance with the characteristics of the Silat sport, the dominant elements are needed. To find out physical needs, it is necessary to observe and observe athletes in competitions”.

The above principles, the focus of research in Pencak Silat movement activities such as sickle kicks that must be done quickly and strongly because optimal strength and speed are absolute needs needed by Banten province fighters, especially STKIP Setia Budhi Rangkas Bitung students who are the backbone of athlete nurseries in Banten province to improve performance at the national level. The goals to be achieved from an athlete must go through a process of regular, planned and continuous training and coaching, without having to sacrifice the athlete's future. Based on this, this study focuses more on the process of the influence of plyometric training methods, continuous training methods and circuit training methods, with leg muscle explosive power on Pencak Silat kick skills.

2. Methods

The method used in this research is an experimental

method (comparative quantitative) with a 3 x 2 factorial design. Experiments in cells are the same as many treatments being studied (Sudirman, 2013). This research involves three kinds of factors or variables, which will examine their effect on the dependent variable, namely Pencak Silat kick skills. The independent variables include plyometric, continuous, circuit training methods and the attribute variable, namely leg muscle explosive power. This research was conducted at the STKIP Setia Budhi Rangkas Bitung School of Teacher Training and Education, Lebak-Banten. The implementation of the research is planned after this research proposal is presented in a seminar, the research will be carried out for 14 meetings with a training frequency of 2x a week based on the lecture schedule on campus.

The target population in this study were all students of the Sports Education Study Program, STKIP Setia Budhi Rangkas Bitung, Lebak Regency - Banten totaling 200 students. Sampling was done by using a cluster random sampling technique. Each experimental class was tested for limb muscle explosive power. The test results from each class are arranged according to the scores obtained from the strongest score to the weakest value. After that, look for the average test results and then determine students who have strong leg muscle explosive power and weak leg muscle explosive power which is carried out by referring to the procedure stated by Verduci (1980) which is selecting 27% of the highest score of data and 27% of the lowest score. (Verduci, 1980). Furthermore, 27% of the highest data scores were classified in the group with strong leg muscle explosive power (B1), while 27% of the lowest total scores were classified in the group with weak leg muscle explosive power (B2). Furthermore, each cell of the exercise method group, both the cells of the athlete group with strong leg power and weak leg power, were treated with plyometric training methods, continuous and circuit training methods. So that each cell or group gets a sampling of 10 athletes. The first three samples were taken and then drawn to place the positions of groups A, B and C, so on until 30 students had the opportunity to be drawn.

In accordance with the 3 x 2 factorial experimental research design, hypothesis testing was carried out using a two-way analysis of variance (ANOVA). However, before conducting the analysis, several tests will be carried out first. First, to test the statistical hypothesis, a 3x2 analysis of variance (ANOVA) technique was used at a confidence level **of 0.05.** Furthermore, the normality test was carried out of the athlete's leg muscles, it was carried out (1) Pencak Silat Kick Skills Test with the validity of the correlation coefficient r arithmetic (6.52) > r table (2.05) and reliability with test- re test (0.56) with the category "highly reliable".

(2) Leak Muscle Lead Power Test with correlation coefficient validity r count (4,20) > r table (2,05) and reliability with test-re test (0,48) with "reliable" category.

3. Result and Discourse

The data presented after being processed from raw data using descriptive statistical methods, namely the maximum value, minimum value, range, average, standards deviation and variance.

Table 1. Summary of Research Calculation Results

Leg muscle explosive power	Practice Method			Amount
	Plyometric	Circuit	Continuous	
High leg muscle explosive power	25	18	19	
	21	24	18	
	20	19	16	
	19	18	16	
	22	19	21	
	21	16	24	
	19	17	15	
	21	17	16	
	18	21	19	
	20	20	17	
n	**10**	**10**	**10**	**30**
Average	**20,30**	**18,70**	**16,40**	**18,47**
SD	**0,95**	**1,34**	**1,35**	**2,01**
ΣX	**203**	**187**	**164**	**554**
Low leg muscle explosive power	17	18	18	
	19	16	17	
	15	17	19	
	16	22	16	
	18	17	18	
	15	13	21	
	20	15	18	
	23	18	20	
	15	19	19	
	17	18	18	
n	**10**	**10**	**10**	**30**
Average	**16,50**	**17,90**	**18,10**	**17,50**
SD	**1,27**	**1,20**	**0,99**	**1,33**
ΣX	**165**	**179**	**181**	**525**
n_{Total}	**20**	**20**	**20**	**60**
Average total	**18,40**	**18,30**	**17,25**	**17,98**

using the Lilliefors test, the homogeneity test was carried out using the Bartlett test. If there is an interaction between the training method and the explosive power of the leg muscles on the Pencak Silat kick skill, it will be continued with the Tukey test. In accordance with the research design, there are two kinds of data that must be collected, namely: (1) data on Pencak Silat kick skills, and (2) data on leg muscle explosive power. To obtain data on Pencak Silat kicking skills and data on the explosive power

Furthermore, normality testing was carried out using the Lilifors test of data on group 1 (plyometric method with high leg muscle explosive power), group 2 (plyometric method with low leg muscle explosive power), group 3 (circuit method with high leg muscle explosive power),

group 4 (circuit method with low leg muscle explosive power), group 5 (continuous method with high leg muscle explosive power capability), group 6 (continuous method with low leg muscle explosive power capability) and the following table is shown.

Table 2. Summary of Normality Results

Group	N	L_0	L_t	Result
1	10	0,224	0,280	Normal
2	10	0,224	0,280	Norma
3	10	0,200	0,280	l
4	10	0,174	0,280	Norma
5	10	0,217	0,280	l
6	10	0,240	0,280	Norma
				l
				Norma
				l
				Normal

The results of the normality test of the entire research data group show that the largest Lo value of the entire treatment group is smaller than the Lt value, thus it can be concluded that the sample comes from a normal distribution population. The homogeneity test in each treatment group was carried out with the Bartlett test at a significance level of 0.05 which is described below.

Table 3. Summary of the results of Bartlett's test calculations α 0,05

Group	dk	1/dk	si2	Log Si	(dk) Log Si
1	9	0.111	0.90	-0.04576	-0.41182
2	9	0.111	1.79	0.252583	2.27325
3	9	0.111	1.82	0.260601	2.345412
4	9	0.111	1.61	0.207125	1.864129
5	9	0.111	1.43	0.156347	1.407125
6	9	0.111	0.99	-0.00485	-0.04367
	54				7.434427

Based on 0.05 the chi-square distribution list with dk = 5 obtained 2t 0.95 (5) = 11.1. It turns out that 2count = 1.424
< 11.1. Thus Ho : 12 = 22 = 32 = 42 is accepted at a significance level of 0.05, it can be concluded that the six populations have the same variance (homogeneous). After testing the normality and homogeneity of the research data, the requirements for the analysis of variance (ANOVA) have been met, while the summary can be seen in the table below.

Table 4. Summary of the calculation results of Anova, the exercise method and the explosive power of the limb muscles on pencak silat kick skills at the level α 0,05.

Source of Variation	Dk	JK	RK	Fo	Ft
Row average	1	14,02	14,02	15,49	4,02
Column average	2	16,23	8,12	8,97	3,17
Interaction Error	2	103,87	51,93	57,39	3,17
		48,87	0,90		

methods and high and low leg muscle explosive power on pencak silat kick skills. On the variation of the column mean, the significant level value = 0.05 obtained Fo = 8.97 and Ft(2.54) = 3.17, thus Fo> Ft so that Ho is rejected. So it can be concluded that overall there are differences in the average results for the three training methods. In the interaction variation, the significant level value = 0.05 obtained Fo = 57.39 and Ft(2.54) = 3.17, thus Fo> Ft so that Ho is rejected. So it can be concluded that there is an interaction between the explosive power of the leg muscles and the training method on the results of pencak silat kick skills.

Kick is one of the attack techniques used in Pencak Silat in the sparring category. This study was conducted to determine which of the three types of training methods, namely the plyometric training method, the circuit training method, and the continuous training method, which has more effect on improving the results of the Pencak Silat kick skills training. The method used in this study is an experimental method (comparative quantitative) with a 3 x 2 factorial design that includes the level of generalization of students and athletes who have the same population characteristics and attributes.

From the results of testing the ten hypothesis formulations, the results show that hypotheses 1 (one), 2 (two), 4 (four), 5 (five), 6 (six), 7 (seven), 8 (eight), and 9 (nine).) is tested. While the formulation of the 3 (three) and
10 (ten) hypotheses shows that there is no statistically significant difference. On average, the score of the plyometric training method was higher on the results of pencak silat kick skills for the group with high leg muscle explosive power compared to the circuit and continuous methods. Through plyometric training, it can increase leg muscle explosive power (Gomang, 2012). There is no significant effect of circuit training on increasing ability compared to plyometric training. There is an effect of increasing pencak silat kicks by using training circuits. The explanation is supported by Richard's (2015) quote that, "there is no significant effect of circuit training on increasing ability compared to plyometric training. . . an effect of increasing by training circuits". The absence of a significant effect is because the two exercises have similarities in the application of muscle loads in practice, in this study both have dominance in the target strength and
explosive power of the muscles in the legs. This shows that the two forms of training methods have the same different effect on the results of pencak silat kick skills. This is as quoted by Woue (2015), "polyometric and circuit training are carried out with goals that the

The results of the calculation analysis (ANOVA) on the variation of the row mean, the significant level = 0.05 obtained Fo = 15.49 and Ft(1.54) = 4.02, thus Fo> Ft so that Ho is rejected. So that it can be interpreted that overall there is a significant difference in the effect of training

trainer can control so that the load applied can be conditioned by the training objectives". Polyometric and circuit training are carried out with objectives that the trainer can control so that the load applied can be conditioned by the training objectives. The third and tenth hypotheses show that they are not proven or cannot be verified because they are not supported by the data collected. This is not in accordance

with the theoretical study and the framework of thinking that has been put forward in the theoretical study is still a conjecture because it cannot be proven empirically. Thus, it is necessary to discuss the various possibilities that cause the hypothesis to not be proven.

Overall, the plyometric training method with high leg muscle explosive power has a better effect than the circuit and continuous training method. This is supported by research conducted by Sudirman, (2013) "This study concludes that: (1) overall there is a significant difference between the treatment of plyometric training methods and continuous training on speed with QO = 8.87 (2) there is an interaction between the methods plyometric and continuous training with strength to the speed of Pencak Silat kicks, where Fo = 15.48 (3). This is supported by Bungin's (2015) quote that, "plyometric training methods with high leg muscle explosive power have a better effect than circuit and continuous training methods, this is because exercises based on high muscle explosive power have stronger muscle fibers to train".

4. Conclusions

The explanation based on the data that has been carried out by the researchers led to the overall conclusion that there is a significant difference in the effect of training methods and high and low leg muscle explosive power on pencak silat kick skills. In addition, the overall results there are differences in the average results for the three training methods. Furthermore, there is an interaction between the explosive power of the leg muscles and the training method on the results of pencak silat kick skills. The circuit training method has no significant effect compared to the continuous training method on pencak silat kick skills, there is no significant difference in the results of the Pencak Silat kick skills that receive the circuit training method and the continuous training method in terms of explosive power of weak leg muscles.

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