The Effect of Exercise Methods and Leg Muscle Power on Agility Badminton Player at PB Satria Club Tegal Regency in 2021

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Article Info	Abstract
	Agility is a very important component in the game of badminton. Leg muscle power is a factor that affects agility. Less varied agility training methods will have an impact on performance that has not been maximized. This study aims to analyze the 4-corner shuttle run training method and shadow and leg muscle power on agility in PB Satria players, Tegal Regency. This study uses a quantitative approach. The research design used is a quasi-experimental design with a 2x2 factorial design. The sample in this study was the male players of PB Satria, Tegal Regency, totaling 20 people. The data collection instrument is the 4-corner shuttle run and shadow training method and the measurement of leg muscle power. The data analysis technique used two-way variance (Two Way Anova). The results of this study are as follows: (1) the results of the calculation of the variable method of the 4-corner shuttle run and shadow training method obtained a sig value of $0.001 < 0.05$ (2) the results of the calculation of the high leg muscle power variable and low leg muscle power obtained a sig value of $0.004 < 0.05$ (3) the results of testing the interaction between the training method and leg muscle power obtained a sig value of $0.052 > 0.05$. The conclusions based on the results of this study are (1) there are differences in the effect of the 4-corner shuttle run training method sample and the shadow training method on agility (2) there is a difference in the effect between samples of high leg muscle power and low leg muscle power on agility (3) there is no interaction between training methods and leg muscle power on agility.

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INTRODUCTION

Badminton is a sport that requires a player to move swiftly. An athlete needs to do exercises continuously and systematically in order to have good agility. The training method is a scientific method by providing programmed treatment to improve the athlete's talent, athlete's skill and athlete's physical condition in accordance with the sport being carried out (Adhi & Soenyoto, 2017:8). Exercise is a process of change for the better, namely to improve the physical quality, functional ability of the body's equipment and the psychological quality of the children being trained (Oky Anggia, 2019:2). Exercise in a narrow sense is the process of preparing athletes physically, technically, tactically and mentally with the help of physical exercise (physical loading). The goals and objectives to be achieved are something that must be done in every training process.

Some of the dominant physical components in badminton include agility, power, reaction time and strength. Agility is the most important factor in playing badminton in order to get maximum performance. According to Widiastuti (2011:125) that agility is the ability to change the direction or position of the body quickly which is done together with other movements. Meanwhile, according to Ramadhan Arifin (2018:64) agility is the ability to change the direction or position of the body quickly and carried out together with other movements. According to Bompa in Harsono (2018: 49) that agility or agility is a product of a complex combination of speed, coordination, flexibility and power as demonstrated in gymnastics, wrestling, soccer, volleyball, boxing, jumping, tennis, badminton and figure skating.

The agility of badminton players is strongly influenced by the reaction speed and muscle ability. Muscular strength or explosive power is one of the elements and the ability to produce large amounts of force is recognized as a major factor in athlete success (Cinthuja et al. 2015:15). Badminton players must have excellent physique because this sport requires players to always be actively moving and requires strength, one of which is leg muscle strength. Power according to Harsono in Munizar et al (2016: 2) is the ability of muscles to direct maximum strength in a very fast time. According to Suharno in Munizar et al (2016:2) muscle explosive power is the ability of the muscles to withstand loads at high speed in one complete movement. Explosive power is the ability to display or release power explosively or quickly (Sefri Herdiansyah, 2016:63).

PB Satria is one of the places where badminton athletes are born for children or male and female beginners. PB Satria is located in Slawi, Tegal Regency which was formed on September 5, 2000 and is the longest standing badminton club in Tegal Regency to date. The goal is to serve as a forum for children in Tegal Regency who want to develop their talents in the field of badminton with the aim of creating outstanding athletes. So PB Satria is a place for breeding and coaching badminton athletes who are still below the minimum standard for pro athletes. PB Satria has produced many athletes in Tegal Regency. The PB Satria training program is carried out 3 (three) times a week, namely on Wednesdays at 16.30-20.00 WIB, Fridays at 14.00-20.00 WIB and Sundays at 08.00-13.00 WIB.

The results of observations made through observations obtained that one of the shortcomings possessed by the athlete is agility. Researchers in observing the training program run by the trainer are more dominant in terms of technique, physical and drill. According to PB Satria coach, the results of several championships that were followed were not as satisfactory as expected. This cannot be separated from the trainer's observation that agility is one of the factors that causes the results to be less than optimal. Agility cannot be separated from the effect of leg muscle power.

Badminton players must have excellent physique because this sport requires players to always be actively moving and requires strength, one of which is leg muscle strength. Power according to Harsono in Munizar et al (2016: 2) is the ability of muscles to direct maximum strength in a very fast time. Several types of exercises to improve agility are zig zag run, shuttle run, obstacle run, squat thrust, and others. However, in badminton, the exercises used to improve agility are shuttle runs and shadows.

Shuttle run is a test to measure foot agility which is done by running back and forth from one point to another. Research (Apriyanti et al., 2021:10) states that the shuttle run training method is quite effective in increasing the agility of the 6-point shadow movement using a training dose of 16 face-to-face sessions. The 4-corner shuttle run exercise is a modified form of running back and forth towards 4 corners which includes the right-left front corners and right-left rear corners by touching the cones that have been placed on the 4 corners. The way to maximize the movement in this exercise is to add a barrier on 4 each side. This barrier is useful for making players focus more on the center point of the field to make it easier to reach the dominant corners in the badminton game.

While the shadow exercise is a shadow movement exercise hitting the shuttlecock in a certain position and in a certain direction as quickly as possible. According to Subarjah in Tri Wisnu Saputra (2020:742) shadow steps are foot steps that regulate the body to get the body position to make it easier for players to make the movement to hit the shuttlecock with its position. So the right exercises in developing agility in the game of badminton are exercises related to elements of basic movement patterns and dominant movement patterns.

METHOD

This research is a quantitative research. The research design used was a quasi-experimental with a 2x2 factorial design. This study uses a quasi-experimental method which aims to analyze the agility of badminton players PB Satria, Tegal Regency. A factorial experiment is an experiment in which almost or all levels of a factor are combined or crossed with all levels of every other factor in the experiment. The population in this study were all badminton players at the PB Satria club, Tegal Regency, totaling 28 athletes consisting of 24 male athletes and 4 female athletes.

The sample in this study was the male badminton player of PB Satria, Tegal Regency, which was obtained by purposive sampling technique. From the number of 28 athletes, tests and measurements of leg muscle power were carried out on 24 male athletes with the aim of knowing athletes who had a high level of leg muscle power category and athletes who had a low level of leg muscle power category which were then ranked in the research group and taken. a sample of 20 players. The implementation of this research was carried out for 16 meetings which were divided into 3 (three) times a week according to the PB Sartria training schedule, Tegal Regency.

The research variable used in this study is the independent variable (manipulative), namely the training method consisting of two levels, namely the 4-corner shuttle run exercise and shadow training, while the attribute independent variables (which are controlled) are high leg muscle power and low leg muscle power and the dependent variable is agility. The data collection instrument used in this study was observation, leg muscle power test using a vertical jump test to determine the category of athletes who have high leg muscle power and low leg muscle power categories, pre-test and post-test, and documentation.

The data analysis technique used to test the hypothesis of this research is to use two-way analysis of variance (Two Way Anova). Normality test and homogeneity test with significant level =0.05 assisted by IBM SPSS Statistics 28 program.

RESULTS AND DISCUSSION

Differences in the Effect of the 4-corner Shuttle Run Training Method and Shadow on Agility Results

Table 1. Description of Pre-test and Post-test Statistical Data

Treatment	N	Mean	Std. Deviation
Pre test of 4-corner Shuttle run	20	19.05	2.114
Post test of 4-corner Shuttle run	20	24.35	2.540
Pre test of Shadow	20	17.40	3.085
Post test of Shadow	20	21.05	2.114

Based on the results of data processing shown in the table above, it is known that the pre-test results of the 4-corner shuttle run exercise have the lowest value of 16 and the highest value of 23 with a mean of 19.05. The post test results obtained the lowest score of 20 and the highest score of 30 with an average of 24.35. Then for the results of the shadow practice pre-test, the lowest value was 13 and the highest value was 22 with a mean of 17.40. While the post test results from the shadow training method obtained the lowest value of 17 and the highest value of 25 with an average of 21.05.

Table 2. Calculation of the Pre-test Data Normality Test

	Exercise Type	df	Sig.
Agility	4-corner Shuttle run	20	.197
	Shadow	20	.082

*Kolmogorov-Smirnova
a. Lilliefors Significance Correction

Based on the normality test table above, it is obtained information on the value of sig > 0.05. So the pre-test data on the exercise method variables are normally distributed.

Table 3. Homogeneity Test Results

		Levene Statistic	df1	df2	Sig.
Agility	Based on Mean	1.029	3	36	.391
	Based on Median	.508	3	36	.679
	Based on Median and with adjusted df	.508	3	27.877	.680
	Based on trimmed mean	1.001	3	36	.404

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.
a. Dependent variable: Hasil Kelincahan
b. Design: Intercept + Metode + Power + Metode * Power

Based on the homogeneity test table above, information is obtained from all test indicators with a significant value of Fcount 0.404 and Ftable 0.05 which indicates that the data variance between groups is homogeneous.

Table 4. Results of the Effect of Training Methods on Agility Results

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	165.800[a]	3	55.267	13.211	<.001
Intercept	20611.600	1	20611.600	4927.076	<.001
Practice Method	108.900	1	108.900	26.032	<.001
Error	150.600	36	4.183		
Total	20928.000	40			
Corrected Total	316.400	39			

a. R Squared = .524 (Adjusted R Squared = .484)

The table above shows the results of hypothesis testing with a significant value of 0.001 < 0.05 and the value of Fcount 26.032 > Ftable 4.183. It can be concluded that H_0 is rejected and Hα is accepted, meaning that there is a significant difference between the 4-corner shuttle run training method and shadow training on agility in badminton athletes at the PB Satria Club, Tegal Regency.

Table 5. Differences in Agility Results Based on Training Methods

Exercise Method	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
4-corner Shuttle run	24.350	.457	23.422	25.278
Shadow	21.050	.457	20.122	21.978

The average value of the 4-corner shuttle run results is 24.350, while the shadow training group has a lower result, which is 21.050 or there is a difference of 3.300. These results indicate that the 4-corner shuttle run training method is better in increasing agility compared to the shadow training method for badminton athletes at the PB Satria Club, Tegal Regency.

The results showed that there was a significant difference between the 4-corner shuttle run training method and the shadow training method on agility in PB Satria badminton players, Tegal Regency, which was obtained from the results of hypothesis testing where there was a significant value of 0.001 < 0.05 so that H_0 was rejected and Hα accepted. According to Achmad Rifai (2020:26) badminton players must be able to perform movements such as sprinting, jumping, reaching, turning the body, stepping wide and trying to respond to the opponent's attack quickly and precisely.

In line with research results (Gani Kardani & Hendra Rustiawan, 2020) stated that there was a significant difference between shuttle run training and shadow training on footwork agility in badminton. Other research results (Saibatul Islamiah & Endang Sepdanius, 2019:63) states that footwork and shadow exercises can significantly increase agility, as evidenced by the data tcount = 6.21 > ttable = 1.8 with an average of 13.84 (pre-test) 13.47 (post-test) an increase of 0.37 . Shuttle run allows to know the level of development of coordination ability in badminton (Stovba et al. 2020:2442).

Based on the explanation above, that a regular and directed exercise program on an ongoing basis will result in adjustments to increasing physical conditions. According to the results of the research hypothesis test that there is a significant effect between the 4-corner shuttle run and shadow training on agility in badminton athletes at the PB Satria Club, Tegal Regency.

Differences in the Effect of Low Leg Muscle Power and High Leg Muscle Power on Agility Results

The results of the study of measuring leg muscle power tests on 20 research samples at the PB Satria Club, Tegal Regency in 2021 as a whole had an overall average of 35.15. The following is a table of leg muscle power test results:

Table 6. Descriptive Statistics of Leg Muscle Power

Category	N	Mean	Std. Deviation
High	10	42.70	5.964
Low	10	27.60	3.307
Total	10	35.15	

The following are the results of the leg muscle power normality test in the research sample of PB Satria players, Tegal Regency in 2021.

Table 7. Calculation of the Normality Test for Leg Muscle Power

	Leg Muscle Power	Statistic	Df	Sig.
Agility	High	.220	10	.186
	Low	.134	10	.200*

*. This is a lower bound of the true significance.
*Kolmogorov-Smirnova

Based on the normality test table above, it is obtained information on the value of sig> 0.05. So the pre-test data on the leg muscle power variable were normally distributed. After it was stated that the leg muscle power variable was normally distributed, then the hypothesis was tested for the effect of low leg muscle power and high leg muscle power on the results of the agility of the PB Satria Players in Tegal Regency in 2021.

The results of the research on the difference in the effect of low leg muscle power and high leg muscle power on the results of the agility of the PB Satria Players in Tegal Regency in 2021 are as follows:

Table 8. Results of the Effect of Leg Muscle Power on Agility Results

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	165.800ᵃ	3	55.267	13.211	<.001
Intercept	20611.600	1	20611.600	4927.076	<.001
Leg Muscle Power	40.000	1	40.000	9.562	.004
Error	150.600	36	4.183		
Total	20928.000	40			
Corrected Total	316.400	39			

a. R Squared = .524 (Adjusted R Squared = .484)

The results of testing the hypothesis above show a significance value (p value) of 0.004 < 0.05 and the value of Fcount 9.562 > Ftable 4.183. Based on these results, H_0 is rejected and Hα is accepted, meaning that there is a significant difference in the effect of high leg muscle power and low leg muscle power on agility in badminton athletes at the PB Satria Club, Tegal Regency.

Table 9. Differences in Agility Results Based on Leg Muscle Power

Leg Muscle Power	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
High	23.700	.457	22.772	24.628
Low	21.700	.457	20.772	22.628

Based on the table data above, it is known that the average agility result in the high leg muscle power group is 23,700 while the low leg muscle power group has a lower result of 21,700 or there is a difference of 2,000. These results indicate that the high leg muscle power group has better agility than the low leg muscle power group in badminton athletes at the PB Satria Club, Tegal Regency.

The results showed that the difference in the effect between the categories of high leg muscle power and low leg muscle power on agility in PB Satria badminton players, Tegal Regency with the results of hypothesis testing II, a significant value of $0.004 < 0.05$, then H_0 was rejected and $H\alpha$ was accepted. Sometimes long legs have a good influence on a sport and sometimes have a bad influence on sports (Elmando, Nasuka & Sulaiman, 2020). The results of Trihadi Karyono (2016) stated that there was a significant difference in the effect between groups of students with high leg muscle power and low leg muscle power on badminton agility results. The group of students with high leg muscle power had a higher increase in badminton results than the group of students with low leg muscle power.

The results of another study by Miftakudin Nur (2017) on students participating in basketball extracurricular activities at Theresiana 1 High School Semarang where there is an effect of differences in leg muscle power on agility to students participating in basketball extracurricular activities at Theresiana 1 High School Semarang. This shows that basketball extracurricular participants at SMA Theresiana 1 Semarang who have high leg muscle power have better agility than students who have low leg muscle power.

So in badminton, leg muscle power affects the performance of players on the field because speed and agility are influenced by leg muscle power. So this indicates that badminton athletes who have high leg muscle power categories will produce better agility compared to athletes who have low leg muscle power in performing a movement in badminton.

The Interaction Between Exercise Methods And Power Of The Leg Muscles On Agility

The results of the interaction research between exercise methods and leg muscle power on the agility of PB Satria players in Tegal Regency in 2021 showed that the interaction between exercise methods and leg muscle power showed a significant value of $0.052 > 0.05$. The table of interaction test results can be seen as follows:

Table 10. Hasil Interaksi Metode Latihan dan *Power* Otot Tungkai terhadap Kelincahan

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	165.800[a]	3	55.267	13.211	<.001
Intercept	20611.600	1	20611.600	4927.076	<.001
Metode Latihan * Power Otot Tungkai	16.900	1	16.900	4.040	.052
Error	150.600	36	4.183		
Total	20928.000	40			
Corrected Total	316.400	39			
a. R Squared = .524 (Adjusted R Squared = .484)					

The results of the interaction test between the exercise method and leg muscle power on agility showed a significant value of 0.052 > 0.05. Significant value shows > 0.05 and Fcount 4.040 < Ftable 4.183, it can be concluded that H_0 is accepted and $H\alpha$ is rejected, meaning that there is no interaction between training methods and leg muscle power on agility in badminton athletes at the PB Satria Club, Tegal Regency.

The results showed that there was no interaction between training methods and leg muscle power on agility in PB Satria badminton players, Tegal Regency with a significant value of 0.052 > 0.05, then H_0 was accepted and $H\alpha$ was rejected, which means that there was no interaction between the 4-corner shuttle run training method and shadow training and high leg muscle power and low leg muscle power on agility in badminton athletes at the PB Satria Club, Tegal Regency. So in this study to support the success of agility results in badminton games, it is not only supported by training methods and athletes who have high or low leg muscle power categories. However, there is a physical condition factor that can be a support in this success.

In a study conducted by Fahritsani (2009) said that the method or method of training is an important factor in improving skills. Practicing with a systematic and planned method will have better results than without a method and must be done continuously. Agility is a multidimensional skill, defined as the speed of movement of the whole body with a change in speed or direction in response to a stimulus (Jaroslaw Domaradzki & Popowczak, 2021:699). Several factors cause the absence of interaction between training methods and leg muscle power on agility, among others, such as the correct training pattern and the athlete's motivation in training. Therefore, factors that are outside the field are also very important in influencing the components of athlete's fitness.

CONCLUSION

The conclusions of this study are (1) the 4-corner shuttle run exercise is better in increasing agility compared to shadow training. So there is a difference in the effect between the 4-corner shuttle run and shadow training methods on agility in badminton athletes at the PB Satria Club, Tegal Regency (2) Athletes who have high leg muscle power are better than athletes who have low leg muscle power in terms of agility. So that there is a difference in the effect between categories of athletes who have high leg muscle power and athletes who have low leg muscle power on badminton athletes at the PB Satria Club, Tegal Regency (3) The results of increasing agility are not only determined by the exercise method and leg muscle power, but there are other supporting factors that can influence. So there is no interaction between the 4-corner shuttle run and shadow training methods with leg muscle power on agility in badminton athletes at the PB Satria Club, Tegal Regency.

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