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The Improvement of Jump Height and Limb Muscle Power Using Self-Training Split Squat and Lateral Jump in Basketball Player of Familia Surabaya Age Group-15 During the Covid-19 Pandemic

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Abstract

The research aims to analyze the effect of split squat jump practice and lateral jump practice on jump height and leg muscle power. Besides, it is to analyze the most influencing practice between split squat jump practice and lateral jump practice on jump height and led power muscle. The method used in the research is quantitative using the quasi-experimental method. The research design used is pretest and posttest which are divided into three groups, group I as split squat jump, group II as lateral jump, and control group. The data analysis is ANOVA. The data collection is done by testing jump height using vertical jump test and limb muscle power test using jump MD tool while pretest and posttest. The data is analyzed by using SPSS 22.0 series. The result of Paired sample T-test shows that each variable is obtained sig 0,000<0,05 from the jump height and paired sample T-test of limb muscle power. It indicates that there is a significant effect or differences of pretest and posttest from the dependent variable between jump height and limb muscle power. The ANOVA result of strength and limb muscle power shows the jump height, F: 3,874, sig 0,040, power F: 4,829, sig 0,017. It can be concluded that there is a significant difference in the result of jump height and limb muscle power in three different groups which is sig <0,05.

Keywords
plyometric exercise;
split squat jump;
lateral jump exercise

I. Introduction

In this modern era, sports will be not separated from the activities of the world community. Socializing sports in today's era is not as easy as turning your hand (Arsani, 2020). Some people do sports for maintaining physical health, recreation, and also sports for achievements and work. Good physical condition is the great beginning of doing the activities perfectly so that the optimal achievement will be completed perfectly. The work should be arranged perfectly to support the athletes achieve great achievements in their careers. In sporting achievement, we face a very complex action. The problems are influenced by external factors called environmental factors like equipment, facilities, fans of the opponent, weather, climate, etc.

Workout activities have been widely known by millennials. The word of workout has been known as the physical activities which are done at the fitness place with the trainer. The importance of maintaining a healthy body to support the physique has become the reason for doing workout activities. In 2020, workout activities are performed at home or known as work from home. The situation exists due to the spread of the covid-19

pandemic which causes social activities to be restricted. Every country has issued the work from home policy by its government. Outside activities should be diverted and forced to do at home (WHO, Riksani & Hidayat 2020). Doing a healthy lifestyle by exercising is one way to fight the Covid-19 outbreak. With a healthy lifestyle, it is hoped that the body's immunity will be better so that immune stability can help prevent the spread of COVID-19 or break the chain of the outbreak (Telaumbanua, 2020).

Covid 19 was assigned as a pandemic outbreak by WHO on March 12, 2020. Coronavirus has attacked 222 countries with 85,091,012 people infected and a mortality of 1,861,005 people. There are 797,723 positive Covid-19 cases in Indonesia, with 659,437 recoveries and 23,520 deaths (data on 7 January 2021 via the covid19.go.id). This is not the first time a viral pandemic has occurred, because in 2002 there was an attack by the SARS (Severe Acute Respiratory Syndrome) virus which had a mortality rate of 10%. Then in 2012, there was an attack by the MERS virus (Middle East Respiratory Syndrome) which has a mortality rate of 40% (Yuliana, 2020; PDPI, 2020).

During the COVID-19 pandemic like now, exercise is one of the physical activities that must be done to maintain physical condition to stay healthy. The community must remain active even though they are working and studying from home. Social distancing and work from home tend to make someone have a sedentary lifestyle. A sedentary lifestyle can lower the body's immunity so it will increase the risk of infections (Association of Sports Specialist Doctors, in Hadi, 2020). Actively exercising regularly with moderate intensity is very good for keeping the body healthy during the covid-19 pandemic. Physical activity is divided into 3, namely daily physical activity, physical exercise, and sports activities (Kemenkes 2017). By its definition, sports training is part of physical activity or it can be stated that sports training is a physical exercise that is planned, structured, repetitive, and aims to maintain physical fitness (Haskell & Kieman, in Hadi, 2020, p. 29).

Preparing an individual training program to achieve optimal performance in one of the sports during the COVID-19 pandemic requires a form of the individual training program which is designed to fulfill desires and goals. According to Bompa (1983), the training factors including physical preparation, technique, tactics, and psychology should ideally be integrated with all sports programs and have a strong relationship with one another.

Basketball sport focuses on the physical condition which is important for the player at supporting the effectiveness of the game. A proper individual training program is needed to improve the physical abilities of players, such as speed, movement agility, punch strength, jump height, etc. Physical condition is integrated components that can not be separated either improvement or maintenance. In improving physical conditions, all these components must also be developed.

The components of physical condition are: (1) strength is a component of a person's physical ability to use muscles to take loads when worked optimally. Strength is widely used in nearly all sports, for example in sports, athletics, and martial arts; (2) explosive power is a person's ability to use maximum power in the shortest time. In other words, explosive power equals strength and speed; (3) speed is a person's ability to do or perform continuous movements in the same form during the shortest time.

According to Clark (2012), Plyometric exercise is an exercise to increase power by muscle lengthening (eccentric) and muscle shortening (concentric) exercises. Plyometrics can also be defined as exercises that use explosive movements such as jumping to develop muscle power.

Split Squat Jump training is a form of exercise that mostly uses leg muscle strength to perform continuous jumping movements along with upward arm movements (Chu in Mujriah, 2013). According to Chu (in Mujriah, 2013, p. 22), lateral jump training can develop leg muscle strength and abdominal muscles. When viewed in terms of normal people (not special needs) this sport is a sport that is very easy to do (Haris, 2020).

In this study, the sport of basketball is suitable for the application of plyometric split squat jumps and lateral jumps. It is because the lay-up shot, jump shot, rebound, block techniques require jump height and power when doing the movements.

II. Research Methods

In this type of research, the researcher uses quantitative research methods. The approach used in this study is a quasi-experimental research design using "the matching only pretest-posttest control group design".

Table 1. Research Design

$T1_1$	X_1	$T2_1$
$T1_2$	X_2	$T2_2$
$T1_3$	____	$T2_3$

Source: Maksum (2012)

Description:
M : Matching
T11 : Group 1 Pretest Treatment 1, jump height test and limb muscle power
T12 : Group 2 Pretest Treatment 2, jump height test and limb muscle power
T13 : Group 3 Pretest Without Treatment, jump height test, and limb muscle power
X1 : Plyometric training Split Squat Jump
X2 : Plyometric training Lateral jump
Conventional training
T21 : Group 1 Pretest Treatment 1, jump height test and limb muscle power
T22 : Group 2 Pretest Treatment 2, jump height test and limb muscle power
T23 : Group 3 Pretest Without Treatment, jump height test, and limb muscle power

The population of the research is 15 male young athletes, with the following characteristics:

a) Academy Familia Surabaya basketball athlete
b) The age of the athlete is 15 years old.
c) Actively participates in training at the Surabaya Familia Basketball Academy.

The sampling technique used in the research is Simple Random Sampling where the sampling of population participants is carried out simply. For experimental research is divided into various groups, the number of sample participants is between 10 to 20 for each group. In this research, there will be three groups, namely experimental group 1, experimental group 2, and control group, so the pairing used in the research is ordinal pairing.

Based on the ordinal pairing technique, the samples in this research will be grouped as follows, group A = 5 participants are given the split squat jump exercise, group B = 5 participants are given the lateral jump exercise, group C = 5 participants as the control group. The total number of samples is 15 participants. To generalize the participants' ability, it takes an effort to standardize scores using statistical terminology which is the standard score, namely the Z-score. The standard score (Z) is a number that indicates how far a score deviates from the mean (M) in standard deviation (SD) units. To avoid negative or decimal numbers generated by calculating Z-scores, the statistical method is provided by transforming it into a T-score.

2.1 Independent Variable:

A *Plyometric exercise Split Squat Jump*
B *Plyometric exercise Lateral jump*

2.2 The Dependent Variable in the Research is Jump Height and Limb Muscle Power

The research was conducted for 6 weeks at the Royal Riverside Court Surabaya. The treatment limit of each individual's ability to do exercises before being presented to the power intensity is 60-80%. Adaptation can be obtained approximately four to five days after exercise, but it will be more after several weeks of exercise (Bompa & Haff 2009). Anaerobic interval training will stimulate physiological adaptation significantly within 2 to 15 weeks in untrained individuals (Bompa & Haff 2009). According to the theories, the increase in intensity for 2 weeks can adapt physiologically to the given training load. The research uses a type of test to measure the height of the limb muscle jump using the Vertical Jump Test tool and to measure the power using the jump MD tool.

The analysis was conducted in the research. The types of collection data in the research are the jump height and limb muscle power tests, then the height of achievement of the two types of exercise for each group. After that, the test results will be recorded and calculated based on the group and the type of exercise applied, data analysis using descriptive statistical techniques, normality test, homogeneity test, hypothesis testing and analyzed using the computer program SPSS (Statistical Program For Social Science) 22.0.

III. Discussion

The results of the study were based on the jump height test using the Vertical jump test equipment and the power test using the MD jump test which was given to the experimental group I, experimental group II, and control group. This chapter will describe the description of the data, the conditions for testing the hypothesis, and the results of testing the hypothesis. The description of the data that will be presented in the form of test results of jump height and leg muscle power before (pretest) and after (posttest) treatment is given to each group which includes: group I for Split Squat Jump, group II for Lateral jump, and group III for the control group. This research was conducted at the Academy Familia Surabaya Basketball Athletes, totaling 15 people and divided into 3 groups, each group consisting of 5 people.

(Limb muscle power, Name, pretest data, posttest data, improvement, average) Group 1 who do Hatha yoga exercises.

Table 2. Post Test and Pre Test Data of Group I

POWER OTOT TUNGKAI				
NO	NAMA	DATA PRE-TEST	DATA POST-TEST	PENINGKATAN
1	CW	436.3	499.8	63.5
2	NH	351.7	586.1	234.4
3	BH	484.12	539.98	55.86
4	MLW	339.86	453.152	113.292
5	YFK	311.64	586.18	274.54
RERATA		384.7	533.0	169.5

Table 3. Pre-Test and Post-test Data of Group II

POWER OTOT TUNGKAI				
NO	NAMA	DATA PRE-TEST	DATA POST-TEST	PENINGKATAN
1	DAD	420.0	513.3	93.3
2	HPN	292.6	483.2	190.6
3	RJY	379.8	499.8	120
4	SAN	355.6	421.7	66.1
5	JB	528.1	621.3	93.2
RERATA		395.22	507.86	112.64

Table 4. Pre-Test dan Post-Test Data of Control group

POWER OTOT TUNGKAI				
NO	NAMA	DATA PRE-TEST	DATA POST-TEST	PENINGKATAN
1	ND	324.8	468.4	**143.6**
2	JAB	324.8	414.6	**89.8**
3	RMP	254.8	360.4	**105.6**
4	MRN	413.6	365.0	**9.8**
5	NPK	329.7	450.3	**120.6**
RERATA		329.54	423.42	93.88

Split Squat Jump and Lateral Jump exercises found good pretest and posttest data. The data consists of jump height and limb muscle power. The data includes the average value, maximum value, minimum value, and standard deviation. Based on the results of the data obtained in Table 4.1, it can be seen that the results of the exercise in the Split Squat Jump and Lateral Jump groups experienced an improvement in the average results of limb muscle power. This can be seen from the pretest and posttest data. Leg Muscle Power which was originally 384.7 Joules improved to 533.0 Joules in group 1, 395.22 Joules improved to 507.86 Joules in group 2, and 329.54 Joules improved to 423, 42 Joules in the control group.

3.1 Hypothesis Testing Conditions

After describing the research data, the next step is to perform a normality test and homogeneity test. The aim is to find out whether the data is normally distributed and homogeneous.

a. Normality Test

The normality test conducted in the research is Kolmogorof Smirnov. If the p-value is greater than 0.05, then the data is stated that it is normally distributed. The data tested include the research data on improving jump height and limb muscle power data from the Split Squat Jump (K1) group, the Lateral Jump exercise group (K2), and the control group.

Table 5. Normality Test

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
PRE TEST	.276	5	.200*	.906	5	.446
POST TEST	.222	5	.200*	.906	5	.443
PENINGKATAN	.236	5	.200*	.864	5	.242

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
PRE TEST	.188	5	.200*	.967	5	.857
POST TEST	.270	5	.200*	.933	5	.614
PENINGKATAN	.258	5	.200*	.880	5	.307

Based on the data in the table above, it can be concluded that the normality test in the research data on the improvement on Limb Muscle Power obtained from the Split Squat Jump (K1) exercise group obtained significant values, all of which were greater than the p-value 0.05. This means that the data is normally distributed. The tuck jump exercise group (K2) obtained significant values which were all greater than p-value 0.05, this means that the data is normally distributed. The control group (K3) obtained significant values which were all greater than p-value 0.05, so the data were normally distributed.

From the table above, the results of the normality test in the research data on the increase in Jump Height from the Split Squat Jump (K1) exercise group obtained significance values which were all greater than p-value 0.05, so the data is normally distributed. The Lateral Jump exercise group obtained significant values which were greater than p-value 0.05, so the data were normally distributed. The last, the control group (K3) obtained a significant which were all greater than p-value 0.05, so the data is normally distributed.

b. Homogeneity Test

The homogeneity test in this study was conducted by the mean difference of each group using the Lavene Test in the SPSS program. If the statistical value is greater than 0.05, the data will have a homogeneous variance.

Table 6. Homogenety Test

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
hasil postest	Based on Mean	1.797	2	12	.208
	Based on Median	1.353	2	12	.295
	Based on Median and with adjusted df	1.353	2	8.779	.307
	Based on trimmed mean	1.751	2	12	.215

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
hasil postest	Based on Mean	.413	2	12	.671
	Based on Median	.307	2	12	.741
	Based on Median and with adjusted df	.307	2	8.637	.743
	Based on trimmed mean	.384	2	12	.689

The results of the data in the table above show that the significant value of all data is more than 0.05, it can be concluded that the data is homogeneous. After understanding that the data is normally distributed and homogeneous, the research data is possible to be used in further analysis.

c. Testing the Hypothesis

In testing the hypothesis, the different dependent variables of paired samples by using t-test analysis in SPSS are called paired T-tests. The hypothesis test of different dependent variables between groups uses analysis of variance.

1. The Result of Difference Score for a Paired Sample

To find out the results of the T-test conducted in each group, it can be seen in the table below:

Table 7. The Result of Difference Score for a Paired Sample

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	PRE TEST - POST TEST	-.19600	.13576	.06071	-.36456	-.02744	-3.228	4	.032

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	PRE TEST - POST TEST	-.15000	.08246	.03688	-.25239	-.04761	-4.067	4	.015

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	PRE TEST - POST TEST	-148.31640	100.38662	44.89516	-272.96733	-23.6694 7	-3.304	4	.030

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	PRE TEST - POST TEST	-112.64000	47.56536	21.27187	-171.70019	-53.57981	-5.295	4	.006

Based on the two tables above, it shows that the level of significance of each variable is obtained sig < 0.05. Thus, there is a significant effect or difference between the pretest and posttest of each dependent variable (jump height and limb muscle power) in experimental group I, experimental group II, and experimental group III. It can be concluded that there is a difference after being given the Split Squat Jump exercise program, Lateral Jump exercise, and in the control group.

2. The result of ANOVA

In conducting the different tests, the data were tested the mean difference of the three groups together. The difference test in this research was conducted by the Anova test (F). The result is to determine whether there are differences or not in the results of the mean difference in each group simultaneously. The test results can be seen in the table below.

Table 8. The Result of ANOVA

ANOVA

hasil postest

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	.046	2	.023	3.874	.040
Within Groups	.071	12	.006		
Total	.117	14			

ANOVA

hasil postest

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	32968.896	2	16484.448	4.829	.029
Within Groups	40964.277	12	3413.690		
Total	73933.173	14			

Based on the results in the table above, it shows that the significant value of the Anova Test on Leap Height and leg muscle power is sig < 0.05, so it can be concluded that there are significant differences in the results of Leap Height and limb muscle power in three different groups.

With the different influences between the groups, the data analysis can be continued by using the post hoc multiple comparisons test which is the Least Significant Difference (LSD) analysis in the SPSS series 22.0 program. This is used to find out which independent variables have a significant influence on the dependent variable improvement.

Table 9. The Results of Leap Hight and Limb Muscle Power

Multiple Comparisons

Dependent Variable: hasil postest

LSD

(I) kelompok	(J) kelompok	Mean Difference (I-J)	Std. Error	Sig.	95% Confi Lower Bound
kelompok 1	kelompok 2	.04000*	.04863	.427	-.066
	kelompok 3	.13200*	.04863	.019	.026
kelompok 2	kelompok 1	-.04000*	.04863	.427	-.146
	kelompok 3	.09200*	.04863	.083	-.014
kelompok 3	kelompok 1	-.13200*	.04863	.019	-.238
	kelompok 2	-.09200*	.04863	.083	-.198

Multiple Comparisons

Dependent Variable: hasil postest

LSD

(I) kelompok	(J) kelompok	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
kelompok 1	kelompok 2	25.18240*	36.95235	509	-55.3298	105.6946
	kelompok 3	109.62240*	36.95235	012	29.1102	190.1346
kelompok 2	kelompok 1	-25.18240*	36.95235	509	-105.6946	55.3298
	kelompok 3	84.44000*	36.95235	041	3.9278	164.9522
kelompok 3	kelompok 1	-109.62240*	36.95235	012	-190.1346	-29.1102
	kelompok 2	-84.44000*	36.95235	041	-164.9522	-3.9278

Based on table 9 above, it shows that there is a significant difference in mean difference between the Split Squat Jump group, the Lateral jump group, and the control group on the variables of Jump Height and limb muscle power. Based on the result, it can be concluded that the Split Squat Jump exercise has more effect on the Jump Height and limb muscle power compared to the Lateral Jump exercise and the control group.

IV. Conclusion

Understanding the most effective exercise method to increase jump height and limb muscle power is important. The results of the analysis with the ANOVA test on the mean different exercises of Split Squat Jump, Lateral jump, and the control group obtained sig < 0.05. It means that there are significant differences in the results of Jump Height and limb muscle power in the three different groups. The results of the Pos Hoc LSD test showed that there was a difference in mean difference between the Split Squat Jump, Lateral jump, and control groups on the variables of Jump Height and limb muscle power. Based on these results, it can be concluded that the Split Squat Jump exercise has more effect on the

jump height and limb muscle power compared to the Lateral jump exercise and the control group based on the comparison of the plyometric Split Squat Jump and Lateral jump exercises.

There is a difference in the effect of Jump Height and limb muscle power where the Split Squat Jump exercise is better than the Lateral jump exercise. This happens because of the increase of muscle contractions in the limb when doing the Split Squat Jump exercise which is compared to the muscle contraction in the Tuck Jump exercise.

When doing the movement, the limb muscles will work heavier, so the workload of the leg muscles in the Split Squat Jump exercise is heavier than the Lateral jump exercise. The impact is stress because the leg muscles have increased more in the Split Squat Jump exercise. Besides, the Split Squat Jump exercise is heavier in giving a load on the leg muscles. Therefore, the improvement in jump height and limb muscle power between the Split Squat Jump and Lateral jump exercises is different because the leg muscles in the Split Squat Jump group have increased.

Based on the results of the training and the mean test, it was stated that the Split Squat Jump exercise gave better results than the Lateral jump exercise on the Jump Height and limb muscle power for the Basketball Athlete Academy Familia Surabaya (groupage) KU-15. This can be seen and analyzed from the Split Squat Jump exercise process conducted by the process of jumping up repeatedly and holding the weight on the legs. Split Squat Jump exercise indicates better muscle functional adaptation and muscle coordination. Meanwhile, the Lateral jump exercise is easier because it makes a high jump to the side. From the results of the significant test using the posthoc test, it was stated that there was a significant difference in the effect of the results of the Split Squat Jump and Lateral jump exercises on the jump height and leg muscle power in the Basketball Athlete Academy Familia Surabaya KU-15. In line with the results of research conducted by Milic (2008), Plyometrics can contribute to increasing speed, jumping and jumping, leg muscle strength, and power.

Thus, the Split Squat Jump group has a better result than the Lateral jump group and control group. It is because the Split Squat jump group does the movement of jumping repeatedly and changing the position of the legs. However, the Lateral Jump group only performs high jump sideways. By analyzing motion biomechanically, there is a bigger effect on the Split Squat Jump group other than the Lateral jump group and control group.

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