3 - THE EFFECT OF EXERCISE ROPE JUMP AND FRONT CONE HOPS

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THE EFFECT OF EXERCISE ROPE JUMP AND FRONT CONE HOPS WITH RATIO 1: 1, 1: 2 TO POWER, LIMBS MOTOR STRENGTH, AND VO_2 MAX CAPACITY

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Abstract

Plyometric exercise is a form of training that is quite diverse. In this study the researchers only use two forms of training that is Front Cone Hops and Rope Jump with a ratio of 1:1 and 1:2. By using the ratio 1:1 and 1:2 then this form of exercise in addition to increasing leg muscle strength, leg muscle power can also affect the increase in aerobic capacity. Pre test is done to know the initial data which will be used for division of group in Rope Jump and Front Cone Hops with ratio 1: 1.1: 2. given treatments 3 meetings in 1 week for 6 weeks. A week after the treatments were done post test in all groups. The results of paired t-test after post test in four groups showed significant results for leg muscle strength variables, to increase leg muscle power significantly only occurred in Front Cone Hops 1: 1 training group, and Front Cone Hops 1: 2. However, for aerobic capacity improvement showed less significant results in the four training groups. So it can be concluded that plyometric exercise using Front Cone Hops and Rope Jump with a ratio of 1: 1 and 1: 2. very efficient to increase leg muscle strength and leg muscle power but less efficient to increase aerobic capacity.

Keywords – Plyometric, Power, Strength, VO_2 Max

1. Introduction

Sport Modern currently moving to a different type of game, changes in regulations in various sports as entertainment so that the game can attract attention, apparently this element also has an impact on the physical condition of the athletes who are required to increase their physical capacity.

Various studies in sports science, with the scope of exercise models for physical improvement, have been widely carried out, of course with different results in each study, generally the difference in each study apart from the characteristics of the people trying is the manipulation of the exercise variable. Manipulation of exercise variables can also be done by adjusting the ratio or rest intervals carried out on one training model, there is a statement that the effect of rest intervals affects the increase in the physical capacity of an athlete. Interval training results in an increase in oxygen delivery to actively working muscles due to the dilation of blood vessels and the size of the mitochondria. Research comparing 1:1 and 1:2 intervals states that "for an increase in strength or aerobic more significant when carried out at 1:1 or 1:2 intervals, the interval time for an increase in the anaerobic always below 1:1 (Svedahl). , 2013). Thus a longer rest period can increase aerobic capacity. Therefore in this study using 1:1 and 1:2 training intervals which are expected to increase aerobic with the plyometric.

Giving rest is very dependent on the workload. If the workload given is above the submaximal level, the rest is relatively long when compared to the stimulation given with low intensity. Thus, in interval training, not only is the process repetitive but the amount of movement development is affected by previous work and rest.

In this study, it will be carried out by applying the Plyometric rope jump and front cone hops by manipulating the exercise variables on the aspect of the rest interval using a ratio of 1:1 and 1:2 which has been proven in some literature capacity aspect aerobic. on the increase in the aerobic, this is based on the statement by Svedahl (2013) that if there is an increase in anaerobic, it is also

possible for an increase in aerobics. This is because physiologically anaerobic also helps increase aerobic.

In addition, Arazi (2013) suggests that if you want to improve the quality of your heart, namely with the aim of reducing blood pressure and heart rate per minute, you can use plyometric, especially front cone hops. Basically, the heart rate is closely related to VO_2 max, in athletes who have a high VO_2 max , the heart rate per minute is also relatively lower. Steven (2008) argues that plyometric can increase VO_2 max.

Exercises Rope jump effective for improving agility, power, VO_2 max, and coordination (Jahromi, 2016). Therefore, rope jump is the best activity to improve the physical condition of all parts of the body, this exercise is a variation of exercise that can improve coordination, rhythm and timing at various ages. The results of other studies, rope jump with 1:2 intervals are effective for improving the physical condition of athletes (Makaruk, 2013). Exercise Front cone hops is a type of exercise that uses the SSC (Stretch-Shortening Cycle) , which is a method that uses the ability to contract muscles to lengthen and shorten.exercises Plyometric have the basic concept of SSC (Stretch-Shortening Cycle), (Chu, 2013). So that this exercise can improve physical power performance.

Based on the above discussion, it can be taken the title of the research on the effect of rope jump and front cone hops with 1:1 and 1:2 intervals on increasing power, VO_2 and max leg muscle strength.

2. Method

The design used in this research is to use the factorial design using a quantitative approach. In this study, researchers used treatment with exercise treatment (1) Rope jumps with a ratio of 1:1, (2) Rope jumps with a ratio of 1:2, (3) Front cone hops with a ratio of 1:1, and (4)workout Front cone hops in a 1:2 ratio. This study aims to analyze the effect of treatment on increasing power, capacity (VO_2 max), and leg muscle strength.

Interval / Latihan Plyometric	Rasio 1:1 (1)	Rasio 1:2 (2)
Rope Jump (A)	Kelompok A1	Kelompok A2
Front Cone Hops (B)	Kelompok B1	Kelompok B2

Figure 1. Factorial Research Design

Description:

a. exercise treatment rope jump with a ratio 1:1.

b. The experimental group A2 was given rope jump with a ratio of 1:2.

c. The experimental group B1 was given the front cone hops with a ratio of 1:1.

d. exercise treatment front cone hops with a ratio of 1:2

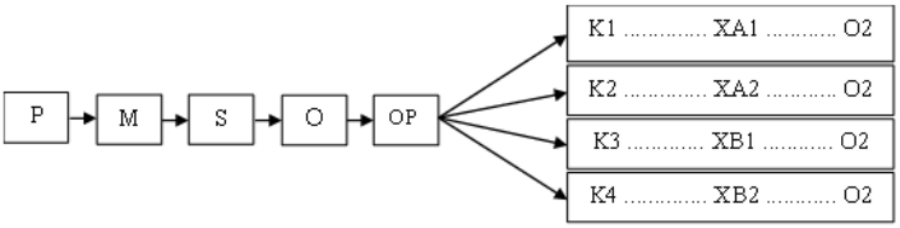

Figure 2. Research Design

Based on the chart above, this study uses a Matching-only and pre-test post-test design with the following research design:

1. The research subjects were taken as part of the population of Rugby athletes, Kab. Bojonegoro, then divided into 4 groups. Each group was given a pre-test , namely a leg muscle strength test, an aerobic (VO_2 max), and a power leg muscle

2. The experimental group 1 was given treatment (Xa) namely rope jump with a ratio of 1:1. Experimental group 2 was given treatment (Xb) namely rope jump with a ratio of 1:2. Experimental group 3 was given treatment (Xc), namely front cone hops with a ratio of 1:1. And the experimental group 4 was given treatment (Xd) namely front cone hops with a ratio of 1:2.
3. After six weeks of treatment, post-test to the five groups, namely a leg muscle strength test, an aerobic (VO_2) maxtest power leg muscle

3. Result and Discussion

a. Normality Test

Table 1. Normality Test Data Pre-test

Tests of Normality			
Shapiro-Wilk (*pre-test*)			
Group	Variable	Sig.	Description
Rope Jump 1:1	Strength	,335	Normal
	Power	,883	Normal
	VO2 Max	,493	Normal
Rope Jump 1:2	Kekutan	,382	Normal
	Power	,775	Normal
	VO2 Max	,544	Normal
Front Cone Hops 1:1	Kekutan	,477	Normal
	Power	,161	Normal
	VO2 Max	,170	Normal
Front Cone Hops 1:2	Strength	,567	Normal
	Power	,257	Normal
	VO2 Max	,104	Normal

From the SPSS calculation results, the pre-test (initial tests) the dependent variables are leg muscle strength, leg power capacity aerobic (VO_2 Max) can be seen that the value of Asymp. Sig (2-tailed) in all groups was greater than the significant level of 5%. so that the results of the pre-test in this study were normally distributed.

Table 2. Data Normality Test Post-test

Tests of Normality			
Shapiro-Wilk (*post-test*)			
Group	Variable	Sig.	Description
Rope Jump 1:1	Strength	,302	Normal
Rope Jump 1:2	Power	,880	Normal
	VO2 Max	,589	Normal
	Kekutan	,707	Normal
	Power	,778	Normal
	VO2 Max	,458	Normal
Front Cone Hops 1:1	Kekutan	,316	Normal
	Power	,218	Normal
	VO2 Max	,117	Normal
Front Cone Hops 1:2	Strength	,540	Normal
	Power	,328	Normal
	VO2 Max	,368	Normal

From the SPSS calculation results post-test (final test) the dependent variables are leg muscle strength, leg power capacity aerobic (VO_2 Max) can be seen that the value of Asymp. Sig (2-tailed) in all groups was greater than the significant level of 5%. so that the post-test in this study were normally distributed.

Table 3. Data Normality Test Difference

Tests of Normality			
Shapiro-Wilk (difference)			
Group	Variable	Sig.	Description
Rope Jump 1:1	Strength	,767	Normal
	Power	,683	Normal
	VO_2 Max	,980	Normal
Rope Jump 1:2	Kekutan	,820	Normal
	Power	,335	Normal
	VO_2 Max	,570	Normal
Front Cone Hops 1:1	Kekutan	,741	Normal
	Power	,670	Normal
	VO_2 Max	,532	Normal
Front Cone Hops 1:2	Strength	,358	Normal
	Power	,935	Normal
	VO_2 Max	,73	Normal

Meanwhile, for the calculation results of SPSS pre-test and post-test there are differences (both increase and decrease) of each variable bound, it can be seen

that the value of Asymp. Sig (2-tailed) in all study groups was greater than the significant level of 5%.

The following is research data that shows the results of the pre-test and post-test of the dependent variable, namely Muscle Strength using the Leg Dynamometer test, Leg Power using the Jump MD, and VO_2 Max using the Multiple Fitnes Test (MFT).

Table 4. Average Pre-test and Post-test Exercise Group Rope Jump Ratio 1:1

Exercise Group	Bound Variable	*Pre-test*	*Mean Post-test*	Increase %
Rope Jump 1:1	Strength	91.0	91.5	0.5 %
	Power	621.3	623.3	2 %
	VO_2 Max	40.5	41.1	0.6%

From the table above we can see that rope jump with a ratio of 1:1 can increase the dependent variable of strength, which is an increase of 0.5% of the data the average pre-test of 91.0 after being given treatment increased by 91.5. Meanwhile, the power increased by 2% from the average pre-test data of 621.3 after being given treatment, it increased by 623.3. Likewise, the variable VO_2 Max experienced an increase of 0.6% from the average pre-test 40.5 after being given treatment, it increased by 41.1.exercise group the rope jump ratio of 1:1 all variables increased.

Table 5. Average Pre-test and Post-test Exercise Group Rope Jump Ratio 1:2

Exercise Group	Bound Variable	*Mean Pre-test*	*Mean Post-test*	Increase in %
Rope Jump 1:2	Strength	101.3	102.3	1 %
	Power	581 ,3	583.2	1.9 %
	VO_2 Max	39.1	39.9	0.8%

From the table above we can see that rope jump with a ratio of 1:2 can increase the strength dependent variable, which is an increase of 1% from the average data pre-test of 101.3 after being given treatment increased by 102.3. Meanwhile, the power increased by 1.9% from the average pre-test of 581.3 after being given treatment, it increased by 583.2. Likewise, the VO_2 Max has an increase of 0.8% from the average pre-test 39.1 after being given treatment, it increases by 39.9.exercise group the rope jump ratio of 1:2 all variables increased.

Table 6. Average Pre-test and Post-test Exercise Group Front Cone Hops Ratio 1:1

Exercise Group	Bound Variable	Mean *Pre-test*	Mean *Post-test*	Increase %
Front Cone Hops 1:1	Strength	100.5	102.6	2, 1 %
	Power	555.7	558	2.3 %
	VO_2 Max	42	42.4	0.4%

From the table above we can see that front cone hops with a ratio of 1:1 can increase the dependent variable of strength, which is an increase of 2.1% of the data the average pre-test of 100.5 after being given treatment increased by 102.6. Meanwhile, the power has an increase of 2.3% from the average pre-test of 555.7 after being given treatment, it increases by 558. Likewise, the VO_2 Max average data. pre-test 42 after being given treatment increased by 42.4.exercise group front cone hops with a ratio of 1:1, all variables increased.

Table 7. Average Pre-test and Post-test Exercise Group Front Cone Hops Ratio 1:2

Exercise Group	Bound Variable	Mean Pre-test	Mean Post-test	Increase %
Front Cone Hops 1:2	Strength	103.7	106.1	2, 4 %
	Power	603.4	606.5	3.1%
	VO_2 Max	35.9	36.3	0.4%

From the table above we can see that front cone hops with a ratio of 1:2 can increase the dependent variable of strength, namely increasing by 2,average data pre-test of 103.7 after being given treatment increased by 106.1. Meanwhile, the power increased by 3.1% from the average pre-test data of 603.4 after being given treatment, it increased by 606.5. Likewise, the VO_2 Max increased 0.4% from the average pre-test 35.9 after being given treatment, it increased by 36.3.exercise group front cone hops with a ratio of 1:2 all variables experienced an increase.

The discussion of the results of this study provides further interpretation, especially regarding the results of data analysis that have been stated previously. In detail, the overall data from the calculation of the SPSS pre-test with post-test from 4 groups can be explained in the table presenting the results of the exercise from the 4 groups below:

Table 8. Exercise Group Rope Jump 1:1 ratio

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	pretes_power1 - postes_power1	-,55000	1,92137	,60759	-1,92447	,82447	-,905	9	,389
Pair 2	pretes_power1 - postes_power1	-2,00000	1,94365	,61464	-3,39040	-,60960	-3,254	9	,010
Pair 3	pretest_vo2max1 - postest_vo2max1	-,57400	1,73771	,54951	-1,81708	,66908	-1,045	9	,323

From table 8. the results of data analysis can be seen in the column “Sig.(2-tailed)” pre-test and post-test strength variables which can be interpreted as follows: there is a significant effect if the significance (Sig.) <0.05 = Significant. From the table shows the number 0.389> 0.05, this means that rope jump a ratio of 1:1 has a less significant effect on increasing leg muscles.

While in the column "Sig.(2-tailed)" the pre-test and post-test variable power showed the number 0.010 <0.05, this means that rope jump with a ratio of 1:1 has a significant effect on increasing power.

Likewise in the column "Sig.(2-tailed)" pre-test and post-test variable VO2 Max shows the number 0.323 > 0.05, this means that rope jump with a ratio of 1:1 has an effect but is less significant on increasing VO_2 Max.

Table 9. Exercise Group Rope Jump 1:2 ratio

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	pretest_power2 - postest_power2	-1,00000	2,30940	,73030	-2,65205	,65205	-1,369	9	,204
Pair 2	pretest_power2 - postest_power2	-1,90000	2,28279	,72188	-3,53301	-,26699	-2,632	9	,027
Pair 3	pretest_vo2max2 - postest_vo2max2	-,80800	1,52853	,48336	-1,90144	,28544	-1,672	9	,129

From table 9. the results of data analysis can be seen in the column "Sig.(2-tailed)" pre-test and post-test strength variables which can be interpreted as follows: there is a significant effect if the significance (Sig.) <0.05 = Significant. The table shows the number 0.204 > 0.05, this means that the rope jump a ratio of 1:2 has a less significant effect on increasing leg muscles.

While in the column "Sig.(2-tailed)" the pre-test and post-test variable power showed the number 0.027 <0.05, this means that the rope jump ratio of 1:2 has a significant effect on increasing power.

Likewise in the column "Sig.(2-tailed)" pre-test and post-test variable VO2 Max shows the number 0.129 > 0.05, this means that rope jump with a ratio of 1: 2 has an effect but is less significant on increasing VO_2 Max.

Table 10. Exercise Group Front Cone Hops ratio 1:1

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	pretest_power3 - postest_power3	-2,05000	1,83258	,57951	-3,36095	-,73905	-3,537	9	,006
Pair 2	pretest_power3 - postest_power3	-2,30000	2,75076	,86987	-4,26777	-,33223	-2,644	9	,027
Pair 3	pretest_vo2max3 - postest_vo2max3	-,40200	,96358	,30471	-1,09130	,28730	-1,319	9	,220

From table 10 the results of data analysis can be seen in the column "Sig.(2-tailed)" pre-test and post-test strength variables which can be interpreted as follows: there is a significant effect if the significance (Sig.) <0.05 = Significant.table shows the number 0.006 < 0.05, this means that the front cone hops ratio 1:1 exercise has a significant effect on increasing leg muscles.

While in the column "Sig.(2-tailed)" the pre-test and post-test variable power showed the number 0.027 < 0.05, this means that the exercise front cone hops ratio of 1:1 has a significant effect on increasing power.

Likewise in the column "Sig.(2-tailed)" the pre-test and post-test variable VO2 Max shows the number 0.220> 0.05, this means that the front cone hops ratio of 1:1 has an effect but is less significant on increasing VO2_ Max.

Table 11. Exercise Group Front Cone Hops ratio 1:2

		Paired Differences					T	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	pretest_power4 - postest_power4	-2,45000	2,3148	,73201	-4,10591	-,79409	-3,347	9	,009
Pair 2	pretest_power4 - postest_power4	-3,10000	2,6012	,82260	-4,96084	-1,23916	-3,769	9	,004
Pair 3	pretest_vo2max4 - postest_vo2max4	-,39300	1,3565	,42899	-1,36344	,57744	-,916	9	,384

From table 1.11 the results of data analysis can be seen in the column "Sig.(2-tailed)" pre-test and post-test strength variables which can be interpreted as follows: there is a significant effect if the significance (Sig.) < 0.05 = Significant.table shows the number 0.009 < 0.05, this means that the front cone hops ratio 1:2 exercise has a significant effect on increasing leg muscles.

While in the column "Sig.(2-tailed)" the pre-test and post-test variable power shows the number 0.004 <0.05, this means that the front cone hops ratio of 1:2 has a significant effect on increasing power.

Likewise in the column "Sig.(2-tailed)" the pre-test and post-test variable VO2 Max shows the number 0.384> 0.05, this means that the front cone hops ratio of 1:2 has an effect but is less significant on the increase VO_2_ Max.

The purpose of this study was to determine: (1) The effect of rope jump with a ratio of 1:1 on increasing leg muscle strength, leg power , and VO2 Maxexercise rope jump with a ratio of 1:2 on increasing strength. leg muscles, leg power , and VO2 Max, (3) Effect of front cone hops with a ratio of 1:1 on increasing leg muscle strength, leg power , and VO2 Max, (4) Effect of front cone hops with ratio 1:2 to increase in leg muscle strength, leg power , and VO_2 Max.

Based on the four SPSS calculation tables above, it can be interpreted that the plyometric rope jump has a significant effect on increasing power leg muscle VO_2 Max. While the plyometric front cone hops has a significant effect on

increasing power and leg muscle strength, but has less significant effect on increasing VO_2 Max.could not have a significant effect on increasing VO_2 Max.

4. Conclusion

Test results Paired The t-test after the post-test in the four groups showed a significant increase in power , but the significant increase in leg muscle strength only occurred in the Front Cone Hops 1:1 and Front Cone Hops 1:2 exercise groups.capacity aerobic (VO_2 Max) showed less significant results in the four exercise groups. So it can be concluded that plyometric use Front Cone Hops and Rope with a ratio of 1:1 and 1:2. very efficient for increasing leg muscle strength and leg power capacity aerobic (VO_2 Max).

Acknowleggement

Based on the conclusions obtained after conducting the research, some suggestions that the researcher will convey to the readers are:

1. The preparation of an exercise program must be based on individual principles because the character and muscle abilities of each person are different.
2. Type of exercise rope jump and front cone hops with a ratio of 1:1, 1:2 It is recommended in an exercise program to increase leg muscle strength and leg power muscle
3. For further research, it can be used as input for research results when choosing the same problem as the object of research and it is advisable to use a larger sample.

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