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Comparative Test Circuit Training To Increase Leg Muscle Strength

I Putu Prisa Jaya[1], I Putu Astrawan[2]
[1,2]Program Studi Fisioterapi, Fakultas Ilmu Kesehatan, Universitas Bali Internasional

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ABSTRACT

Improving physical condition at the Futsal UKM Universitas Bali International, training was carried out on the Calf Raise Diagonal Cone Hop circuit and the Front Cone Hop Squad circuit. This study aims to determine the training of the Calf Raise Diagonal Cone Hop circuit and the Squad Front Cone Hop circuit in increasing leg muscle strength. The research method used is the randomized pre and post test group design experimental method. The research sample was 30 Futsal UKM participants who were divided into 2 groups, each group consisting of 15 people. Kelompok I diberikan pelatihan sirkuit Calf Raise Diagonal Cone Hop, sedangkan kelompok II diberikan pelatihan Squad Front Cone Hop. Frequency of exercise 3 times a week for 6 weeks. Leg muscle strength is measured with a leg dynamometer. The results of the test study were different from the non-parametric U Mann-Whitney test in group I after treatment obtained an average leg muscle strength of 133.00 ± 26.43 kg. While the results of group II after treatment obtained an average leg muscle strength of 11 6.33 ± 1 4.76 kg. The difference in average leg muscle strength between before and after training from the two groups obtained a value of p = 0.000 which means there is a significant difference with a percentage increase in group I of 18.04% and group II of 13.26%. Based on the results of the study, it can be concluded that these two forms of training can be used to increase leg muscle strength. However, Calf Raise Diagonal Cone Hop circuit training is more effective than the Squad Front Cone Hop circuit to increase leg muscle strength.

E-mail:
prisajaya@iikmpbali.ac.id

1. INTRODUCTION

The process of coaching the sports Student Activity Unit (UKM), especially in the futsal branch at Bali International University, has not shown optimal results, this is evident from the competitions that have not shown maximum results. This is inseparable from physical coaching and techniques that still do not touch the needs of athletes, especially the strength of leg muscles. The improvement of futsal sports achievement has many obstacles, due to the lack of theory development and utilization of training methods supported from various disciplines and the improvement of the quality of sports coaching training. Such coaching can be achieved through a scientific approach to related sciences. Science related to exercise includes exercise physiology, exercise biomechanics, sports pedagogy, sports sociology, sports psychology and sports health[1]. Trainers should know and understand the knowledge that has been mentioned, because this knowledge is an underlying concept in the establishment of an efficient and applicable physical exercise program in the world of education. As happened at UKM futsal Universitas Bali Internasional, according to the author's observation has different muscle strength, this is seen during training there are players who have hard, strong and accurate kicks but there are players who are not precise in making movements and have weak kicks.

The basic techniques that futsal players need to have are basically the same as soccer is kicking, stopping, dribbling, heading, tackling, and goal keeping [2]. One of the basic techniques that are very influential in futsal games is kicking (passing and shooting), kicking is an attempt to move the ball from one place to another using the feet or feet, a futsal player who cannot master the technique of kicking the ball correctly, then it is impossible to become a reliable and good futsal player. In general, kicks in futsal games are the main attack action during the game. The main purpose of kicking in futsal games is passing, shooting at the goal, and defending. The success of a kick can be judged by

the success of achieving the goal. Kicks intended to pass are considered successful when they can reach the intended location, either in the form of an area or an opposing player. Kicks intended to shoot towards the goal are considered successful when the ball reaches the goal, regardless of whether the kick results in a goal or not.

Strength is the most important component to improve overall physical condition. This is because strength is the driving force of every physical activity, strength plays an important role in protecting athletes from possible injury, with strength can also help strengthen the stability of the joints[3]. Therefore, this time the author will discuss the important component to achieve maximum futsal player achievements, namely about leg muscle strength. Muscle strength is defined as the condition when a resistance is successfully overcome by a muscle group in the activity performed. Leg muscle strength is one of the physical component factors needed in the skills of an athlete[4]. Leg muscle strength is a component that can affect the results of a futsal player's kick. The strength of the leg muscles is very decisive in shooting[5]. Through proper strength training, several other biomotor components will also be affected and increased, including: speed, muscular endurance, coordination, explosive power, flexibility, and agility[3].

The strength component can be increased by means of inner and outer loading. Inner load is a change that occurs physiologically and psychologically in humans as a result of the influence of external load. Many exercise methods to increase leg muscle strength, for example by running up and down stairs, jumping frogs, pliometric exercises, skipping, barbells, dumbbells and ball medicine [6]. Seeing the importance of leg muscle strength in futsal sports games, therefore the author wants to examine training to increase muscle strength with the circuit method (Circuit Training). The training that will be provided is to compare the Squad Front Cone Hop circuit training with Calf Raise Diagonal Cone Hop.

2. METHOD

This research is an experimental research with the design of The Randomized Pre and Post Test Group Design [7]. Group I was given Calf Raise Diago nal Cone Hop circuit training and group II Squad Front Cone Hop circuit training. The studywas conducted in the WINKS futsal field for 6 weeks with a frequency of 3 times a week. The sample of this study was students participating in Futsal UKM Universitas Bali International. The sample was randomly selected simply from the total number of students participating in the Futsal UKM Universitas Bali Internasional which was selected based on inclusion and exclusion criteria in accordance with the sample selection technique. Pre test was carried out before the n trainer, leg muscles were measured by tests using a leg dynamometer, Group I was given Calf Raise Diago nal Cone Hop circuit training and Group II was given Squad Front Cone Hop circuit training conducted for 3 trainings every week for 6 weeks. Before training is warmed up for ten to fifteen minutes. After training for 6 weeks, a final test is carried out. Post test performed after training is measured by testing using a leg dynamometer.

The data obtained before and after the training were analyzed by descriptive analysis to analyze subject data such as height, weight. Comparative analysis is preceded by a data normality test using the Shapiro-Wilk test and a homogeneity test using the Levene test. Comparative tests in both groups between before and after training in groups I and II using the Wilcoxon test (nonparametric) to analyze the average increase or change after training in training groups I and I. Test the difference in the effect of average leg muscle strength with the Mann-Whitney U test (nonparametric) before training between groups I and II and then after training between groups I and II. The meaning limit used is $\alpha = 0.05$. $\alpha < 0.05$ then the research hypothesis is accepted or there is a significant difference, while $\alpha > 0.05$ then the hypothesis is rejected or there is no significant difference.

3. RESULTS AND DISCUSSION

The training was carried out for 6 weeks involving twotraining groups with a total of30 people divided into two groups. Group I training Calf Raise Diagonal Cone Hop and group II training *Calf Raise Diagonal Cone Hop*.

Analysis of the characteristics of the research subject

The characteristic data of the study subjects analyzed include: age, height, weight, body mass

index (BMI). Data is presented in Table 1 below.

Table 1. Data on the characteristics of the subject of study

Characteristic	Group I (Average± SB)	Group II (Average± SB)
Age (yr)	19,1 ± 0,88	19,6 ± 1,05
Height (m)	1,66 ± 7,74	1,63 ± 5,87
Weight (kg)	59,3 ± 6,65	56,1 ± 6,55
BMI kg/m²	21,2 ± 1,36	20,9 ± 1,88

Normality and Homogeneity

To determine the distribution of research samples, a normality test was carried out using the Saphiro Wilk Test. The test was conducted on data obtained in both groups both before and after training. To determine whether the distribution of data is homogeneous or not, the homogeneity of data is tested using the Levene Test. The variables tested were the results of leg muscle strength before and after training in each group. Data is presented in Table 2 below.

Table 2. Normality and Homogeneity Test Results of Leg Muscle Strength Data Before and After Training

Analysis Results	(p) Normality Test (*Shapiro Wilk Test*)		(p) Homogeneity Test (*Levene Test*)
	Group I	Group II	
Before Training	0,229	0,184	0,023
After Training	0,229	0,834	0,013

Table 2 shows that the leg muscle strength data in each group before training showed that the distribution of data was not normally distributed with the values of leg muscle strength in Group I (p = 0.229) and Group II (p = 0.184), Leg muscle strength data in each group after training showed that the distribution of data was not normally distributed with the values of Group I (p = 0.229) and Group II (p = 0.834) (p <0.05), Based on these results, the data can be tested with Non-Parametric tests to see an increase or decrease in results on research variables.

Leg Muscle Strength Test Results Before and After Training

Comparative tests in both groups between before and after training in groups I and II using the Wilcoxon test to analyze the average improvement or change after training in training groups I and II. Data are presented in Table 3 below.

Table 3. Test Leg Muscle Strength Before and After Training

Muscle Strength Results	n	Group I	Group II	p
		Average ± SB (kg)	Average ± SB (kg)	
Before training	15	112,67 ± 26,55	102,53 ± 16,21	0,000
After training	15	133,00 ± 26,13	116,13 ± 14,76	0,000

Table 3 shows that the results of leg muscle strength between groups before training both with Calf Raise Diagonal Cone Hop and Squad Front Cone Hop training showed a value of p = 0.00. While the results of leg muscle strength after training between groups p = 0.00 0 so that the results of leg muscle strength after training have significant differences.

Results of Different Leg Muscle Strength Between Groups

Difference test analysis was used to compare the average results of leg muscle explosive strength before and after training between group I and group II. Results of meaning analysis using the Mann-Whitney U test. Data are presented in Table 4 below.

Table 4. Test of Average Differences in Leg Muscle Strength Results Between Training Groups

Muscle Strength Results	n	Group I	Group II	p
		Average ± SB (kg)	Average ± SB (kg)	
Before training	15	112,67 ± 25,55	102,53 ± 16,21	0,023
After training	15	133,00 ± 26,13	116,13 ± 14,76	0,013

Table 4 shows that the results of leg muscle strength between groups before training both with *Calf Raise Diagonal* Cone Hop and *Squad Front Cone Hop* rotation training showed p = 0.023

values. While the results of leg muscle strength after training between groups p = 0.013 so that the results of leg muscle strength after training have significant differences.

Percentage increase in leg muscle strength

After 6 weeks of training, there was a difference in improvement and percentage. The percentage increase in leg muscle strength in both groups. Data are presented in Table 5 below.

Table 5. Percentage of Leg Muscle Strength

Leg Muscle Strength (kg)	Group I	Group II
Before Training (T1)	112,67	102,53
After Training (T2)	133,00	116,13
Upgrade Difference (T2-T1)	20,33	13,6
Percentage	18,04 %	13,26 %

Table 5 shows that the percentage increase in leg muscle strength in both training groups for 6 weeks provided an increase in leg muscle strength. After being given training in Group I the percentage increase was greater than that of Group II. This showed that both treatment groups had an increasing effect after being given Circuit training and Calf Raise Diagonal Cone Hop circuit training further increased leg muscle strength than Squad Front Cone Hop circuit training.

Effect of Calf Raise Diagonal Cone Hop Circuit Training on Increased Leg Muscle Strength

The results of the leg muscle strength study in Group I obtained an average before training of 112.6 6 ± 25.55 and after training 133.00 ± 26.13 with a value of p < 0.05 which is p = 0.000. So that by conducting Calf Raise Diagonal Cone Hop training can increase leg muscle strength in students who take part in UKM Futsal Universitas Bali International. The increase in the ability of leg muscle strength in each group was caused by Calf Raise Diagonal Cone Hop training, this is quite reasonable because the training was carried out for six weeks with a frequency of three times a week in accordance with the recommended training dose so that it was beneficial for the ability of leg muscle strength where there was an adaptation of muscle contractions to the given load During the training[8]. In line with Nala, states that training given regularly for 6-8 weeks will get real results because the body can already adapt to the training given. Training given systematically, progressively and repeatedly will improve the body's organ systems so that physical appearance will be optimal[9]. Training conducted with a frequency of three times a week, is good for beginners and will result in significant improvement.

Basically, physical training that is carried out regularly, systematically, and continuously as outlined in the training program will significantly improve physical abilities[10]. Muscle strength is a very important component to improve overall physical condition. First, because strength is the driving force of every physical activity. Second, because strength plays a very important role in protecting athletes or people from possible injury. Third, because with strength, athletes will be able to run faster, throw or kick farther and more efficiently, hit harder, as well as help strengthen the stability of the joints[8]. With Calf Raise Diagonal Cone Hop circuit training, it will be able to increase leg muscle strength, because during training the leg muscles are required to jump over the cone repeatedly. The muscles involved in this jumping motion are mainly the quadriceps femoris muscle (especially the rectus femoris), triceps surae muscle and tendo achilis[11]. With the Front Cone Hop Squad Circuit training, the leg muscles are required to work to lift the body then land then jump back, so that the leg muscles must be exerted as much as possible both strength and speed[8].

The Effect of Front Cone Hop Squad Circuit Training on Leg Muscle Strength

The results of the leg muscle strength study in Group II obtained a median before training 102.53 ± 1 6.21 and after training 1 15.33 ± 15.06 with a value of p < 0.05 ie p = 0.0 0 0. So that by conducting Front Cone Hop Squad Circuit training, it can increase leg muscle strength in students participating in UKM Futsal Universitas Bali International. With the Squad Front Cone Hop Circuit training, it will be able to increase leg muscle power, because during training the leg muscles are required to jump over the cone (cone) repeatedly. Strength will be achieved when a muscle is stimulated repeatedly to produce an energy level that exceeds the energy that normally stimulates the muscle. Muscle strength cannot occur without maximal muscle contraction[12].

The muscles involved in this jumping motion are mainly the quadriceps femoris muscle (especially the rectus femoris), triceps surae muscle and tendo achilis [11]. The Squad Front Cone

Hop Circuit training form is believed to be based on reflex contraction of muscle fibers as a result of rapid loading (the same muscle fibers). The increase occurs due to leg muscle strength training using the circuit method, which is the occurrence of movement between posts[13]. So this exercise can develop the ability of strength and speed to the maximum, so that with this exercise will be able to develop a large enough leg muscle power[8]. With the Front Cone Hop Squad ircuit training, the leg muscles are required to work to lift the body to land then jump back, so that the leg muscles must be exerted as much as possible both strength and speed[11].

Calf Raise Diagonal Cone Hop Circuit Training is More Effective Compared to Front Cone Hop Squad To Increase Leg Muscle Strength

Muscle strength will be more effective when given a load slightly above its ability. It aims to adapt the body's functional, so as to increase muscle strength. With this overload principle, muscle groups will develop their strength effectively. The increased load carried out must be heavier than the previous exercise at the limit of the threshold excitatory sensitivity. The application of a load increase system, this is called progressive overloading. Weight training is one of the exercises needed to be able to achieve physical fitness. This exercise can increase muscle mass and muscle metabolic function so that it becomes an important exercise in metabolic syndrome conditions. Weight training results in hypertrophy or increased muscle time and hyperplasia or increased number of muscle cells[14]. When the athlete is strong, the heavy load will feel light. The load on the working muscles should be gradually increased during the implementation of the exercise program. The muscle will work on an area slightly above its ability called the principle of gradual increase[15].

Based on this study, the difference in results that occur is due to different types of training where the reps and sets in training have been made almost the same. It is better that Calf Raise Diagonal Cone Hop rotation training than Front Cone Hop Squadrotation training in increasing leg muscle strength can be caused by differences in movement during training, where for Calf Raise Diagonal Cone Hop rotation movements seen from the leg muscles that play more roles than s.Ircuit Squad Front Cone Hop. So that with more leg muscles trained in Calf Raise Diagonal Cone Hop rotation training, it makes leg muscle strength stronger than Squad Front Cone Hop training In addition, the muscles that play a role in Calf Raise Diagonal Cone Hop rotation training has similarities in stabilization at the time of kicking. The more often the training, the better the muscle fibrils will be enlarged so that there is an increase in muscle strength[16]. These similarities are found in the muscle vastus lateralis and fascia latae. In doing a kick if the focus is not strong it will affect the result of the kick performed.

4. CONCLUSION

Based on the description of the results of the research that has been done, it can be concluded that, training the calf raise *Diagonal* cone hop circuit with the training of the squad front cone hop circuit can increase leg muscle strength and the training of the *calf raise circuit Diagonal* cone hop is more effective than *the squad front cone hop* circuit to increase leg muscle strength.

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