

Effect of Squat Jump Weight Training Exercise to Leg Muscle Power of Volleyball Players

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Abstract— This study aimed to describe the effect of the implementation of squat jump weight training exercise to improve the leg muscle power of male volleyball players at UABV UKM State University of Malang. The employed research method was pre-experimental design. The collected data was analyzed using paired sample t-test analysis technique assisted by SPSS. Based on the results of repeated observation t-test between pretest and posttest, it was determined that the value of $p = 0.000$; thus, it can be concluded that there is a significant effect of squat jump weight training on the leg muscle power of male volleyball players at UABV UKM State University of Malang.

Keywords— *Leg muscle power, volleyball, weight training, squat jump*

I. INTRODUCTION

Sports is one of the means in national building, especially in physical and spiritual development. In order to achieve good development results, it is necessary to improve good physical conditions. The reason is that maximum performance is greatly influenced by good physical condition. In achieving good physical conditions, both the coach and player must be able to implement good and proper training methods or exercises in order to obtain optimal results. To start the basic training, coaches must pay attention to the abilities of each athlete [1]. The development and progress of the era requires that educators or trainers have good knowledge and skills in achieving good physical condition. Physical condition in sports is defined as the capacity of athlete performance. The term or phrase that is used to physical condition in the domain of high sports performance is physical fitness. General physical condition is an aspect of conditioning that is not related to a particular sport. Specific physical condition is developed to obtain the highest possible ability, which is required in the appropriate sport. Physical exercises that are included in basic physical conditions include exercises to increase specific and general strength, speed, explosive power, flexibility and endurance [2]. The implementation of good physical exercise must pay attention to physical exercise methods. Physical exercise methods that can be used include: 1. weight training exercise method, 2. circuit training exercise method, 3. interval training, 4. speed play or fartlek method, 5. step-up (up and down the bench) exercise method, and 6. aerobic and anaerobic exercise method [3]. It is important to realize that in the efforts to overcome the arising problems and the various types of

needs as well as the increase of community aspirations, especially the ones related to sports achievements for good physical development.

The higher the jump, the greater the leg power of the athlete [4]. Players who still have lack of power can be given special training such as squat jump weight training exercise to train the leg muscles power. Improving and developing the physical condition of an athlete can be achieved by implementing a number of different training methods or forms as described above including weight training as an effort to provide variations of exercise and to develop the physicality of an athlete. Weight training is a strength-training program by providing resistance using weights such as barbells and dumbbells [5]. Weight training itself is a systematic exercise where the weights are only used as a tool to increase muscle power to achieve certain goals, such as improving physical condition, health, strength, or achievement in a sport [6]–[8].

Based on the facts about the success of weight training exercise, the researchers managed to obtain the studies that could be used as a reference for conducting similar research. weight training and plyometric exercises had a significant effect on increasing the speed of the ap chagi kick in Taekwondo [9].

Weight training exercise can increase leg muscle power of an athlete. Considering that the results of the study mentioned that weight training exercises can increase muscle power by training leg muscle power, weight training exercise aims to make the muscles reach their maximum strength in the shortest possible time .

The observations made by researchers during the practice of the male volleyball team of UABV UKM State University of Malang showed that the ability of athletes in performing volleyball techniques in the male volleyball team of UKM UABV State University of Malang is less than the maximum, especially when doing a Block in a match. They often make mistakes, for example, the ball is not blocked perfectly and they are unable to reach the ball when making a Block so that the ball passes through the blocking when attacked by opposing players. This statement was supported by the results of observations during routine practice obtained that the number of successful blockings was 87 times from 3 sets of a match, meaning that the athletes were only able to block 34 times (35.8%) correctly while for the remaining 61 times (64.2%),

they were not able to block correctly. At the next practice, the test of blocking accuracy from 10 athletes who performed six blockings on the specified test criteria resulted in only two athletes who managed to get the highest score by one precise blocking out of six trials. This occurs due to the lack of exercises that support the players from having good leg muscle power because the UABV UKM team focuses on basic training techniques such as passing, servicing, blocking and smashing. By taking this situation into account, it is distinct that the leg muscle power of the male volleyball team athletes of UABV UKM State University of Malang is not good; thus, the athletes have not mastered the physical training methods and good training techniques optimally. Hence, the physical component in a volleyball game studied in this research covers the leg muscle power.

II. METHOD

The research method used is *pre-experimental* or non-experimental. It is considered *pre-experimental* because this research is not a real experiment. This research is *pre-experimental* study using *one-group pretest-posttest design*.

This *one group pretest-posttest design* consisted of one group that was supplied with *squat jump weight training* exercise treatment. The *samples* were measured before and after having the treatment.

The population and sample of this research was the volleyball players of UKM UABV State University of Malang. The population was 32 male volleyball players while the samples of this study were 20 of them. The method of collecting the sample data was by using *Stratified Samples*.

The research instrument used was test technique. The employed test was the initial measurement (*pretest*) and final measurement (*posttest*) that used *vertical jump* test. The instrument used to measure the height of a player's jump is a *vertical jump* board. Experimental technique was utilized for *squat jump weight training* exercise treatment. The test technique applied is the implementation stage (*pretest*), the treatment stage and the *posttest* stage. Data collection in this study employed a test technique in the form of a *vertical jump* test that was given to the tested group. The treatment group was the *squat jump weight training* group. Consequently, the effect of *squat jump weight training* exercise on the leg muscle power of male students at UABV UKM State University of Malang can be identified. In this study, there were several stages of data collection including the preparation stage and the implementation stage.

The data analysis used is quantitative method or it can be said that the research that calculates the results of the treatment that has obtained the results of this data analysis aims to find the answers of the questions in the formulated problem. Data analysis was performed after the data was collected. The data analysis technique utilized in this study was normality test analysis with the significance level of ≥ 0.05 and a homogeneity test of significant level of ≥ 0.05 , which was then analyzed using the repeated observation t-test of ≤ 0.05 assisted by SPSS.

III. RESULTS

The results of jump height test data using a test instrument in the form of a *vertical jump* test on male athletes at UABV UKM State University of Malang. The tests were carried out before and after the treatment. The following is the description results shown in Table 1.

TABLE I. DESCRIPTION OF THE PRETEST AND POSTTEST DATA OF THE EXPERIMENTAL GROUP USING VERTICAL JUMP FOR MALE VOLLEYBALL PLAYERS OF UABV UKM STATE UNIVERSITY OF MALANG

Component	N	Min	Max	Mean	Std. Deviasi	Variance
Pretest	20	39	56	50.75	4.575	20.934
Posttest	20	42	60	53.60	5.266	27.726

In table 1, the experimental group was given a treatment to determine the effect of the *squat jump* exercise. This study used 20 samples with a minimum *pretest* (initial test) value of 39 cm, a maximum *pretest* value of 56 cm, an average (*mean*) of 50.75 cm and a standard deviation of 4.575. The *measurement of squat jump* exercise will use the *vertical jump* test to find out whether there is an effect on leg muscle power. The results were a final test (*posttest*) with a minimum value of 42 cm and a maximum value of 60 cm, an average (*mean*) of 53.60, and a standard deviation of 5.266, which was higher than the *pretest* before the *weight training* exercise treatment.

TABLE II. DESCRIPTION OF THE PRETEST AND POSTTEST DATA OF THE EXPERIMENTAL GROUP USING VERTICAL JUMP FOR MALE VOLLEYBALL PLAYERS OF UABV UKM STATE UNIVERSITY OF MALANG

Data type	Total score	N	Mean	Mean difference
Pretest	1015	20	50.75	
				2.85
Posttest	1072	20	53.60	

From table 2, it can be observed that the means of pretest and posttest are not the same or are considered to be improved since the pretest is 50.75 cm and the *posttest* is 53.60 cm with the *mean* difference between *pretest* and *posttest* of 2.85. This indicates that the difference or increase in jump height is more significant with the influence of *Squat jump* exercise.

TABLE III. RESULTS OF VERTICAL JUMP T-TEST CALCULATION

Data type	t-count	t-table	df	Sig 2-tailed
Pretest and posttest	11.213	1.795	19	.000

Based on the t-test above, the results showed t-count value of 11.213 and t-table value of 1.795; hence, t-value > t-table which means significant. Consequently, the null hypothesis is rejected if the value of t-count is greater than t-table and the working hypothesis is accepted if the value of t-count is greater than t-table.

IV. DISCUSSION

Exercise is a sport activity that is carried out systematically and programmed in the form of a process of performing activities or providing stimuli that aim to improve the ability of athletes in the form of sports adaptation. Exercise is the process of sports activities conducted by a training program that is designed systematically, aiming to improve the ability of athletes in an effort to obtain the maximum possible achievement, mainly implemented for the preparation before facing a match/competition [10]. The objective of exercise is important to improve performance and fitness [11]. Based on the experts' opinion above the researchers want to conduct a study on the volleyball team of UABV UKM State University of Malang. Based on the results of observations during routine practice, it was found that the players succeeded to do a block with the total of 87 times from 3 sets of a match, proving that the athletes were only able to block 34 times (35.8%) correctly, and in the remaining 61 times (64.2 %), they were not able to block correctly. At the next practice, the test of blocking accuracy from 10 athletes who performed six blockings on the specified test criteria resulted in only two athletes who managed to get the highest score by one precise blocking out of six trials. Currently, the problem with the team is the lack of jump height or leg muscle power ability, considering that the most dominant thing required in a volleyball game is leg muscle power. This occurs because the trainer does not pay enough attention to the provision of leg muscle power exercise to his athletes. For volleyball athletes, the physical component of leg muscle power is essential to assist them in smashing and blocking; thus, it is necessary to examine whether the provision of variety of squat training models can help improve leg muscle power in male volleyball athletes at UABV UKM State University of Malang.

Strength practice can be designed to see the number of sets and repetitions to be used in order to work efficiently for athletes, i.e. 3 sets each of which is performed with 6 reps for experienced athletes, but the sets and repetitions can be changed into higher number depending on the response and adaptation of the athletes to the given training load [12]. As stated above, this study aims to determine the effect of squat jump weight training exercise to improve the leg muscle power of male volleyball athletes at UABV UKM State University of Malang. The exercise is carried out systematically which is seen from the power of the player in making foot contact jump with the base used. In the research, the power training reaction is based on the application of ground contact after a jump [13]. Eventually, the sequence of performed activities can be concluded as the following: (1) the provision of pretest with the aim of determining the ability of an athlete, (2) the provision of treatment using Squat jump weight training exercise program for 16 sessions, and (3) the provision of posttest that aims to determine whether or not there is an increase in leg muscle power to the subject given the treatment. To determine the effects on the results of the Squat jump weight training exercise in volleyball athletes at UABV UKM State University of Malang can be proven by t-test. T-test will show the value of tcount and its significance.

Whether there is an increase in leg muscle power of the male volleyball athletes at UABV UKM State University of Malang after doing Squat jump weight training exercise can be identified from the average value of pretest and posttest on t-test, which is 11.213, and t-table value of 1.795; thus, the value of t-count > t-table. After conducting Squat jump weight training exercise treatment over 16 sessions (three times a week exercise), there is an effect to leg muscle power in volleyball athletes at UABV UKM State University of Malang. Squat jump weight training exercises influence the increase in leg muscle power. This is based on the results of the repeated observation t-test between the pretest and posttest that obtained tcount of 11.213. Based on the results of significance test, the value of t-count is 11.213 and that of t-table is 1.795, showing that tcount > ttable, which means significant. Hence, the null hypothesis stating that there was no significant effect of Squat jump weight training exercise on male volleyball athletes at UABV UKM State University of Malang was declared rejected and the working hypothesis stating there was a significant effect of Squat jump weight training exercise on male volleyball athletes at UABV UKM State University of Malang was accepted. The conclusion is that there is a significant effect of Squat jump weight training exercise on male volleyball athletes at UABV UKM State University of Malang.

In accordance with the research that has been done, it can be interpreted that improving the physical abilities cannot be accomplished in a short time. Yet, it requires a relatively long time and uses an exercise program planning that suits one's needs. Exercise is the process of conducting systematically arranged exercise program-based sports with the aim of improving the ability of athletes in an effort to achieve the most maximum achievement, primarily implemented to prepare for a match/competition [14]. Training is a very complex process involving internal and external variables, including motivation and ambition of the player, quantity and quality of the training, volume and intensity of the training, and training experiences. In arranging an exercise program, one must pay attention and understand the principles of training, training factors, training components and the status of the athlete's condition. There are many principles to consider in the preparation of training programs including the principles of increasing weight, specialization, individual, variety, gradually increasing weight, multilateral development, recovery, reversibility, over training avoidance, active training participation, and model-based training [15]–[17]. Trainers must be observant in determining the principles of training that must be implemented by taking the training methods used into account. Training factors that must be understood include physical, tactic, technical and mental. In volleyball, power or explosive power is often used to make jumps during smashing and blocking, to get high repulsion and to be the booster for jumping during repulsion after starting; hence, volleyball players must have good leg muscle power by training the muscles consistently, one of which is through weight training exercise.

Based on the facts about the success of weight training exercise, the researchers managed to find research that could be used as a reference for conducting similar research. The results of the study stated that weight training and plyometric exercises had a significant effect on increasing the speed of the ap chagi kick in Taekwondo [9]. Another study was conducted that handball has physical activities that support the basic techniques in the hand power of volleyball athletes, the difference of which is only on the way of doing these activities [18]. Consequently, the results of this study indicate that weight training exercise can increase leg muscle power of an athlete.

From several studies mentioned above, it can be concluded that weight training exercise can have such a significant effect that it increases the leg muscle power of volleyball players.

V. CONCLUSION

Based on hypothesis testing and discussion in this research, it was concluded that there was a significant effect of *Squat jump weight training* exercise on male volleyball players at UABV UKM State University of Malang in increasing their leg muscle power with the significance level of 0.05.

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