



The Comparison of the Strength of the Arm Muscle between the Conventional Basket Ball Training and the Training Using the Medicine Ball

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Abstract

The training for athletes in the basketball sports must have the excellent biomotor skills, especially in the components of the strength of the arm muscle to be able to do the passing and shooting with the maximum movement. The basketball game uses three main elements namely passing and catching, dribbling, and shooting. Until now, the training technique in order to maximize the function of the arm muscle is carried out by loading sand in the body weighing 0.5 kg. This training technique is felt to be uncomfortable when moving, thus another technique is needed to perfect it, namely the training with the medicine ball. This research is a quasi-experimental study using the randomized pre and posttest control group design. The results show that the comparison of athlete's arm muscle strength levels using the conventional training technique with the medicine ball in a row, with the result of 21.45 : 42.3, i.e., there is an increase in the strength of the arm muscle by 49.29% in the medicine ball training. The training by using the medicine ball is an exercise plan using a 1.7-kg medicine ball which can improve the conventional training method.

Introduction

Until now, Indonesia has been recognized for its achievements at the international level for several sports. However it has not yet appeared on an international scale in the basketball sport, therefore various training designs are needed by considering the ability of the athletes, especially for athletes and potential athletes who come from a region or regency. As an achievement sport, basketball requires supporting aspects in the game preparation, especially for the athletes.

The success of an athlete to attain achievements needs a kind of preparation which is a regular and measurable training, and also by the use of appropriated and standardized training methods that based on the characteristics the athletes have. The exercise dose needs to pay attention to the principles of limitations, abilities, and human abilities, to avoid overtraining or to avoid the exercises that are not in line with the athletes' abilities, thus there is no deterioration in the health such as cramping or injury to certain body parts.

The effective and efficient training is needed with the right way and right method, and is supported by a scientific approach in the field of sports. In addition to programmed exercises, it is necessary to have the athlete's physical condition that is always excellent, especially at the sports using the muscle strength [1, 2, 3]. Physical condition is one of the important factors that need to be developed in achievement sports, in addition to other factors such as technique, tactics, and the mental of the athletes.

A fit physical state can improve the effectiveness and efficiency of motion towards the better way, faster recovery time, and faster moving responses. Physical condition is related to health and fitness [4, 5, 6, 7]. Physical fitness can improve the ability of the heart's circulation and work system, as well as to increase strength, flexibility, stamina, speed, and other components of physical condition. To develop the physical condition, there is a need for the guidance.

The physiological function of the body develops with a range of ages 10 to 18 years for women, and 12 to 20 years for men. The adolescence is the most important period, because this is a phase of dynamic development in the life of an individual, an athlete. It is very appropriate in this research to take a number of samples from this developing age. Physical training is a process of systematically programmed physical exercise, performed repeatedly, with the loads gradually increasing, and also for preparing the athletes at the highest level of their performance.

The condition of physical training needs to be maintained regularly. Some physical muscles need adaptation in the exercise process. The primal muscle condition can improve the body performance [8, 9], especially if supported by the physiological condition of the body that remains homeostasis [10]. One branch of the game that requires physical condition that is always prime and fit is the basketball. The athletes in the basketball sports must have excellent biomotor skills, especially in the components of the hand muscles and arm muscles to be able to do the passing and shooting with maximum movement.

The body movements are influenced by the various results of evaluating certain body condition [11]. There is connection between the explosive power of the limb muscles and the arm muscles [12]. The basketball game is performed by using three technical elements which are the main points of the game, namely passing and catching, dribbling, and shooting; and there are six basic techniques of basketball, namely dribble, passing, shooting, laying up, pivot, and rebound. To take a sample of the training subject, it is necessary to do the right sample calculation to represent the presence of the athletes in a population [13].

Until now, the several training techniques carried out to maximize the function of the muscles of the arm are using a load of sand weighing 0.5 kg in the body. This technique makes the athlete's condition in doing training uncomfortable or less-free to move. The movement in the use of arm muscles is limited due to the condition of the loading sand that attaches to the body parts. The condition of attaching such load into the arm has the principle of *fitting the man to the job*.

The training participants must adjust the weight of the load given by the trainer. This condition disturbs the movement in doing the activities of dribbling, passing, and shooting. The main purpose of the process of loading the sand in the body is to increase the strength of the arm muscles, so the output of training receptions can be produced optimally. This research, carried out a comparison of two training techniques, namely the conventional training or using basketball generally, and with no loading on the body, and the other is the training using a weight ball (Medicine ball) weighing 1.7 kg.

This change in training design will give participants the freedom to move in doing activities of dribbling, passing, and shooting, where the center of weight of the load is on the ball, not on the additional loading attached to the certain body parts. The medicine ball training, besides being able to increase the participants' arm muscle strength, the subsequent impact caused by increasing the weight of the ball, so when competing, it will actually increase the throwing distance of basketball due to the weight reduction, along with changes in attitude from the sand to the arm muscles without loading, and the fulcrum loading on the weight of the ball thrown when shooting.

The medicine ball training involves the muscles of the shoulders, arms, and chest. The success of the training program is inseparable from the local culture. Culture influences behavior [14], besides the discipline towards the principles of the sports physical training [15].

Method

This research was a quasi-experimental study using a randomized pre and posttest control group design. Subjects were randomly divided into two groups, namely the first group was given training without being given any weight load on their bodies, and the second group was the experimental training group using 0.8 kg of basketball in the medicine ball activities of throwing, passing, and shooting with no ring. The place for conducting research was at the State High School 1 of Sukawati (SMAN 1 Sukawati), for six weeks. The target population was all 210 male students who participated in the basketball extracurricular of the SMAN 1 Sukawati. The affordable population was 40 people.

The inclusion criteria in this study were: (a) Age 16 to 18 years old, (b) Male gender, (c) Body weight of 55 to 60 kg, (d) Height between 160 to 179 cm, (e) Physical Health as proven by an information letter from a doctor, (f) Willing to be involved as a sample of research until completed, and proven by filling out the informed consent. Meanwhile the exclusion criteria for this research were (a) Absent at the time of the research process, (b) Sick while the research was underway, (c) Resigning as a research sample for certain reason.

Discussion and Results of Research

The Conventional Method of Basketball Training is the training given to the athletes with the techniques without any loading on the body parts, so this technique is often said to be the most common or conventional technique, i.e., without being given a certain load, so all prospective athletes can do it, this technique relies on the strength and physical fitness of the individual. Whereas the basketball training using the Medicine Ball is the basketball training using a 1.7-kg ball. The difference between the conventional training and the medicine ball training is the type and weight of the ball, the technique of throwing the ball when shooting.

Training is a stimulation in certain time condition with the aim of improving achievement. A systematic process and practice that is carried out repeatedly by increasing the training load. Training is one of the improvements in the physiological system in the body. Improving the physiological and psychological functions of the body so when doing sports activities can achieve the optimal appearance. This training is in line with using the muscles of the whole body, although it focuses on the strength of the arm muscles, still the activities which can cause musculoskeletal complaints, need to be avoided [16,17,18].

The technique of measuring the arm muscle strength, which is used as the independent variable in this research in the two types of training, is the same. The measurements are made before the training (pre) and after the training (post), on the conventional training and the training with medicine ball. The measurement steps of arm muscle strength are started from the subject doing a sleeping motion, face down, both legs held together straight behind, and the toes resting on the floor. The palms are on the side of the chest, fingers pointing forward and the elbows bent, illustrated in Figure-1.



Figure1: The initial movement of the measurement of the arm muscle strength

The next stage after completing the first movement (Figure-1), the subject performs the body movements raised upward until

both hands are straight, and the position of the body and legs are in a straight line, as illustrated in Figure-2.



Figure 2: The second movement of the measurement of the arm muscle strength

The next stage after completing the second movement (Figure-2), the subject moves the body by lowering it again, by bending both

the elbows and the body, and the two legs remain straight touching the floor, as illustrated in Figure3.



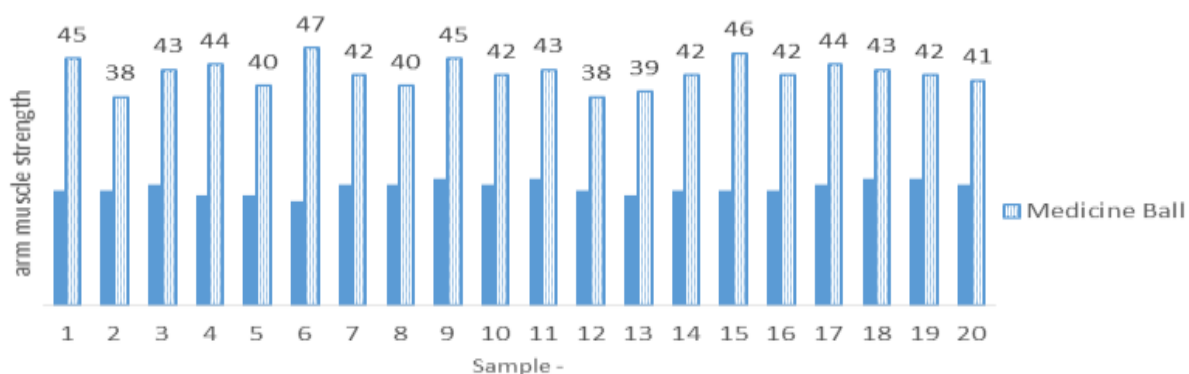
Figure3: The last movement of the measurement of the arm muscle strength

The results of measuring arm muscle strength, after completing a scheduled training program, experience a difference between the conventional basketball training method and the basketball training using the Medicine Ball. In accordance with the measurement stages (Figure-1 to 3), a comparison of the strength of the athlete's arm muscles can be obtained as shown in graph-1.

The strength of the arm muscle can continue to grow along with the adaptation during training in each period. Generally, sports that require power, the emphasis lies in the intensity, while for durability, lies in its volume. The higher the training portion, the higher the results will be obtained. The training volume will correlate to the portion of the load provided for one unit or type of exercise. The intensity of physical training is not only determined by the weight of the musculoskeletal system, but is also determined by the frequency of muscle

contractions. The frequency of the physical training that can improve the physical performance is generally 3-5 times a week. However, training must adhere to the principles that will result in better physical conditions. Basically to get a good training effect, the body organs must be given a load that exceeds the usual load, the muscles will develop strength effectively, but do not let muscle fatigue occur whereas the load is given with a fixed time and maximum intensity resulting in muscle fatigue.

The correct training technique will have an impact on optimal results, as well as other types of weight training, effectiveness and plyometric exercises to improve the leg muscle strength and the reaction speed, but also a number of activities that have an impact on the musculoskeletal complaints [19-25]. The training by considering the physiological conditions, such as abilities, skills, and limitations of the athletes, can maximize the results [26].



Graph1: The comparison of the strength of the arm muscle between the conventional method and the medicine ball

Table1: The test results of data normality for the strength of the arm muscle (n=40)

Tabel Tests of Normality						
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Conventional Method	0.184	20	0.073	0.917	20	0.085
Medicine Ball Method	0.152	20	0.200 [*]	0.969	20	0.726

The data of the strength of the arm muscle are then tested for the data normality; the data shows that the value ($p > 0.05$) means that it is normal data, so to determine the difference in the strength levels of the arm muscle in the conventional training with the training using medicine ball, the next step is

done by the parametric test. Based on Table-2, it can be reported that the athlete's muscle strength in the training using the conventional method, with the training using Medicine Ball, is significantly different ($p < 0.05$).

Table2: The Test Results of Data Difference for the Strength of the Arm Muscle (n=40)

Paired Differences					t	df	Sig. (2-tailed)
Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
			Lower	Upper			
-2.085001	2.73909	0.61248	-22.13194	-19.56806	-34.042	19	.000

The Relationship of the Strength Level of the Arm Muscle

When viewed from the relationship of the strength level of the arm muscle, the conventional method (Figure 4.a) and the training using Medicine ball (Figure 4.b), it is obtained that both have the correlation coefficient values of 0.1537 and 0.0013 with a "linear," line pattern, and it means that the correlation is very weak between the results of the arm muscle strength and the people, when viewed by each type of training. The comparison between the two types of training has a linear line pattern, which means it has a "very weak" correlation, i.e., the difference in the patterns of the two training shows changes in the strength level of the arm muscles that do not influence each other, and both can be carried each other out without dependence. Other research results are in line with other studies showing that the medicine ball scoop toos and the medicine ball throw have a significant influence on increasing the explosive power of the arm

muscle. The basic objectives of the physical training program are the efforts to increase the physical fitness, health, the quality of physical movement, and the prevention of disease. The freshness aspects at the level of sports coaching can be shown in the total fitness indicators which include physical fitness, psychological freshness, and social freshness. Physical fitness is a reflection of ability and efficiency in physiological responses indicated by healthy and fit conditions. Many occurrences of sitting or standing positions during activities, musculoskeletal complaints occur [27], this condition is caused by the lack of discipline in the intensity of the exercise. The body condition in the form of excess body weight can influence the physiology when completing activities [28]. A programmed training can gradually increase the ability of the athlete's arm muscles, and it is possible if the training is carried out continuously and gradually, the strength of the arm muscle can tend to continue to increase.

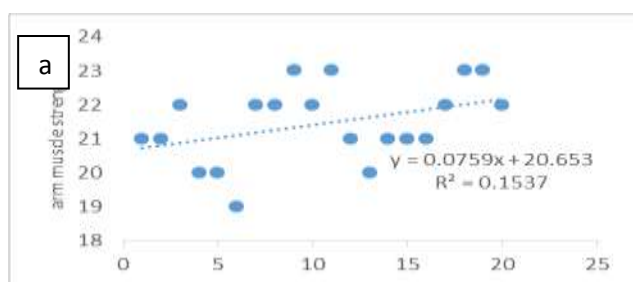


Figure 4.A: Scatter Diagram of Spread Data of the arm muscle strength training with the conventional methods (n = 40 athletes); B. Scatter Diagram of Spread Data of the arm muscle strength level training by using medicine ball (n = 40 athletes)

The strength of the arm muscles affects the results of the shot. Statistics reveal that the best three-digit shooters only succeed in the range of 40-45% of all their three-point throw attempts, while the highest percentage of shots is in the inner shot or shooting in the medium range. The strength of the arm muscles affects the results of ball passes among the players. In order to pass perfectly, the players need to master the various basic techniques of throwing the ball including chest passes, bounce passes, over head pass, baseball pass or fast break (Fiba, 2008). All results of the passes will be optimal and accurate if supported by the adequate strength of the arm muscle.

The arm muscles during a higher-grade training have an impact on the ball control during the actual game. The energy released when playing is not needed to the maximum, so the final hope of maximum achievement can be obtained. To achieve this condition, training techniques are needed to increase the strength of the arm muscles of the athletes. Arm muscle strength is very supportive of improving achievement in basketball game because when basketball athletes pass and shoot, the use of maximum arm muscles is needed. Excessive muscle use can cause musculoskeletal complaints [29-33].

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The training using medicine ball in an exercise program can influence the arm muscle strength increasing, has increased in the shooting and muscle strength after the athletes have been given regular training programs. The medicine ball training is a training that is used to increase the strength of the arm muscle. The medicine ball training can increase the muscle strength and speed which are the important elements in the explosive power of the arm muscles. In line with the other research reports that the programmed medicine ball training can improve the physical conditions, especially for the explosive power of the arm muscles.

Conclusion

The conclusions obtained in this research are:

- The medicine ball training is a training plan using 1.7 kg of medicine ball that can improve the conventional training method as seen from the strength of the athlete's arm muscles.
- The change in the size of the athlete's arm muscle improvement using the conventional training techniques of 21.45, while using the medicine ball is 42.3.
- The magnitude of changes in the level of arm muscle strength in the use of medicine ball is 49.29%.

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