The Effect of Weight Training Method With the Level of Motor Ability to Hypertrophy of Thigh Muscle

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ABSTRACT

Weight training performed continuously with the basic principles of exercise effects an increase in muscle mass or known as muscle hypertrophy. There are many training methods used to increase muscle hypertrophy, such as the fast and slow repetition exercises. In addition, the factor of motor skill level also determines the achievement of maximum training results since it is related to the quality of the repetitions possessed by weight training actors. This study aims to determine the effect of weight training methods and the level of motor ability on thigh muscle hypertrophy. This research was kind of quasi experimentalresearch with 2 x 2 factorial design by level. The research sample was selected by using a purposive sampling technique. The sample research were 40 male students of Universitas Negeri Padang, the faculty of sports science majoring in coaching 2017 who took specialization courses. The data collection were carried out in two ways: the barrow motor ability test for the motor skills test and the thigh muscle hypertrophy test by measuring the circumference and thickness of the thigh fat. After all data were obtained, the formula MMC = MMC- (3.14 x TSF) was used. The data were analyzed with 2 X 2 Factorial ANOVA and Tukey's further tests. The results show that, (1) overall the fast repetition training method is more effective when compared to the slow repetition training method on thigh muscle hypertrophy with $F_h = 6.96 > F_t$ 4.11, (2) there is an interaction between weight training with motor ability on thigh muscle hypertrophy with $F_h = 17,289 > F_t = 4,11$, (3) the method of fast repetitionweight training at high motor ability level is more effective when compared to the slow repetitionweight training method athigh motor ability level on muscle hypertrophy thighs with $Q_h = 5.69 > Q_t = 3.85$, and (4) the method of fast repetitionweighttraining at low motor ability levels is less effective when compared to the slow repetitionweight training method at low motor ability levels on thigh muscle hypertrophy with $Q_h = 4.75 > Q_t = 3.85$.

Keywords: Exercise Method, Motor, Thigh Muscle Hypertrophy

1. INTRODUCTION

Exercise in muscles will cause changes in it, both anatomically and physiologically. Exercises which carried out systematically and continuously in accordance with the program determined by increasing loading will have an effect on the muscles, namely increasing muscle mass or often referred to as *hypertrophy*. According to Fox in Umar (2014: 79), "*hypertrophy* is theincreasing of the size of muscle fibers as a result of exercise". According to Giriwijoyo and Dikdik (2013: 209), muscle training will cause enlarged muscles, this muscle enlargement occurs because: a) the enlargement of muscle fibers (*hypertrophy* muscle), b) the increasing number of capillaries in the muscles (capillarization muscle), and c) increasing the amount of connective tissue in the muscle. According to Wiarto (2013: 75), "muscle size can be enlarged with anaerobic training, short duration, and strength training with high intensity, such as weight lifting".

Based on the explanation above, it can be concluded that *hypertrophy* is anincreasing of muscle diameter as a result of theincreased size of muscle fibers. According to Tesch, Thorsson& Kaiser in Sharkley (2011: 177), "training with high barriers can increase the size (*hypertrophy*) of fast jerking fibers, whereas training with medium / high volume barriers causes *hypertrophy* slow fiber jerking". According to Syaifuddin (2011: 112), "a very extensive *hypertrophy* can occur if the muscles are stretched simultaneouslyduring the contraction process, for a maximum within 6-10 weeks". Furthermore Guyton and Hall (1997: 1346) said:

> One of the main principles of muscle development during exercise is as follows: a) Muscles that work without weight, even though they exercise for hours then their strength is only slightly increased. b) Muscle strength that contracts more than 50% of the maximum contraction force will develop quickly even if the contractions are carried out only a few times each day.

By using this principle, muscle enlargement experiments show that six muscle contractions that are close to the maximum performed in 3 sets of 3 exercises a week will provide an increase strength and *hypertrophy* in maximum muscle without causing chronic muscle fatigue. In fact, there is no renewal of the muscle except for the muscle that experiences at least 75% of the maximum stress.

From the opinions of the experts above, it can be concluded that by doing exercises, muscles will enlarge (*hypertrophy*). *Hypertrophy* is an increasingof muscle fibers size that occurs because of the increase in contractile elements in muscle fibers that cause increased strength in muscle contraction. During *hypertrophy*, muscle contractile protein synthesis takes place much faster than the rate of destruction, resulting in a progressively increasing number of actin and myosin filaments in myofibrils. Then the myofibrils themselves will break down in each fiber muscle to form new myofibrils. A group of stimuli can increase the volume of muscle cells, this change occurs as a response adaptive that serves to increase the ability to generate energy or resist fatigue in anaerobic conditions.

To get *hypertrophy* maximum muscle weight training, it is necessary to consider supporting factors such as the program and training methods used. According to Thomas & Roger (1999: 114-116) in designing an exercise program the following things need to be considered in order to achieve maximum results, including: (a) determining the goals of weight training, (b) Choosing the type of exercise, (c) determine the frequency of training, (d) set the exercise, (e) determine the set weight, and repeat, (f) determine the rest time, (g) determine the *intensity of the* exercise, (h) vary the *intensity of* the exercise program. In weight training there are a variety of training methods that can be applied to get *hypertrophy* muscle, including the fast repetition training method and the slow repetition training method.

The slow repetition training method is a training method in which a person makes slow repetitions in weight training. Stoppani (2006: 89) says *slow repetition training* is a technique that is carried out with slow repetitions performed as many as 3 sets with 5 to 10 *reps*. Each *repetition is* carried out for 6-10 seconds (slowly). In addition, Stoppani (2006: 18-20) said that if the repetitions in weight training are carried out with slow repetitions it will be able to increase *hypertrophy* muscle that will appear at the end of the program. However, keep in mind that doing *slow repetition training* does not mean doing the exercises very slowly. While the fast repetition training method is a training method where someone is doing fast repetitions on each repetition made. Stoppani (2006: 18-20) says if the repetitions in weight training are carried out with fast repetitions as much as 2-6 sets with 8-12 *reps*, it will be able to increase *hypertrophy* and muscle strength that will appear at the end of the program, in contrast with slow repetition method. This method of fast repetitionweight training is done with fast repetitions that is doing one *repetition* for 1-3 seconds with 4-6 *reps* of 3 sets, so that the shock type muscle fibers will play a bigger role which will produce *hypertrophy* and greater muscle strength (Building, 2015).

In addition to choosing the right training method, a person's level of motor ability must also be considered, because each person has a different level of motor ability, so that by having a different level of motor ability the results achieved will also be different. Motor ability is a translation of *kemampuan motorik*. Motor skills are the initial abilities of each individual. Motor skills include the process in which repetitions are dynamically adjusted and the method by which commands and types of repetitions are chosen.

Based on the description and exposure that has been stated above, it is necessary to conduct a study to see the effect of exercise methods and the level of a person's motor ability on muscle hypertrophy they have.

2. METHODOLOGY

The research method is *quasi experiment* (Quasi Experiment),Sugiyono (2011) argues that the experimental method is a research method that can test hypotheses about causal relations. In this study there are two independent variables, and two controlled attribute variables, and one dependent variable. The research design used was a factorial design of 2 X 2 by level. For more details, this research design can be seen in the following figure:

Table 1. Factorial Anova Research Design 2 x 2

Weight Training Method (A) / Motor Ability (B)	Quick Repetition (A1)		Slow Repetition (A2)
High (B_1)	(A_1B_1)	>	(A_2B_1)
Low (B2)	(A_1B2)	<	(A_2B2
Total	**A_1**	**>**	**A_2**

The population in this study was120 students of the Faculty of Sport Sciences 2017 who took specialization courses. The sampling technique usedwas Purposive Sampling techniques, so that the sample in this study were 40 male students of Universitas Negeri Padang Faculty of Sport Sciences Department The 2017 class training which took specialization courses. The data collection was done in two ways, namely: barrow motor ability test for motor skills test and thigh muscle hypertrophy test by measuring the circumference of the thigh and measuring the thickness of the thigh fat.After the data obtained, then the formula MMC = MMC was used - (3.14 x TSF) The data were analyzed with ANOVA 2 X 2 and further tests of the Tukey test

3. RESEARCH RESULTS AND DISCUSSION

a. Description of Research Data

In this study, there were four research cell groups which are: (1) the group of fast repetition training methods for students who have high motor skills (A1B1), (2) the group of slow repetition training methods for students who have high motor ability (A2B1), (3) the group of exercises method fast for students who have low motor skills (A1B2), and (4) group of slow repetition training methods for students who have low motor skills (A2B2). The description of the data from the four research cells can be seen in the description below:

Table 1.Research Data Group Description

SUMMARY	RapidRepetition Training Method	Slow Repetition Training Method	Total
High Motor Ability			
Count	10	10	20
Sum	4806.56	4695.06	9501.62
Average	480.665	469.506	475.081
Variance	39.079	18.52356	60.00187
Low Motor Ability			
Count	10	10	20
Sum	4685.19	4710.1	9395.29
Average	468.519	471.01	469.7645
Variance	29.57001	20.444953	25.332638

Based on the data of thigh muscle hypertrophy test forthe group of rapid repetition training method for students who have high motor ability level (A1B1) obtained a total score of 4806.56 on average of 480.66 and variance of 39.08. Moreover, the thigh muscle hypertrophy test data for the group of slow repetition training methods for students who have high motor ability level (A2B1) obtained a total score of 4695.06 on average of 469.51 and variance of 18.52. Data on the

thigh muscle hypertrophy test group of the fast repetition training method for students who have low motor ability level (A1B2) obtained a total score of 4685.19 on average by 468.52 and a variance of 29.57. The thigh muscle hypertrophy test data for the slow repetition training method group for students who have low motor ability level (A2B2) obtained a total score of 4710.10 on average by 471.01 and a variance of 20.45.

b. Research Data Analysis Results and Discussion

Table 2. Factorial ANOVA 2 x 2

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Sample	282.6517	1	282.6517	10.50534	0.002565	4.113165
Columns	187.4457	1	187, 4457	6.96681	0.012196	4.113165
Interaction	465.1922	1	465.1922	17.28984	0.00019	4.113165
Within	968.599	36	26.90553			
Total	1903,889	39				

Based on the data analysis work table above, the data of this study can be described as follows:

1. **In general, rapid repetition training method is more effective compared to slow repetition training method on thigh muscle hypertrophy**

   From the results of data analysis, the research shows that there is an influence of weight training methods on thigh muscle hypertrophy of students majoring in Training, Faculty of Sports Science at Universitas Negeri Padang in 2017 where F_h (6.96)> F_t (4.11). If it is seen from the difference of the mean score the two groups of the weight training methods used in this study, the group of fast repetitionweight training methods has higher meanthan the group of slow repetitionweight training methods in weighttraining, that is equal to 474.59> 470, 26. This has clearly proven that the training method used in weight training greatly affects a person's thigh muscle hypertrophy. The training method is implemented by a trainer in providing training material to athletes. In providing training, a trainer should consider the training methods to be used which should be appropriate to the characteristics of the athletes being trained, so that the exercises can run efficiently. Thus, the aim of the exercise can be achieved well. In weight training there are a variety of training methods that can be used, including the method of fast repetitionweight training and slow repetitionweight training methods. The method of fast repetitionweight training is a form of weight training method where the repetitions performed during the exercise are carried out with rapid repetitions that do one *repetition* for 1-3 seconds with 4-6 *reps* of 3 sets, so that the shock type muscle fibers will play a big role that will produce *hypertrophy* and greater muscle strength. While the slow repetitionweight training method is a technique that is done with slowrepetitions performed about 3 sets with 5 to 10 *reps*. Each *repetition is*executed for 6-10 seconds (slowly), (Jim Stoppani 2006: 18-20). Both of the training methods have contradictory characteristics, so these two methods have different compatibility for each athlete.

   Based on the description above it can be concluded that the use of appropriate weight training methods will produce efficient and targeted training on the stated training objectives. So that it is necessary for a coach's carefulness in using the right training methods for the athletes they train.

2. **There is an interaction between weight training with motor ability on thigh muscle hypertrophy**

   From the data analysis, the study shows that there is an interaction between motor skills with weight training methods on thigh muscle hypertrophy for students majoring in Coaching, Faculty of Sport Science, UniversitasNegeri Padang in 2017 academic year where F_h (17,289)> F_t (4,11). As previously described, motor ability is a person's skill in developing a set of responses that are received to a coordinated and structured form of repetition. Meanwhile, the training method is a way that is done by a trainer in providing training material to athletes who are fostered. These two subjects certainly have something to do with each other, in the process of achieving a desired training outcome. A person who has high motor skills will certainly experience more rapid development if given the right training methods during training, and vice versa if someone who has low motor skills will develop properly if given the training methods that are in accordance with his motor skills . The interactions obtained in this exercise have proven these two variables have a very real relationship in the process of weight training. This means that an athlete's motor skills and weight training methods used by a coach are two important elements that must be considered in carrying out weight training so that the expected muscle mass development can be achieved perfectly.

3. **The weight training method of fast repetition at high motor ability levels is more effective compared to the weight training method of slow repetition at high motor ability levels on Thigh Muscle Hypertrophy**

   From the results of data analysis that has been done, the research results are obtained that there is an influence of weight training methods for students who have high motor ability on thigh muscle hypertrophy students majoring in Coaching, the Faculty of Sport Science UniversitasNegeri Padang class of 2017 where Q_h (5.69)>Q_t (3.85). Judging from the average of the two research groups in students who have high motor skills, the average research group that uses the fast repetitionweight training method is higher than the average research group that uses the slow repetitionweight training method that is equal to 480.66> 469,51.

   For those who have high motor skills have a better ability to develop responses received and manifest into a form of repetition that is structured and organized. This is the reason for them to be more suitable to use the method of fast repetitionweight training, because the method of fast repetition of weight training they are required to do the exercises properly and quickly. Thus they will not experience difficulties in carrying out any form of exercise repetition provided.

4. The weight training method of fast repetition at high motor ability levels is less effective compared to the weight training method of slow repetition at low motor ability levels on Thigh Muscle Hypertrophy

From data analysis, the research results are obtained that there is an influence of weight training methods for students who have low motor ability against thigh muscle hypertrophy of students majoring in Coaching, Faculty of Sport Science UniversitasNegeri Padang class of 2017 where Q_h (4.75)>Q_t (3.85). Judging from the average of the two research groups in students who have low motor skills, the average research group using the slow repetition load training method is better than the average research group using the fast repetitionweight training method that is equal to 471.01>468 , 52. This proves that the slow repetitionweight training method is more suitable for those who have low motor skills.

For those who have low motor skills, it will be more difficult to assemble a structured and organized repetition quickly, so that the weight training method is needed to guide them in doing the exercise repetitions in order to lessen the difficulty in doing the exercise repetitions. Therefore, the slow repetitionweight training method can be used as an alternative for those who have low motor skills.

4. CONCLUSION

a. In general, rapid repetition training method is more effective compared to slow repetition training method on thigh muscle hypertrophy

b. There is an interaction between weight training with motor ability on thigh muscle hypertrophy

c. The weight training method of fast repetition at high motor ability levels is more effective compared to the weight training method of slow repetition at high motor ability levels on Thigh Muscle Hypertrophy

d. The weight training method of fast repetition at high motor ability levels is less effective compared to the weight training method of slow repetition at low motor ability levels on Thigh Muscle Hypertrophy

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