WEIGHT TRAINING WITH PYRAMID SYSTEMS TO INCREASE THE LEG AND BACK MUSCULAR STRENGTH, GRIP STRENGTH, PULL, AND PUSH STRENGTH

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This study aims to find out how much influence weight training with pyramid system against leg and back muscle strength, grip strength, pull and push strength. This research uses experimental method with design of the one group pretest-posttest design. The population of this research is the Sports Science (IKOR) student class of 2013. The sample in this research involves all students of IKOR FIK UNY concentration of fitness as many as 11 people. The instrument used is back/leg dynamometer, hand grip dynamometer, pull and push dynamometer. The data analysis technique uses the normality test to find out whether the data has normal distributed distribution. Test homogeneity variant to test the similarity of experimental group data variance. Test t to find out whether there are differences of variables between pretest and posttest in the experimental group. Based on the result of t test analysis, it can be concluded that there is significance difference of less than 0.05 (p <0.05), it can be concluded that there are significant differences in the four variables during pre test and post test. The increase can be seen on percentage increase of leg muscle strength increased 7,43%, back muscle strength equal to 22,15%, right grip strength 41,42%, left grip strength 10,67%, pull equal to 8,15% and Push strength of 11.14%.

Keywords: Weight training, Pyramid System, Muscle Strength

INTRODUCTION

Muscular strength is the ability of a muscle or group of muscles to be able to do a maximum contraction. Muscle strength will only be obtained through the correct weight training, measurable, orderly and hard-wired. By the time of weight training there should be attention to the basic principles of training in order to achieve maximum physical performance for someone. Sukadiyanto (2008:21-22), says that the principles of the training include: (1) individual, (2) adaptation, (3) overload (overload), (4) the burden of being progressive, (5) specification (specificity), (6), (7) heating and cooling (warm-up and cooling down), periodization (8), (9) contrast (reversible), (10) moderate load (no excess), and (11) the trainings should be systematic.

In addition to the principle of the training, the other thing to note at the time of training is the component of the training. Components of training can exert influence to the quality of a workout. The success rate of a training program can be viewed from the arrangement of the components of this training. As for the components are important in training intensity is (1), (2), (3) volume recovery interval, (4), (5) reps, (6), (7) sets of series or circuit duration, (8), (9), density (10), (11) the beat frequency, and (12) of the session or units (2008: Sukadiyanto, 33).

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Muscular strength trainings can be done with a method of weight training. Weight training is a training that is done systematically by using the load as a tool to increase the strength of the muscle function in order to improve the physical condition, prevent the occurrence of injury or for health purposes. Weight training can be done using the load of its own weight (load) or use external loads, namely free weights such as dumbell, barbell, or gym machines. Most widely forms of training using own weights used are chin-ups, push-ups, crunches, or back-up, while training using external loads is very numerous and vary according to the purpose of the training. There are several methods that are often used when doing weight training that is super sets, compound set, set system, sets block, tri sets, giant sets, pro set, pyramid, and its circuit weight training system.

Pyramid method training is a training by way of raising the load when done doing a set. Along with the addition of the load, the number of repetitions is reduced. Husein *et al*. (2007:60) argue that the pyramid is one of the methods of the system of strength training that is considered to have the best effect in increasing strength. On this system the athletes lift weights from lower intensity with Deuteronomy much then gradually headed to higher intensity with Deuteronomy. Mochamad Sajoto (1989:119) argues that the method or the system pyramide system is a method of practice that is given by the addition of a load of each set and followed by a reduction in the number of repetition.

Weight training will be more benefitial to increase the strength and endurance of muscles. Much research has proven weight training about the influence of the strength and endurance of muscles. According to Baechle (2014:1) weight training will be able to increase muscular strength, muscular endurance, neuromuscular (nerve-muscle) coordination, and bone density (helps prevent osteoporosis). Weight training can increase a deciding factor of performance by improving strength athletes, vertical jumping ability without increasing total body mass and compromising development of VO_2-max (Ronnestad, 2012:2341). According to Kalapotharakos (2007:109) strength training programme is essential for the maintenance of the functional performance of muscle strength and self-reliance in adults. After a period of training, strength training improves significantly (p < 0.001) knee extension 1 RM (32%) and the strength of the flexi (28%).

Muscle strength is one of the components of physical fitness associated with health. Muscle strength should be owned by every person so that he is able to do maximum movement or force against resistance. Therefore, researchers are interested in providing a study by giving a treat in the form of weight training with a pyramid system of the muscle strength of IKOR students class 2013.

RESEARCH METHODS

The type of research used in this study was quasi-experiment with quantitative approach. Experimental research can be defined as a method of research used to

locate a particular treatment influence against the other in controlled conditions (Sugiyono, 2013:109). The design of the research in this study is the one-group pretest-posttest design.

The treatment given was weight training with the pyramid system. Weight training with a pyramid system is training by ways of raising the load after completing a set and reducing the number of repretion. As for the dosage form of workout frequency: 3 times per week, intensity: 90-100% 1RM, 2-5 sets: the number of reps: 1-6 repetitions, and performed using the tools of Chest press, Pull down, Butterfly, Rowing, Leg extension, leg curl, Seated Leg press, leg Lying curl, Arm curl, Triceps pushdown, Low pulley curl, Triceps extension, Abdominal, Lower Back, High Pulley Crunches and Deadlifts.

RESULTS

The data of this research were obtained from the result of measurements of the influence of weight training a pyramid systems on the the strengths of the muscles, leg muscles, back muscles, grip strenght, and pull and push force of the IKOR students class 2013. Measurements were performed twice before treatment (pre-test) and after the treatment (post-test).

A descriptive analysis of the study data include a description of the minimum and maximum scores, mean, median, mode, and standard deviation of each of the research data. The results of the descriptive analysis on the data sub this research can be seen in the following table.

TABLE 1: THE RESULTS OF THE DESCRIPTIVE ANALYSIS OF
THE STUDY DATA

Data	Min.	Max.	Mean	Median	Modus	Std. Dev
The strength of leg muscles (pre test)	146.00	265.00	211.59	216.50	179.00	44.70
The strength of leg muscles (post test)	180.00	278.00	227.32	225.50	270.00	37.14
The strength of back muscles (pre test)	79.00	115.00	97.64	98.50	79.00	11.77
The strength of back muscles (post test)	106.50	136.00	119.27	115.50	106.50	10.92
Right grip (pre test)	35.00	46.00	29.89	38.10	36.20	3.90
Right grip (post test)	34.50	47.90	42.27	42.30	34.50	3.67
Left grip (pre test)	29.10	44.90	36.07	34.10	29.10	5.12
Left grip (post test)	32.80	48.50	39.92	40.90	32.80	5.02
Pull (pre test)	10.00	33.00	25.64	26.00	30.00	6.83
Pull (post test)	16.00	36.00	27.73	27.00	24.00	6.08
Push (pre test)	12.00	30.00	22.00	22.00	22.00	4.75
Push (post test)	14.00	32.00	24.45	25.00	22.00	4.48

1. Hipotesis Testing

The first hypothesis of this research states that there are significant effects with weight training with a pyramid systems on the strength of the muscles of leg, back, grip strenght, and pull and push on IKOR students class of 2013. Hypothesis testing

used Paired Sample t-tests. The results of the data analysis for this research hypothesis testing is as follows.

(a) The T-test Results on the Data of the Strength of Leg Muscles

TABLE 2: T-TEST RESULTS ON THE STRENGTH OF LEG MUSCLES

Data	Test	Mean	t count	p	Category
The Strength of Leg Muscles	Pre test	211.59	2.836	0.018	Significant
	Post test	227.32			

Source: processed primary data

The results of the analysis of the t-test show the value of t count of 2.836 with the significance value of 0.018. Because of the significance value of 0.018 is smaller than 0.05 ($p < 0.05$), it can be concluded there is a significant difference in the strength of leg muscles on the pre test and on the post test. This can be interpreted that there was significant influence on weight training with pyramid systems on the strength of the leg muscles on IKOR students class 2013, so the hypothesis of this research is acceptable.

(b) The T-test Results on the Data of Back Muscles Strength

TABLE 3: THE T-TEST RESULTS ON THE DATA OF BACK MUSCLES STRENGTH

Data	Test	Mean	t count	p	Category
The strength of back muscles	Pre test	97.64	13.670	0.000	Significant
	Post test	119.27			

Source: processed primary data

The results of the analysis of the t-test determine the value of t-count of 13.670 with the significance value of 0.000. Because of the significance value of 0.000 smaller than 0.05 ($p < 0.05$), it can be concluded there is a significant difference in back muscle strength on the pre test and on the post test. This result can be interpreted as there is a significant influence of weight training with pyramid systems on the strength of back muscles of IKOR students class 2013, so the hypothesis of this research is acceptable.

(c) The T-test Results on the Data of Right Grip Strenght

TABLE 4: THE T-TEST RESULTS ON THE DATA OF RIGHT GRIP STRENGHT

Data	Test	Mean	t count	p	Category
Right Grip Strenght	Pre test	39.89	3.753	0.004	Significant
	Post test	42.27			

Source: processed primary data

Based on the results of the analysis of the t-test, it is shown that the value of t-count was 3.753 with the significance value of 0.004. Because of the significance

value of 0.004 is smaller than 0.05 (p < 0.05), it can be concluded there is a significant difference in right grip strenght on the the pre test and on the post test. It can be interpreted that there was a significant influence on weight training with the pyramid system on the right grip strenght of the IKOR students class 2013, so the hypothesis of this research is acceptable.

(d) The T-test Results on the Data of Left Grip Strenght

TABLE 5: THE T-TEST RESULTS ON THE DATA OF LEFT GRIP STRENGHT

Data	Test	Mean	t count	p	Category
Left Grip Strenght	Pre test	36.07	5.613	0.000	Significant
	Post test	39.92			

Source: processed primary data

Based on the results of the analysis of the test t, it is shown that the value of t count was 5.613 with the significance value of 0.000. Because of the significance value of 0.000 smaller than 0.05 (p < 0.05), it can be concluded that there is a significant difference in grip strenght left on the the pre test and the post test. This result can be interpreted as a significant influence on weight training with the pyramid system on the left grip strenght of IKOR students class 2013, so the hypothesis of this research is acceptable.

(e) Results of T-test on the Data of Pull

TABLE 6: RESULTS OF T-TEST ON THE DATA OF PULL

Data	Test	Mean	t count	p	Category
Pull	Pre test	25.64	4.394	0.001	Significant
	Post test	27.73			

Source: processed primary data

Based on the results of the analysis of the test t, it is shown that the value of t count was 4.394 with the significance value of 0.001. Because of the significance value of 0.001 is smaller than 0.05 (p < 0.05), it can be concluded there is a significant difference of pull on the the pre test and on the post test. This result can be interpreted as there is a significant influence on weight training with the pyramid system on the pull force of IKOR students class 2013, so the hypothesis of this research is acceptable.

(f) Results of T-test on the Data of Push

TABLE 7: RESULTS OF T-TEST ON THE DATA OF PUSH

Data	Test	Mean	t count	p	Category
Push	Pre test	22.00	3.766	0.004	Significant
	Post test	24.45			

Source: processed primary data

Based on the results of the analysis of the test t, it is shown that the value of t count was 3.766 with the significance value of 0.004. Because of the significance of 0.004 value smaller than 0.05 ($p < 0.05$), it can be concluded there is a significant difference of push on the pre test and on the post test. This result can be interpreted that there is a significant influence on weight training with the pyramid system on the the push force of IKOR students class 2013, so the hypothesis of this research is acceptable.

The percentage increase of muscles strength of leg, back, grip strenght, and pull and push as the results of weight training with the pyramid system can be seen in Table 8.

TABEL 8: THE INCREASE PRECENTAGE OF RESULTS OF WEIGHT
TRAINING USING THE PYRAMID SYSTEM

Data	Pre test	Post test	Increase
Strength of Leg Muscles	211.59	227.32	7.43%
Strength of Back Muscles	97.64	119.27	22.15%
Right grip strength	29.89	42.27	41.42%
Left grip strength	36.07	39.92	10.67%
Pull	25.64	27.73	8.15%
Push	22.00	24.45	11.14%

Based on the table above it is shown that right grip strength is of the greatest increase of 41.42% and the strength of the back muscles of 22.15%. The ability increased with the lowest level was strength of leg muscles of 7.43%.

DISCUSSION

Muscular strength is the ability to exert maximum force against resistance (Werner, 2011:214). Neiman (1993:28) says that muscle strength is the maximum strength as one effort that performed against resistance. In other words muscle strength is the ability of a muscle or a group of muscles to perform a one-time maximum contraction against a lifted load.

Muscle strength is the maximum force or tension generated by a muscle or a group of muscles (Deuster, 1997:6). Sadoso Sumosardjuno (1997:6), argues that muscle strength is the ability of muscles to use maximal or near-maximal effort, to lift the load. Mechanically muscle strength is defined as the force that can be generated by a muscle or a group of muscles in doing maximum contraction against a lifted load.

The results of t-test analysis of strength of leg muscles show the value t count of 2.836 with the significance value of 0.018. As the significance value of 0.018 is smaller than 0.05 ($p < 0.05$), it can be concluded there is a significant difference in the strength of leg muscles on the pre test and on the post test. This result can be interpreted that there is a significant influence of weight training with pyramid

systems on the the strength of the leg muscles of IKOR students class 2013. The increase in the strength of leg muscles with weight training results pyramid system was from 211.59 becoming 227.32.

On the strength of the back muscles, it is obtained the value of t count of 13.670 witht the significance value of 0.000. As the significance value of 0.000 is smaller than 0.05 ($p < 0.05$), it can be concluded there is a significant difference in the strength of back muscles on the pre test and on the post test. This result can be interpreted as a significant influence on weight training with pyramid systems of the strength of back muscles of IKOR students class 2013. The increase in the strength of the back muscles with weight training using the pyramid system was from 97.64 becoing 119.27.

The results of the analysis on the t-test of right grip strenght show the value of t count of 3.753 with the significance value of 0.004. As the significance value of 0.004 is smaller than 0.05 ($p < 0.05$), it can be concluded there is a significant difference in right grip strenght on the pre test and on the post test. This result can be interpreted as a significant influence of weight training with the pyramid system on the right grip strenght of IKOR students class 2013. The increased of right grip strenght after weight training using the pyramid system was of 39.89 becoming 42.27.

The results of the analysis on the t-test of left grip strenght show the value of t count of 5.613 with the significance value of 0.000. As the significance value of 0.000 is smaller than 0.05 ($p < 0.05$), it can be concluded there is a significant difference in left grip strenght on the pre test and on the post test. This result can be interpreted as a significant influence of weight training with the pyramid system on left grip strenght of IKOR students class 2013. The increased left grip strenght as the results of weight training with a pyramid system is of 36.07 becoming 39.92.

On the strength of pull, it is determined the value of t count of 4.394 with the significance value of 0.001. Because of the significance value of 0.001 is smaller than 0.05 ($p < 0.05$), it can be concluded there is a significant difference of pull on the pre test and on the post test. This result can be interpreted as a significant influence of weight training with the pyramid system on the pull strength of IKOR students class 2013. The increase in the pull strength after weight training with the pyramid system is from 25.64 becoming 27.73.

The t-test analysis results of push strength obtain the value of t count of 3.766 with the significance value of 0.004. As the significance value of 0.004 is smaller than 0.05 ($p < 0.05$), it can be concluded there is a significant difference of push strength on the pre test and on the post test. This result can be interpreted as a significant influence of weight training with the pyramid system on the push strength on IKOR students class 2013. The increased push strenghth after weight training with the pyramid system is from 22.00 becoming 24.45.

In terms of the percentage increase among muscle strength, the strength of leg muscles, back muscles, grip strenght, and pull and push as the results of weight training with the pyramid system it is determined that right grip strength is of the greatest increase of 41.42% and the strength of the back muscles of 22.15%. The ability increased with the lowest level was strength of leg muscles of 7.43%.

Weight training can provide a significant influence on the strength of the muscles. This is in accordance with research conducted by Arazi and Asadi (2011:112) entitled the influence of weight training for 8 weeks with the same volume and frequency of training maximum strength differently to, and durability. Thirty-nine healthy males were devided into four groups; total body endurance training (12 trainings for one session per week) (I = 10), total body resistance training (12 trainings for two sessions per week) (part II = 10), training of the lower body, upper body, and resistance training on the upper body (12 trainings for three sessions per week) (part III = 9), and the control group (CG = 10). Measurements of strength (one maximum reps in the bench press and leg press) and durability (bench press and leg press) were determined before and after 8 weeks of training. The result is one maximum repetition on bench press and leg press was increased significantly on all training groups ($P < 0.05$).

CONCLUSSION

Based on the results of hypothesis testing, it can be concluded that the overall significance values were smaller than 0.05 ($p < 0.05$). Thus, it can be concluded that there is a significant difference in the variables of muscle strength, leg and back muscle strength, grip strenght, and pull and push on the pre test and on the post test. The increase can be seen in the percentage leg muscle strength that is increased 7.43%, the strength of the back muscles 22.15%, right grip strength 41.42%, left grip strength 10.67%, and 8.15% for the pull and 11.14% for the push.

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