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The Effect Of Progressive And Constant Training Loads On The Special Physical Conditions Of Football Players

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Abstract

There are still many football coaches who disagree to have weight training in competition season for fear of increasing physical elements on one side but resulting in a decrease in other elements, for example strength increases, but running speed does not increase or it can even decrease. The statement is actually not unreasonable if the weight training is done with the correct method. There is no empirical evidence that tests the method of progressive weight training and constant weight training on strength, running speed and muscular endurance. This study aims to analyze the differences in the effects of progressive weight training and constant weight training on muscle strength, running speed and muscle endurance of soccer players.

This type of research is experimental research, with the design "The Randomized Pretest-posttest Control Group Design". The sample of this study is the Yogyakarta State University football players aged 18-24 years. The studied variables were as follows: Independent variables included: 1) progressive weight training, 2) constant weight training, and 3) play training. Dependent variables: 1) muscle strength, 2) running speed, and 3) endurance of leg muscles. Data collection instruments used were: 1) the Leg Dynamometer to measure the leg muscle strength , 2) the running test to measure the running speed of the 50 Yard, was used, 3) To measure the leg muscle endurance, the Half Squat Test was used to find out the effects of exercise on muscle strength, speed, and endurance data were analyzed by t-test.

Meanwhile, to analyze the differences in the mean count due to the effect of weight training between the study groups, the data were analyzed using the analysis of variance (ANAVA) techniques. The results of this study concluded that: (1) weight training using progressive weight training methods and constant weight training methods that are provided for 8 weeks with a frequency of 3 times per week, with a load between 60 to 80% of maximum ability, with reps between 8 to 12 times per set can be done by soccer athletes during competition periods, because both methods can increase muscle strength, and can also increase explosive power, running speed and muscular endurance, (2) If the training period before entering the competition is relatively short, for example, only 3-4 months,

Key Words: *weight training, muscular endurance, playing soccer.*

INTRODUCTION

In the development of soccer, physical condition is an important component that needs special coaching, because soccer is a dynamic sport with a long game duration (2 x 45 minutes), so it demands excellent physical condition. Specific physical conditions such as muscle strength, muscular endurance, explosive power, sprint speed, flexibility, agility and coordination are used alternately throughout the match. Muscle strength is used to fight resistance that comes from the opponent's body thrust, as well as to maintain body position throughout the match. Good muscle endurance can be demonstrated when a player can continuously use physical abilities and technical movements without experiencing significant fatigue. Explosive power is used when a player has to jump to head the ball, kicking to dispel the ball, as well as to score goals into the opponent's goal and start movements when running. Sprint speed is used in chasing the ball, chasing opponents and in dribbling. Dribbling also requires agility, and good coordination.

In soccer coaching, weight training has become an important part of improving the physical condition of players. Usually football coaches develop a weight training program placed in the initial period (general physical preparation) of the entire training period, ie long before entering the competition period. Weight training during the general physical preparation period is good if the time available for team preparation is sufficient, which is more than 6 months, and weight training should still be carried out until entering the competitive season so that there is no decrease in physical abilities, especially muscle strength and running speed. Meanwhile in the field it is often found that the time available for team preparation is very short, for example less than 3 months, while the competition period can last a long time, which is more than 4 months.

Under these conditions, the coach must be able to create training programs that can optimize physical, technical and tactical conditions synergistically during preparation and throughout the competition period. However, there are still many coaches who do not agree if during the competition season weight training is carried out for fear of increasing physical elements on one side but resulting in a decrease in other elements, for example increasing strength, but not increasing speed and skills or even decreasing. This statement is actually unreasonable if weight training is carried out with the correct system (Sumosardjuno, 1994). Even Maran & Parmar (2005) confirmed that weight training in the right way will improve muscle strength, prevent injury, control body weight, strengthen bones.

If weight training is done correctly, there will be an increase in the physical elements of soccer players, such as strength, explosive power, speed and muscle endurance. The increase in physical elements due to weight training is caused by physiological changes that occur in the neuromuscular system (adaptation of the neuromuscular system). These changes are partly due to the occurrence of muscle hypertrophy (Baechle & Earle, 2008). With weight training the nervous system will also get better because the mobilization of the motor unit increases. This is caused by the "learning" process in the motor cortex of the brain by repetitive motion stimulation through a number of repetitions of exercises, carrying out various loads,

Weight training in addition to building strength, but also has a positive transfer to the elements of other physical conditions. Bompa (1999) states that if weight training aims to develop one of the biomotor components, such as strength, it will affect other abilities, such as muscle endurance, speed, and explosive power. This happens because weight training causes the repetition of contractions to be faster, thereby increasing speed and explosive power, and training for a long period will increase muscle endurance.

If the physical elements increase, then it is expected to lead to an increase in technique ability. Dreger (2006) states that weight training in addition to improving physical abilities, will also improve skills so as to enhance achievement. This happens because in the action of movement techniques also require physical ability. If one's physique is poor, then the technique being demonstrated will also be inaccurate and imperfect. If this happens to a football player, it will usually cause his movements to become sluggish, and his foot kick to become weak.

Weight training is an effective exercise to improve physical (biomotor) abilities such as strength, explosive power, speed and muscle endurance. To achieve the objectives of each of

these biomotor components, the intensity of the load, the number of repetitions and the exercise rhythm are different. Baechle (1997) and Bompa (1994) stated that to train strength, heavy weights (80% or more) were required, with a number of repetitions of 1-8 times, to train speed and explosive power, moderate loads (70%), with the number of repetitions 8- 12 times, and to train muscle endurance required light weights (less than 70%), with the number of repetitions 12-20 times. The progressive weight training method requires the training load to increase from light to heavy from one set to the next.

In this study, constant weight training used an intensity of 70% of 10RM with a fixed load for the 1st, 2nd and 3rd sets and with the same repetitions for each set, which is 10 repetitions. Judging from the aspect of exercise loading with an intensity of 70% of the dominant 10RM to develop speed. While the progressive weight training exercise intensity for each set is different. In the 1st set with light intensity (60% of 10RM) and with 12 repetitions, in the 2nd set with moderate intensity (70% of 10RM) and with 10 repetitions, and in the 3rd set with heavy intensity (80% of 10 RM) and with 8 reps. Judging from the aspect of setting the intensity of exercise with this progressive load, in the 1st set it is dominant to develop muscle endurance,

From a physiological point of view, exercise with increasing intensity, such as progressive weight training, has the advantage of optimizing the muscle contraction system. The light intensity exercise in the first set did not involve all muscle fibers to work, then the moderate load in the 2nd set, the muscles involved were more than the 1st set, and then the heavy load in the 3rd set, the more muscles involved than in the 1st and 2nd sets (Baechle & Groves, 1997). Furthermore, Baechle & Groves stated that progressively heavier loads from set to set will provide a stimulus for an increase in load.

Progressive weight training in the 3rd set using heavy weights. Exercise with heavy intensity has a tendency to produce more maximal muscle contractions, therefore the intensity of exercise that is close to the maximum ability will provide more stimulation to increase strength. Strong muscles, can carry a greater workload and are less prone to fatigue as the training period increases. Weight training produces muscle hypertrophy which causes an increase in muscle size. An increase in muscle size and the number of capillaries favors an increase in strength, so that muscle contraction is stronger and can subsequently have an effect on increasing speed. Meanwhile, the exercise using the constant load method involved the muscles to lift the weight in the 1st set, the 2nd set and the 3rd set are relatively the same, because the weight lifted is the

same. Such a load does not stimulate the involvement of all muscles to work. Baechle & Groves (1997) stated that with constant weight training, the completion of motion in the 1st set is easy to do, and the 2nd and 3rd sets are usually more difficult, because not all the muscles working in the first set have recovered from fatigue.

Research conducted by Surakka (2005) shows that weight training with light intensity can increase explosive power by 15%, moderate intensity increases by 16% and with heavy intensity it can increase 14%. Exercise with light intensity can not improve 20 m running speed, with moderate intensity 20 m running speed can increase by 5%, and with heavy intensity 20 m running speed only increase 3%. Research conducted by Kraemer (1997) showed that there was a significant increase in strength, power, muscle endurance and lean body mass with multiple-set system weight training on student soccer players. While Ostrowski (1997) reported that moderate-intensity weight training can increase maximum strength, but there is no significant difference between training with system one, two and four sets to increase in strength. Sanborn, Boros & Hruby (2000) stated that after 8 weeks of training with a multiple set program, vertical jumps increased by 11%, while training with a single set program only increased by 0.3%.

From the description above, it shows that the exercise with a physiological constant load does not reach the maximum muscle strength, so it is less able to stimulate the work of all existing muscle fibers. In addition, the intensity of the constant load system is not varied (fixed), namely at moderate intensity, which is dominant to the increase in speed. Meanwhile, in progressive weight training with a gradual increase in intensity, the physiological load approaches the maximum muscle strength, allowing more muscle fibers to work. On the other hand, weight training with the progressive method uses loads that vary in intensity, starting with light loads, then medium loads and ending with heavy loads. With light intensity will increase muscle endurance, with moderate intensity will increase explosive power and speed and with heavy intensity will be able to increase muscle strength. Thus it can be assumed that weight training with the progressive method is more effective in increasing muscle strength, explosive power, speed and muscle endurance than training with the constant load method. However, empirical evidence that distinguishes the effectiveness of the two weight training methods on improving the specific physical conditions of soccer players such as muscle strength, explosive power, speed and muscle endurance needs to be researched. This study was intended to analyze the differences in the effect of progressive weight training and constant weight training on

muscle strength, explosive power, speed and muscle endurance for soccer players. Based on the description of the background of the problem,

METHODS

This type of research is a true experimental research, using "The Randomized Pretest-posttest Control Group Design" (Zainuddin, 1988). In this study, the target population of Yogyakarta State University (UNY) football players aged 18-24 years, with a total population of 51 people. The sample size of 45 people was calculated using the Slovin formula (Umar, 1999). Furthermore, the total sample of 45 people was divided into three groups, each group of 15 people by means of ordinal paining, based on the order of the results of the pre-test of muscle strength.

In this study, the variables studied can be explained as follows: The independent variables include: 1) progressive weight training, 2) constant weight training, and 3) playing method training. Dependent variables: 1) muscle strength, 2) explosive power, 3) running speed, and 4) leg muscle endurance. The data collection instruments used in this study were: 1) To measure the strength of the leg muscles, the Leg Dynamometer was used, 2) To measure explosive power, the vertical jump test was used, 3) To measure the running speed, the 50 Yard Run test was used, 4) To measure the power of the leg muscle endurance used the Half Squat Jum test.

To determine the effect of exercise on strength, explosive power, speed, and muscle endurance, the data were analyzed by t-test. Meanwhile, to analyze the difference in the arithmetic mean due to the effect of weight training between the research groups, the data were analyzed using the technique of analysis of variance (ANOVA). If the results of the analysis show differences between the research groups, the analysis is continued with the Least Significance Difference (LSD) test (Nurgiyantoro, Gunawan & Marzuki, 2002; Dewanto, Tarmudji & Tarsis, 1995). Before the data was analyzed, the requirements test was first carried out, namely the normality test for the frequency distribution of the data and the homogeneity test of variance (Somantri & Muhidin, 2006). To test the normality of the frequency distribution of the data using the Kolmogorove-Smirnov test (Dewanto, Tarmudji & Tarsis, 1995), and homogeneity of variance test using Levene's Test statistical test (Nurgiyantoro, Gunawan & Marzuki, 2002). All tests performed with a significance level of = 0.05%. All analysis using the Statistical Product and Service Solution (SPSS) computerized program

RESULTS

1. Variable Muscle Strength

The results of the descriptive analysis in the form of the mean (mean), standard deviation (SD) of muscle strength variables in the pre-test, post-test, and delta (difference between post-test and pre-test scores) for each research group are presented in Table 1. as follows.

Table 1. Results of Descriptive Analysis of Muscle Strength Variables

Variable / Group	Muscle Strength						
	N	Pre-Test		Post-Test		Delta	
		mean	SD	mean	SD	mean	SD
Progressive	15	167.40	26.106	201.00	30.062	33.60	5.409
Constant	15	166.20	23,275	189.60	26,286	23.40	4.703
Played	15	172.00	27.042	173.67	28,341	1.67	3.177

2. Variable Explosive Power

The results of the descriptive analysis in the form of the number of samples (N), mean, and standard deviation (SD) of explosive power variables in the pre test, post test and delta for each research group are presented in Table 2.

Table 2. Results of Descriptive Analysis of Explosive Power Variables

Variable / Group	Explosion power						
	N	Pre-Test		Post-Test		Delta	
		mean	SD	mean	SD	mean	SD
Progressive	15	85,661	9.397	98.360	9.573	12,699	2,244
Constant	15	86,313	11,479	95.74	11,681	9,451	2,397
Played	15	84,849	8,238	85,655	8026	0.805	1.617

3. Variable Running Speed (Sprint)

The results of the descriptive analysis in the form of the mean and standard deviation (SD) of the sprint speed variables in the pre test, post test and delta for each research group are presented in Table 3 as follows.

Table 3. Results of Descriptive Analysis of Running Speed Variables Variabel

Variable / Group	Running speed						
	N	Pre-Test		Post-Test		Delta	
		mean	SD	mean	SD	mean	SD
Progressive	15	6.447	0.250	6.062	0.125	0.385	0.206
Constant	15	6.444	0.385	6.177	0.288	0.267	0.103
Played	15	6.489	0.422	6,401	0.289	0.088	0.340

4. Variable Muscle Endurance

The results of the descriptive analysis in the form of the mean (mean) and standard deviation (SD) of muscle endurance variables in the pre test, post test and delta for each research group are presented in table 4 as follows.

Table 4. Results of Descriptive Analysis of Muscle Endurance Variables

Variable / Group	Muscle Endurance						
	N	Pre-Test		Post-Test		Delta	
		mean	SD	mean	SD	mean	SD
Progressive	15	134.87	25,241	167.80	25,624	32.93	3,863
Constant	15	135.80	22,428	149.80	22,954	14.00	4.226
Played	15	140.47	15,198	142.87	16,044	2.40	4.657

Hypothesis testing

Statistical Analysis Requirements Test

In order to fulfill the requirements of statistical analysis, a prerequisite test was first carried out on the research data. The test requirements in question include the normality test of the data frequency distribution and the homogeneity test of variance.

1. Data Normality Test

The results of the normality test of the strength, explosive power, speed and muscle endurance variables can be seen in Table 5 as follows.

Table 5. Normality Test Results For Physical Elements Data

Group / Variable	Test	Progressive (Ex.1)	Constant (Ex.2)	Played (Ex.3)	Ketera just	Status
		Significance (p)	Significance (p)	Significance (p)		

Power	Pre-Test	0.993	0.990	0.860	p>0.05	Normal
	Post-test	0.998	0.885	0.937	p>0.05	Normal
Explosion power	Pre-Test	0.967	0.768	0.672	p>0.05	Normal
	Post-test	0.987	0.619	0.829	p>0.05	Normal
Speed	Pre-Test	0.382	0.810	0.983	p>0.05	Normal
	Post-test	0.990	0.934	0.977	p>0.05	Normal
muscle endurance	Pre-Test	0.979	0.948	0.586	p>0.05	Normal
	Post-test	0.915	0.667	0.477	p>0.05	Normal

2. Variance Homogeneity Test

The homogeneity of variance test in this study used Levene's Test statistics. The results of the homogeneity of variance test results for the variables of strength, explosive power, running speed and muscle endurance as shown in Table 6 as follows.

Table 6. The Results of the Homogeneity Test of the Variance of the Physical Elements

Variable	Test	Lavene's Statistics	Significance (p)	Information	Status
Power	Pre-test	0.263	0.770	p>0.05	Homogeneous
	Post-test	0.106	0.889	p>0.05	Homogeneous
Explosion power	Pre-test	0.273	0.762	p>0.05	Homogeneous
	Post-test	0.432	0.652	p>0.05	Homogeneous
Speed	Pre-test	1.424	0.252	p>0.05	Homogeneous
	Post-test	2,944	0.064	p>0.05	Homogeneous
muscle endurance	Pre-test	1.826	0.174	p>0.05	Homogeneous
	Post-test	2.262	0.117	p>0.05	Homogeneous

Hypothesis Test 1. Is there a difference in physical ability before and after being given treatment in the progressive weight training group, constant weight training and playing exercise group

To determine the difference in muscle strength, explosive power, running speed and muscle endurance between before being treated and after being given treatment, a t-test was carried out. The results of the research for each research group are as follows.

1. Variable Difference Test Results Depending on the Progressive Weight Training Group.

The results of the test of different variables depend on the progressive weight training group as shown in Table 7 as follows.

Table 7. The Results of the Test of Different Variables Depending on the Progressive Weight Training Group

Variable	Between Observations	t- count	Significance (p)	Information
Muscle Strength	Pre test – Post test	24.059	0.000	Different
Explosion power	Pre test – Post test	21,921	0.000	Different
Speed	Pre test – Post test	7.239	0.000	Different
Muscle Endurance	Pre test – Post test	33.017	0.000	Different

2. Variable Difference Test Results Depending on the Constant Weight Training Group

The results of the test of different variables depend on the constant weight training group as shown in Table 8 as follows.

Table 8. The Results of The Different Test of Variables Depending on the Constant Weight Training Group

Variable	Between Observations	t- count	Significance (p)	Information
Muscle Strength	Pre test – Post test	19.272	0.000	Different
Explosion power	Pre test – Post test	15,269	0.000	Different
Speed	Pre test – Post test	10,054	0.000	Different
Muscle Endurance	Pre test – Post test	12.831	0.000	Different

3. Variable Different Test Results Depending on the Play Practice Group Kelompok

The results of the test of different variables depending on the playing practice group as shown in Table 9 as follows.

Table 9. The Results of The Test of Different Variables Depending on the Playing Group

Variable	Between Observations	t count	Significance (p)	Information

Muscle Strength	Pre test – Post test	2.032	0.062	No Different
Explosion power	Pre test – Post test	1,929	0.074	No Different
Speed	Pre test – Post test	1.003	0.333	No Different
Muscle Endurance	Pre test – Post test	1996	0.066	No Different

Hypothesis Test 2. Is there a difference in the effect of exercise between progressive weight training, constant weight training and playing training on physical elements.

To determine the difference in the dependent variable between groups, analysis of variance was used. The dependent variables in this study were muscle strength, explosive power, running speed, and muscle endurance. The data used for statistical analysis is the difference between the pre-test and post-test (delta) data of the dependent variables. The results of the analysis can be presented as follows.

1. Results of Variable Analysis of Muscle Strength Variables.

The results of the analysis of muscle strength variance can be seen in Table 10 as follows.

Table 10. The Results of The Analysis of Muscle Strength Variance

Variable	F	Significance (p)	Information
muscle strength	194.754	0.000	Different

To find out which groups are different, then proceed with the Post Hock test with LSD. The results of the Post Hock test with LSD can be as shown in Table 11 as follows.

Table 11. Post Hock Test Results with LSD Muscle Strength

Variable	Group	Group	*mean difference*	Significance (p)
Power	lat. Progressive Load	lat. Constant Load	10.20	0.000
		lat. Played	31.93	0.000
	lat. Constant Load	lat. Progressive Load	-10.20	0.000
		lat. Played	21.73	0.000
	Play Practice	lat. Progressive Load	-31.93	0.000
		lat. Constant Load	-21.73	0.000

2. Variable Muscle Explosive Power

The results of the analysis of explosive power variance can be seen in Table 12 as follows.

Table 12. The Results of The Analysis of Explosive Power Variance

Variable	F	Significance (p)	Information
Explosion power	126,972	0.000	Different

To find out which groups are different, then proceed with the Post Hock test with LSD. The results of the Post Hock test with LSD can be seen in Table 13.

Table 13. Post Hock Test Results with LSD Explosive Power

Variable	Group	Group	*mean difference*	Significance (p)
Explosion power	lat. Progressive Load	lat. Constant Load	3.248	0.000
		lat. Play (Control)	11,894	0.000
	lat. Constant Load	lat. Progressive Load	-3.248	0.000
		lat. Brrmain (Control)	8,646	0.000
	lat. Play (Control)	lat. Progressive Load	-11,894	0.000
		lat. Constant Load	- 8,646	0.000

3. Results of Variable Analysis of Running Speed Variables.

The results of the analysis of variance in running speed can be seen in Table 14 as follows.

Table 14. The Results of The Analysis of Variance in Running Speed

Variable	F	Significance (p)	Information
Running speed	5,982	0.005	Different

To find out which groups are different, then proceed with the Post Hock test with LSD. The results of the Post Hock test with LSD can be seen in Table 15 as follows.

Table 15. Post Hock Test Results with LSD Running Speed

Variable	Group	Group	*mean difference*	Significance (p)
Speed	lat. Progressive Load	lat. Constant Load	0.1187	0.178
		lat. Played	0.2973	0.001
	lat. Constant Load	lat. Progressive Load	-0.1187	0.178
		lat. Played	0.1787	0.045
	Play Practice	lat. Progressive Load	-0.2973	0.001
		lat. Constant Load	-0.1787	0.045

4. Results of Variable Analysis of Muscle Endurance Variables.

The results of the analysis of muscle endurance variance can be seen in Table 16 as follows.

Table 16. The Results of The Analysis of Muscle Endurance Variance

Variable	F	Significance (p)	Information
Muscle Endurance	196,264	0.000	Different

To find out which groups are different, then proceed with the Post Hock test with LSD, as shown in Table 17 as follows.

Table 17. Post Hock Test Results with LSD Muscle Endurance

Variable	Group	Group	*mean difference*	Significance (p)
Muscle Endurance	lat. Progressive Load	lat. Constant Load	18.93	0.000
		lat. Played	30.53	0.000
	lat. Constant Load	lat. Progressive Load	-18.93	0.000
		lat. Played	11.60	0.000
	Play Practice	lat. Progressive Load	-30.53	0.000
		lat. Constant Load	-11.60	0.000

Discussion

To become a reliable football player, a player must have good physical, technical, tactical and mental condition. Luxbacher (2011) states that an important aspect of performance in playing football is having good speed, strength, stamina, skills and tactical abilities. Therefore, in order for the appearance of playing football to be good, the physical, technical, tactical and mental elements must be properly nurtured, as stated by Scheunemann (2012) that in order for players to have good skills there are at least four elements that must be considered in fostering football, namely physical , technique, tactics and cooperation. The four factors must be fostered in a programmatic, sustainable and sustainable manner. These components are also interrelated with each other. If someone has good technique, but his physique is not good, then he will not be able to play well. Vice versa if the physical condition is good but the technique is not good, you will not be able to play well. Furthermore, if the physical and technical are good then the application of tactics and teamwork will be easy to carry out.

This study aims to analyze the effect of progressive weight training and constant weight training on muscle strength, explosive power, running speed and muscle endurance. This study also aims to analyze the difference in effectiveness between progressive weight training and constant weight training on muscle strength, explosive power, running speed and muscle endurance.

The results showed that in the progressive weight training group after being treated for 8 weeks with a frequency of 3 times per week there was a significant increase in muscle strength, explosive power, running speed, and muscle endurance, $p = 0.000$ ($p < 0.05$). Similarly, in the constant weight training group after being treated for 8 weeks with a frequency of 3 times per week there was a significant increase in muscle strength, explosive power, running speed, and muscle endurance, $p = 0.000$ ($p < 0.05$). Meanwhile in the playing training group (the group not exercising with weights) showed no change in muscle strength $p=0.062$ ($p>0.05$), explosive power $p=0.074$ ($p>0.05$), running speed $p=0.333$ ($p>0.05$), and muscle endurance $p=0.066$ ($p>0.05$).

The results of this study indicate that both progressive weight training and constant weight training are training methods that can improve muscle strength, explosive power, running speed and muscle endurance. The results of this study strengthen the opinion of Bompa (1999) which states that fundamentally weight training can help increase strength, as well as endurance, if weight training is carried out with the right method and the right intensity. The interesting thing from the results of this study is that the increase in strength is also followed by an increase in speed, explosive power and muscle endurance. Thus the results of this study can answer the trainer's anxiety which states that weight training can increase strength, but usually speed and explosive power will not increase, and can even decrease.

PThe increase in the ability to work muscles due to weight training may be caused by physiological changes that occur in the neuromuscular system (adaptation of the neuromuscular system). These changes are partly due to the occurrence of muscle hypertrophy. An increase in muscle size (hypertrophy) leads to stronger muscle contractions (increased power), faster repetition of contractions (increased speed), a longer period of exercise (increased muscle endurance). Adaptations that occur in muscles include changes in the body's biochemistry, which include an increase in ATP-PC, ATPase and other glycolytic enzymes (Fox, 1988).

The results of this study reinforce previous research conducted by Kreamer (1997) that there was a significant increase in strength, power, muscle endurance and lean body mass with multiple-set system weight training on student soccer players. The results of Ostrowski, Wilson & Weatherby (1997) research reported that moderate intensity weight training can increase maximum strength, but there is no significant difference between exercises with one, two, and four sets system. Sanborn, Boros, & Hruby (2000: 328) reported that after 8 weeks of training with a multiple set program, vertical jumps increased by 11%, while training with a single set program only increased 0.3%.

Judging from the methodology of physical exercise, the results of this study can confirm the exercise theory which states that exercise 3 times per week will appear to increase after exercise lasts between 6-8 weeks. Fox (1984) stated that weight training is an anaerobic exercise, and exercise 3 times per week is a good frequency of exercise to develop the anaerobic system. While the frequency of good exercise for endurance training is 2-5 times per week. Exercise 3 times per week is the minimum frequency that can produce maximum energy gain. The results of this study confirm the findings of Dreger (2006) that weight training will have an effect after 8 weeks of exercise with a frequency of 3 times per week. Weight training can increase muscle strength by up to 50%. Feigembaum, Zalchkowsky,

The results of the study with the aim of knowing the difference in the effectiveness of the effect of progressive weight training and constant weight training on muscle strength, explosive power, speed, and endurance showed that: 1) There was a very significant difference in increasing muscle strength between the research sample groups $p = 0.000$ ($p < 0.05$). Progressive weight training is more effective for increasing muscle strength than training with constant weights, 2) The results of the analysis of variance in explosive power show that there is a significant difference in muscle explosive power between the research sample groups, $p = 0.000$. The difference in mean explosive power of progressive weight training with constant weight training is 3.248, $p = 0.000$ means that there is a significant difference between the two groups of weight training (muscle explosive power of progressive weight training is 3.248 better than constant weight training, 3) There was a very significant difference in the increase in running speed between the three research sample groups $p = 0.000$ ($p < 0.05$). However, after further testing with LSD, it turned out that there was no significant difference in increasing running speed between progressive weight training and constant weight training $p = 0.178$ ($p>0.05$).

While the real differences were: (a) progressive weight training was better than the play training group on increasing running speed, p = 0.001 (p < 0.05), and (b) constant weight training was better than the play training group on increasing running speed. , p=0.045 (p<0.05), 4) There was a very significant difference in the increase in muscle endurance between the sample groups of the study p = 0.000 (p<0.05).

Thus it can be interpreted that to increase muscle strength, explosive power and muscle endurance the progressive weight training group is better than the constant weight training group, while to increase running speed the two weight training systems have the same effectiveness. There is no difference in the effectiveness of the two weight training systems on running speed, probably due to genetic factors. As stated by Coerver (1985) that the only physical element that is difficult to develop is speed, because it is influenced by nature (talent). Furthermore, Coerver stated that players who don't run very fast, even though they get sprint training with a very good method, their improvement is not as good as players with fast muscle type traits.

The results of this study indicate that training with progressively increasing intensity as applied in the progressive weight training method is more effective in increasing muscle strength, explosive power, and muscle endurance, than training with the same load between sets as done in the exercise. constant load system. As stated by Baechle & Groves (1999) that exercise with increasing intensity has the advantage of optimizing the muscle contraction system.

Fox (1988) states that progressive weight training is effective for developing muscle strength and endurance. Physiologically, training on the pyramid system, light intensity exercise in the first set does not involve all muscle fibers to work, then moderate or heavy loads in the second or third set will involve more muscles that have not worked in the first set. The results of this study clarify the statement of Bompa & Half (2009) that to improve various physical elements such as strength, power and muscle endurance, effective weight training uses a progressive load system, which starts from light weights to increase muscle endurance, medium loads to train power and endurance. heavy weights to train muscle strength.

CONCLUSION

Based on the results of research and discussion in this study, the following conclusions can be drawn:

1. Weight training using progressive weight training methods and constant weight training methods given for 8 weeks with a frequency of 3 times per week, with loads between 60 to 80% of maximum ability, with repetitions between 8 to 12 times per set can be done by football athletes during competition, because both methods can increase muscle strength, and can also increase explosive power, running speed and muscle endurance.
2. If the training period before entering the competition is relatively short, for example only 3-4 months, the progressive weight training method is more recommended to be a feasible weight training method because weight training with the progressive weight method is more effective in increasing muscle strength, explosive power, and power. muscle endurance when compared to the constant weight training method, and vice versa if the preparation period for the football team is relatively long, for example 6 to 12 months or more, you can use the constant weight training method to prepare athletes for competition.

Reference

Allerge, LM, Jimenez, F., GonzaloOrden, JM, Acero, RM, & Aguado, X. (2006). Effects of dynamic resistance training on fascicle length and isometric strength. Journal of Sport Sciences. Vol. 26 (5). pp. 501508.

Baechle, TR, & Earle, RW (2008). Essentials of strength training and conditioning. Champaign: Human Kinetics.

Baechle, TR, & Groves, BR (1997). Weight training: Steps to success. Translation of Weight Training by: Razi Siregar. Jakarta: PT. King Grafindo Persada.

Bompa, TO (1993). Periodization of strength. New wave in strength training. Toronto: Veritas Publishing Inc.

Bompa, TO (1994). Theory and methodology of training: The key to athletics performance. Dubuque: Kendal/ Hunt Publishing Company.

Bompa, TOand Half, GG (2009. Periodization, theory and methodology of training. 4th ed. Dubuque: Kendall/ Hunt Publishing Company.

Coerver, W. (1985). The ideal football player coaching program. Jakarta: PT. grammar.

Dewanto, Tarmudji & Tarsis. (1995). Statistical method. Yogyakarta: Liberty.

Dreger, RW (2006). Strength training consideration for youth. Edmonton, Alberta: The Northern Alberta Institute of Technology.

Faigembaum, A., Zalchkowsky, L., Westcott, W., Michell, L., & Fehlandt, A. (1993). The effects of a twice per week strength training program on children. pediatrician. Exer. science. Vol.5, pp. 339346.

Fox, EL (1984). Human physiology. 4thed. Lowa Wm. Brown Publishing Company.

Fox EL, Bowers RW, & Foss, ML. (1988). The physiologicalcal basis of physical education and athletics. USA: WB Saunders Company.

Kraemer WJ (1997). "A Series of studies: The physiological basis for strength training in american football: Fact over philosophy". Journal Strength Condition Res. Vol.11, pp. 131-142.

Luxbacher, J.A. (2011). Soccer. Jakarta: PT Grafindo Persada

Maran, Ruth and Parmar Mindy. (2005). Illustrated weight training. Boston: www. Maran.com.

Nurgiyantoro, B., Gunawan & Marzuki. (2002). Applied statistics for social science research. Yogyakarta: Gajahmada University Press.

Ostrowski, KJ, Wilson GJ, & Weatherby, R. (1997). The effect of weight training volume on hormonal output and muscular size and function. Journal Strength Cond. res. Vol.11, pp. 148154.

Pat R, Mc. Clenaghan B., & Rotella R. (1984). Scientific foundation of coaching. Philadelphia: Saunders College Publishing.

Sanborn K., Boros R., & Hruby J. (2000). Performance effeccts of weight training with multiple sets not to failure versus a single set to failure in women. J. Strength Cond Res. Vol. 14(2), pp. 328331.

Scheunemann, T. (2012). Indonesian football curriculum & basic guidelines. Jakarta: PSSI.

Somantri, A., & Muhidin, SS (2006). Application of statistics in research. Bandung: CV. Faithful Library.

Sumosardjuno, S. (1994). Practical knowledge of health in sports. Jakarta: PT. grammar.

Surakka, J. (2005). PowerType Strength Training in Middle-Aged Men and Women. Academic Dissertation. Turkey, Finland. Publications of the National Public Health Institute.

Umar, H. (1999). Research method for thesis and business thesis. Print 2. Jakarta: PT. King Grafindo Persada