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Eight weeks of different resistance training modes on big muscle hypertrophy of adolescents

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Abstract

To investigate the eight weeks of different resistance training modes on big muscle hypertrophy of adolescents. Eighty physically active and interested students (N=80) were randomly selected as subjects and their age ranged between 14 and 17 years. The selected subjects were randomly divided into four equal groups with twenty subjects each (N=20). Group I was engaged with progressive resistance training (PRG), group II was given fluctuated resistance training (FRG), group III was given regressive resistance training (RRG) and group IV acted as control (CG). The experimental groups underwent their respective experimental programme for eight weeks 3 days per week and a session on each day. Control group was not involved with any specific training in addition to their activities. Thigh girth was taken as variable for this investigation. The pre and post test were conducted one day before and after the experimental treatment. Analysis of covariance (ANCOVA) was used to analyse the collected data. Scheffe's test was applied as a post hoe test to determine which of the paired mean difference significantly. The results revealed that progressive, fluctuated and regressive resistance training (PRG, FRG and RRG) produced significant difference ($p \leq 0.05$) on explosive power as compared to control group (CG). There was also significant difference ($P \leq 0.05$) between progressive and regressive resistance training groups (PRG & RRG) and fluctuated and regressive resistance training groups (FRG & RRG).

Keywords: Progressive resistance, Fluctuated resistance, Regressive resistance, Muscle hypertrophy

Introduction

Resistance training plays a key role in conditioning athletes for the specific strength and conditioning demands of different sports. It has been become the most widely accepted method for improving muscular strength and power (Kraemer & Ratamess, 2004). Youth sports have become more popular and in many ways, more competitive. Many young athletes and parents are seeking way to achieve a competitive edge. They are bombarded with confusing and very often, conflicting information regarding the efficiency of youth strength training and the development of big muscles (Vasilios *et al*., 2007). Many precious studies have explored the effect of different resistance training frequencies on developing muscle strength and size of adolescents (American college of sports medicine, 2000).While the literature supports the efficiency of resistance training (Ramsay *et al*., 1990 and Sewall & Mischeli, 1986) two or three times per week. Resistance training may be isotonic in design. This means that some part of the body is moving against some type of force.

Different modes of resistance training helps to increase the size of every muscle group making it a time consuming and enervating pursuit .The enlargement of muscle size is known as hypertrophy and is the predominant aim of many sporting activities like many athletic events. Athletes that can benefit from a phase of hypertrophy training include shot putters, rugby players, heavyweight wrestlers and linemen in football. The point of maximal thigh circumference is the thigh girth (Johnson & Nelson, 1982). The muscle through use becomes stronger and bigger. Participation in resistance training will improve the strength and size of the muscle in thigh and other parts of the body (Shea, 1966).

Methods

The purpose of the study was investigated the eight weeks of different resistance training modes on big muscle hypertrophy of adolescents. Eighty (N=80) physically active and interested high school students of Abraham Marthoma Memorial High School, Othara, Pathanamthitta (Dist), Kerala, India were selected as subjects and the age of students were between 14 and 17 years. The selected subjects were randomly divided into four equal groups of twenty subjects each (N=20). The groups were three experimental and one control. During the training period, the experimental groups underwent their respective training programmes apart from their curriculum. Group I have given progressive resistance training (PRG), group II underwent fluctuated resistance training (FRG), group III was engaged with regressive resistance training (RRG) for three days per week for eight weeks. The duration of training section in all days was approximately two hours. Group IV acted as control (CG), who did not participate in any specific training. Explosive power was selected as independent variable for this study. Explosive power was assessed by using standing broad jump. All the subjects of the training groups initially performed thorough warming up exercises. Before the commencement of the experimentation, the investigation recorded 1RM for all the three experimental groups taking each subject separately. The experimental groups I, II and III performed the resistance training at different velocity. The volume and load was calculated through the number of sets, repetition and intensity used for each exercise and it was measured in kilograms. The intensity ranged from 65 to 100 percentages. In this study 5% of intensity was increased for every week for progressive resistance training group (RRG), in fluctuated resistance training (FRG) the intensity was increased and decreased of 5% in every alternative week and for the regressive resistance training (RRT) 5% of intensity was gradually decreased in every week over the training period. Thigh girth was taken as a big muscle hypertrophy variable of this study and assessed by using a flexible tape. The percentage of volume and velocity for progressive, fluctuated and regressive resistance training groups presented in table I.

Table I. Percentage of volume and intensity of training for experimental groups

Groups	Components	Weeks							
		I	II	III	IV	V	VI	VII	VIII
Progressive resistance	Intensity	65	70	75	80	85	90	95	100
	Repetitions	12 to 14	10 to 12	8 to 10	6 to 8	4 to 6	2 to 4	1 to 2	1
	Sets	2	2	2	2	3	3	3	3
Fluctuated resistance	Intensity	70	65	80	75	90	85	100	95
	Repetitions	10 to 12	12 to 14	6 to 8	8 to 10	2 to 4	4 to 6	1	1 to 2
	Sets	2	2	2	2	3	3	3	3
Regressive resistance	Intensity	100	95	90	85	80	75	70	65
	Repetitions	1	1 to 2	2 to 4	4 to 6	6 to 8	8 to 10	10 to 12	12 to 14
	Sets	2	2	2	2	3	3	3	3

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Data analysis

Mean and standard deviation were calculated for thigh girth for each training group. And the data were analyzed by using analysis of covariance (ANCOVA). If the 'F' value was found to be significant for adjusted post-test mean, Scheffe's test was used as post hoc test to determine the significant difference between the paired mean. All analysis was carried out using SPSS version (Field, 2000) and statistical significance was set to priority at $p<0.05$.

Results

Table II. Analysis of covariance for Thigh girth of experimental groups and control group

Adjusted Post Test Mean				SOV	SS	df	MS	F
PRG	FRG	RRG	CG					
49.26	49.02	48.56	47.81	BG	23.32	3	7.77	48.12*
				WG	12.12	75	0.16	

*Significant F = (df 3, 75) (0.05) = 2.74, ($p \leq 0.05$)

From the table II, the adjusted post test mean values of thigh girth for progressive, fluctuated and regressive resistance training groups and control group are 49.26, 49.02, 48.56 and 47.81 respectively. The obtained 'F' value of 48.12 for adjusted post test mean is higher than the table value of 2.74 for df 3 and 75 required for significance at 0.05 level of confidence. Hence there exist significant difference in stride length among the experimental groups and control group. Since, four groups were compared, whenever obtained 'F 'value for adjust post test was found to be significant, Scheff's test was used to fount out the paired mean difference and it was present in table III.

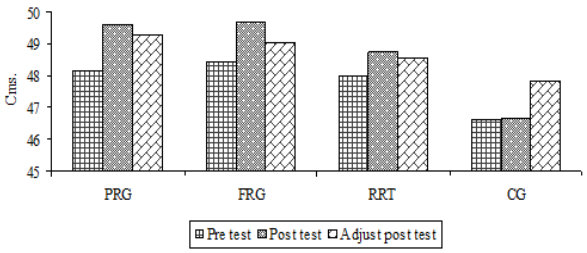
Table III. Scheffe's post hoc test for the difference between paired mean on Thigh girth

Adjusted Post Test Mean				MD	CI
PRG	FRG	RRG	CG		
49.26	49.02	-	-	0.24	0.36
49.26	-	48.56	-	0.70*	
49.26	-	-	47.81	0.45*	
-	49.02	48.56	-	0.46*	
-	49.02	-	47.81	1.21*	
-	-	48.56	47.81	0.75*	

* Significant, ($p \leq 0.05$)

Table III showed that the adjusted post test mean difference on thigh girth between progressive resistance training group and control group, fluctuated resistance training group and control group and regressive resistance training group and control group are o.70, 0.45, 0.46, 1.21 and 0.75 respectively. These values are higher than the required confidence interval value of 0.36, which shows significant difference at 0.05 level of confidence. The results of the study showed that there was a significant difference between experimental groups and control group. There was also significant difference between progressive and regressive resistance training groups and fluctuated and regressive resistance training groups. The pre, post and adjust post test mean values of experimental groups and control group on thigh girth were graphically represented in the figure 1.

Fig. 1: The pre, post and adjust post test mean values of experimental groups and control group on Thigh Girth



Discussion

Simple anthropometric variable such as thigh girth showed quite clearly that there was a significant difference due to different resistance training protocols. Many research studies revealed that the use of different training loads elicits different training adaptations and further it indicate that it also includes the volume specific adaptations in muscle hypertrophy. Bidwell *et al.* (1996) and Taaffee *et al.* (1996) pointed out that resistance is best for increasing the girth of thigh muscles. Faigenbaum *et al.* (1999) stated that resistance training is effective in enhancing the lower body strength and size. Teixeira *et al.*, (2001) pointed out that resistance training three times per week is an effective as five times per week for improving physical performance. The various training components (E.g. sets, repetitions, rest, intervals) could be manipulated the training loads used from the most important factor that determine the training stimuli and the consequent training adaptations (Myer *et al.*, 2006, Jones *et al.*,2001). Macaluso & Vito (2004) conducted a study on the effect of varying resistance training loads on intermediate and high velocity specific adaptations and concluded that heavier training loads increases 1RM strength in the lower bodies of resistance trained athletes. Christou (2006), Losnegard *et al.* (2010) and Kraemer *et al.* (2004) stated that different resistance training helps to improve the size of muscles. The reason may be due to increase in fiber diameter, number and size of the myofibrils, especially in the myosin filaments and capillary density per fiber. From the results of the present study and literature, it is concluded that the dependent variables such as thigh girth was significantly increased due to the influence of progressive, fluctuated and regressive resistance training

Conclusion

The hypertrophic variable such as thigh girth was significant difference occurred between progressive resistance training group and control group, fluctuated resistance training group and control group and regressive resistance training and control group. These was also significant difference between progressive and regressive resistance training groups and fluctuated and regressive resistance training groups for thigh girth ,in which the progressive resistance training is the top , followed by fluctuated resistance training and

regressive resistance training . It is calculated that the PRG performed best for thigh girth as compared to control group.

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