

To Study the Effect of Resistance Training and Plyometric Training on Explosive Strength of College Students

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ABSTRACT

In this present study efforts were made to determine the effect of resistance training and combined resistance and plyometric training on leg explosive strength. To achieve this five interested students (N=45) were selected as subject and their age group ranged between 17 and 21 years. The subjects were categorized into three groups randomly. Group I resistance training group (RTG), group II resistance with plyometric training group (RPTG) group III control group (CG) and each group had thirteen (N=15) subjects. Both experimental groups underwent their respective experimental treatment for eight weeks, 3 days a week and a session on each day. Control group was not exposed to any specific training programme. Leg explosive strength was selected as dependent variable for this study. The collected data was analysed using analysis of covariance (ANCOVA) and Scheffe's test was applied as a post hoc test to determine which of the paired mean difference significantly. The result of the study revealed that both training such as resistance (RTG) and combined resistance and plyometric training (RPTG) produced significant improvement on leg explosive strength ($p \leq 0.05$) as compared to control group (CG).

Keywords:- Resistance training. Plyometric training. Leg explosive strength.

INTRODUCTION

Training is a basic preparation for better performance through exercise. The order of exercise within a resistance training session is an important factor when establishing a resistance training programme (Fleck & Kraemer, 1997). Resistance training programme is act as an integral part of a total strength and conditioning programme for the enhancement of athletic programme and also prescribed by major health organizations, recreational and clinical communities for improving health, fitness and also in rehabilitation. (ACSM 2002). It is a program of exercise designed to improve the skills and increase the energy capacities of an athlete for a particular event (Fox, 1984). It is nothing but weight training. In resistance training load refers to the mass or amount of weight utilized for specific exercise. It is an anaerobic form of exercise (Teng et al., 2008). The percentage of one repetition maximum (1RM) method was used in this training programme. It is the maximum load that can be lifted successfully one time through the full range of movement (Fielding et al., 2002). An athlete becomes capable of high levels of performance; the overall volume of training becomes more important. Resistance training is performing with weight, either free weight, the weight on a gymnasium machine or own body weight.

Plyometrics is a type of exercise training designed to procedure fast, powerful movement and improve the functions of the nervous system, generally for the purpose of improving performance in sports-plyometric movements, which a muscle is loaded and then contracted in rapid sequence, use the strength, elasticity and innervations of muscles and surrounding tissue to jump higher and run faster, depending on the desired training goal (Brooks, 1996 & Goran, 2007). This training involves and uses, practicing plyometric movement to toughen tissues and train nerve cells to stimulate a specific pattern of muscle contraction, so the muscles generates as strong a contraction as possible in the shortest amount of time (Chu, 1998). A plyometric contraction involves first a rapid muscle lengthening movement (eccentric phase), followed by a short resting phase (amortization phase) an explosive muscle shortening movement (concentric phase), which enables muscles to work together in doing in doing the particular motion (Andrew, 2010) explosive strength is the ability of the neuromuscular system to overcome resistance with high speed of contraction where the skeletal lever system accept and expels at a high velocity via., a coordination of motor units, reflexes, elastic component and contractile component of the muscles (Dick,

1978). Explosive strength is the ability to expand energy in one explosive act or in a series of strong movement in jumping (Dodd, 2007). Plyometric training helps to develop the contractile protein that gives the muscle pulling power (Edwin et al. 2000). The jumpers need great leg strength and power while jumping; the explosive strength mainly depends upon one's leg strength. Strength training is help to improve the strength and power that will help to achieve leg explosive strength.

MATERIALS AND METHOD

To achieve this, forty five (N=45) physically active student from Faculty of Arts of Sahu Jain College, Najibabad were randomly selected as subject and their age ranged between 18 to 23 years. The subject are categorized into three group randomly: Group I resistance training group (RTG), group II resistance and plyometric training group (RPTG) group III control group (CG) and each group had fifteen (N=15) subject. Explosive strength was selected as variable for this study. The explosive strength data was measured by using standing vertical jump. Control group was not exposed to any training. Group I (RTG) underwent their weight training for 8 weeks and II (RPTG) group underwent resistance training and plyometric training for alternate days for 8 weeks, 3 days per week and a session on each day. Both group initially performed thorough warming up exercise. Before the experimentation, the investigator recorded 1RM for all the two group taking each subject separately. After that I group performed the following exercise 1 bench press 2. half squat 3. Push press 4. Heel raise 5. Arm curl 6. Leg curl 7. Leg press 8. Military press 9. Sit ups 10. Medicine ball exercises. The intensity ranged from 60 % to 90 % of 1 RM. The II group performed weight with moderate intensity 1. Drop jump 2 truck jump 3. Split jump 4. Medicine ball exercise. 5 bounding 6. Single leg hop (alternate leg) 7 hurdle drills. These exercise were performed for 90 minutes in a day. Data were collected one day before and after the experiment.

Table I_ Percentage of intensity of resistance training for experimental groups

Group	Components	I	II	III	IV	V	VI	VII	VIII
		Intenstiy	60	60	70	70	80	80	90
Strenght Training	Repetitions	8to 10	8 to 10	6 to 8	6 to 8	4 to 6	4 to 6	2to 4	2 to 4
	Sets	2	2	2	2	3	3	3	3

Data Analysis

Mean and standard deviation were calculated for leg explosive strength for each training group. And the data were analyzed using analysis of covariance (ANCOVA). If the 'F' value was found to be significant for adjusting 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 was set to priority at $p < 0.05$.

Table II. Analysis of convariance for Leg Explosive Strenght of Experimental Group and Control Group Leg Explosive Strenght

Test	RTG	RPTG	CG	SOV	SS	df	MS	F
Pre-test	37.89	38.14	37.69	BG	1.55	2	0.77	
Mean	2.25	2.39	2.39	WG	223.34	42	5.32	0.15
S.D(+)	2.25	2.28	2.25	B.G	505.21	2	252.60	39.43*
Pre-test								
Mean	44.30	46.21	38.34	BG	505.21	2	252.60	
S.D(+)	2.79	2.86	1.81	WG	269.07	42	6.41	0.15
Adjusted								
Post-test								
Mean	44.30	46.24	38.31	BG	509.64	2	254.82	

Significant F= (df2,42) (0.05)=3.22 & (df2,41) (0.05)=3.225; (p 0.05)

Table III. Scheffe's Post hoc Test for The Difference between Paired Mean on Leg Explosive Strenght

RTG	RPTG	CG	MD	CI
44.30	46.24		1.94	
44.30		38.31	5.99*	2.36

46.24	38.31	7.93*
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*Significant, p 0.05.

The analysis of covariance on leg explosive strength of the pre, post and adjusted post mean scores of resistance training group, combined resistance and plyometric training group and control group have been analysed and presented in Table II. The above table indicates that the pre and post test mean and standard deviation of experimental and control groups on leg explosive power. The obtained 'F' value for pre test mean agility was 0.15, which was lesser than table value of 3.22 at 0.05 level of confidence; hence there was no significant difference in pre test data of experimental and control group. The analysis of post and adjusted post test mean data reveals that 'F' value of 39.43 and 39.50 respectively, which were higher than table value 3.22 and 3.225 at 0.05 level of confidence; hence there exist difference in leg explosive power among the experimental and control group. Since, three group were compared, whenever obtained 'F' ration for adjusted post test was found be significant, the Scheffe's test was used to found out the paired mean difference and it was presented it Table III.

Table III indicates that adjusted post test difference of leg explosive power between resistance training group and control group and combined resistance and plyometric training group and control group 5.99 and 7.93 respectively , which are higher than the confidence interval value of 2.36 . It is inferred that the eight weeks of resistance training and combined resistance and plyometric training have significantly increased the leg explosive power as compared to control group. The result of the study showed that there was a significant difference between experimental groups and control group and insignificant difference between two experimental groups .The pre ,post and adjusted post mean values of experimental group on leg explosive power was graphically represented in the Figure 1.

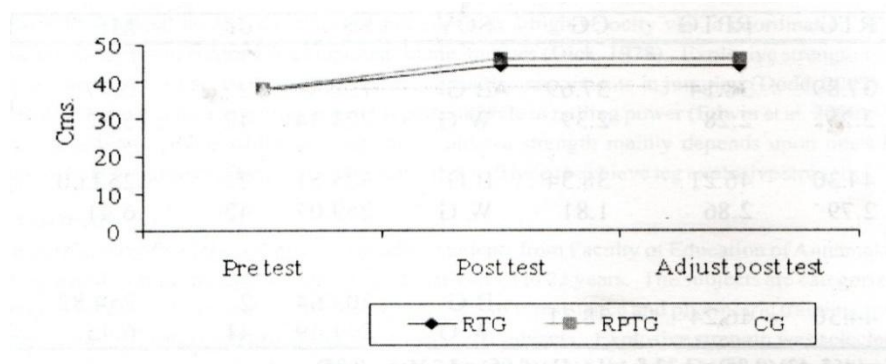


Figure 1: The pre, post and adjust post test mean values of experimental group and control group on Explosive Strength

DISCUSSION

The current study utilized 8-weeks programme duration with three session per week and found that both resistance and polymeric elicited an increase in leg explosive strength. The analysis of the data reveals that there was a significant diffennce in adjusted post test mean among the groups explosive strength. Several studies suggested that plymetric training is very valuable for determining the variables such as explosive strength (Compo et al., 2009, Jensen et al., 2007&Andrew et al.,2010). These results concur with previous studies (utilising training duration between 4to 24 week and various session frequencies), which found plyometric training with the support if weights to improve explosive strength performance (Riadh, 2010, Futures et al., 2000&Gomez et al., 2008). Explosive strength training is used to improve strength training is used to increase the speed or force of muscular contractions, providing explosiveness for a variety of sport specific activities. Vertical jump is improved through explosive strength training with the support of weight (Markovic, 2007). Matavulj et a. (2001) found that plyometrictraining entended jumped performance and running velocity in prepubertal boys. However, plyometric training is not intended to be stand –alone excercise program (Bompa, 2000; Chu et al, 2006). As previously observed in adults, singnificantly greater ganins in performance may be observed when plyometric training is combined with resistance (Adams et al., 1992& Fatouros et al., 2000). Hence, it is recommended that systematic desistance training and resstance with plyometric training helps to improve explsive strength.

CONCLUSION

Research suggests tat resistance is aat least eqally effective, and in some casis superion, when compared to other froms of combined weight abd plyoetric training as evidenced vertical jump in response to a chronice complex training and plymetric conditions . Finally, these data demonstrate a possible relationship between resistance and plymetric performance

in the complex suggesting that this training strategy may best be suited for more highly trained individuals RM loads in the weight training portion of the complex. Any practical application requires careful implementation and individual experimentation. The combined that there was significant improvement on left explosive strength due to eight weeks of resistance and combined resistance and plyometric training. From the result, we recommend that resistance with plyometric training is the best method to improve leg explosive strength.

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