EFFECT OF SHORT-TERM PLYOMETRIC TRAINING ON STRENGTH PERFORMANCE OF THE ATHLETES

(**Received on**: 10 August 2013, **Reviewed on**: 26 September 2013 and **Accepted on**: 09 October 2013)

Dr. Subhabrata Kar, Assistant Professor,
Union Christian Training College, Berhampore,
Murshidabadm, W.B.

Abstract

The golden rule of any conditioning program is specificity. This means that the movement you perform in training should match, as closely as possible, the movements encountered during competition. Plyometric exercises combine speed movements with strength exercises to increase power. One can frame plyometric exercises for improvement of power of shoulder, chest and arm muscles and at the same time to improve the speed of the movement. The example of a reduced intensity plyometric exercises are medicine ball chest throw and clap push ups. In the present study two types of exercise treatment, such as Medicine ball chest throw and Clap push ups was introduced to male college students (22-25 yrs. Age gr.) for 4 weeks with their usual physical activities of Bachelor of Physical Education Course (B.P.Ed.). The treatment was given for 4 days per week and 30 min. per day. Before treatment Pre test for arm and shoulder explosive strength was measures for all subjects. According to post test data, the control group showed no improvement in explosive strength performance, extremely significant improvement was shown by Experiment Gr. No.-1 or EG1 (Treated with Medicine ball chest throw) and also significant improvement was found for EG2 (Treated with Clap push ups).

Keywords: Plyometric Exercise, Training, Strength and Performance

Introduction

Speed and strength are integral components of fitness found in varying degrees in virtually all athletic movements. The combination of speed and strength is called power. For many years, coaches and athletes have sought to improve power in order to enhance performance. Throughout this century and no doubt long before, jumping, bounding and hopping exercises have been used in various ways to enhance athletic performance. In recent years, this distinct method of training for power or explosiveness has been termed plyometrics. Whatever the origins of the word the term is used to describe the method of training that seeks to enhance the explosive reaction of the individual through powerful muscular contractions because of rapid eccentric contractions. The golden rule of any conditioning program is specificity. This means that the movement you perform in training should match, as closely as possible, the movements encountered during competition. If you are rugby player, practicing for the line out or a volleyball player interested in increasing vertical jump height, then drop jumping or box jumping may be the right exercise. However if you are a javelin thrower aiming for a more explosive launch, then upper body plyometrics is far more appropriate. In order for plyometric training to be at its most effective it should follow a phase of maximal strength training. The purpose of plyometrics is to improve the athlete's capacity to apply more force more rapidly. Logically then, the greater the athletes ability to generate maximal force or strength to begin with, the more of it can be converted into sport-specific power. Chelly et al.(2001) suggested that the power that an individual can develop depends on both force and velocity, as determined by friction-loaded ergometers. How do plyometrics work? Think of muscles as springs. Every time you punch or kick, muscles coil and then spring back to their normal length. One reason they spring back is because they contract volitionally. Part of force generated, however comes from what scientists call the stretch reflex. Further force is supplied from natural elasticity of muscle and connective tissues. The stretch reflex and elastic components of force are not volitional, that is, they occur involuntarily. Though plyometric training, these involuntary sources of force can generate even greater volitional strength and speed. De Villarreal et al (2008) noted significant decreases in 20-m sprint time and jump height (CMJ and drop jump) if a 7-week plyometric training program was followed by 7 weeks of detraining. Plyometric exercises combine speed movements with strength exercises to increase power. Most of the exercises involve jumping movements, so use caution if you have any knee or ankle injuries. One can frame plyometric exercises for improvement of power of shoulder, chest and arm muscles and at the same time to improve the speed of the movement. The example of a reduced intensity plyometric exercises are medicine ball chest throw and clap push ups.

Methodology

Subjects**:** 45 male Bachelor of Physical Education students from Union Christian Training College, Berhampore, Murshidabad, W.B., India of age group 22-25 years were selected for the study. All 45 subjects were randomly divided into three groups and each group was consisted with 15 human subjects. Among three groups, one was Control group (CG) and other two groups were Experimental groups, such as EG1 and EG2.

Group Design**:** All three groups were first of all tested for arm and shoulder explosive strength by putting the shot (16pounds). Here standing put was allowed. After that EG1 was treated with 4 weeks of Medicine ball (4kg) chest throw exercise (MBCT) and EG2 was treated with 4 weeks of Clap Pushups exercise (CPU). Both exercises were performed for 4 weeks, 4 days per week and 30 min. per day with other usual physical activities. Before exercise 15 minutes of warm up was mandatory for the subjects. It is to mention that all the groups were continuing their usual physical activity classes in treatment days. After 4 weeks of treatment all 45 subjects were tested for arm and shoulder explosive strength by putting the shot.

Statistical Technique**:** For analysis of pre-test and post test data of three groups paired sample t-test was conducted to compare between two separate means.

Treatment Procedure**:**

Medicine ball Chest Throw (MBCT): The subject had to stand facing partner throwing distance apart with one foot forward. The first person held the medicine ball with both hands against chest. Partner had arms in front ready to receive ball. The first person threw medicine ball to partner's chest by forcefully extending both arms forward. Partner caught the ball in front of chest with both hands, recoils ball toward chest, and immediately throws ball back to first person in same manner. The first person caught the ball and repeats volley. They continued to throw ball back and forth. The whole exercise was done with optimum number (minimum of 20 Nos.) of repetitions by each subject. Between two sets of exercise proper interval time was allowed. Usually, 1 min. exercise repetition was followed by 1 min. of rest interval.

Clap Push-ups (CPU): The exercise was done by following method:

The subject had to lie on floor face down and positioned hands on floor. With toes on floor they had to push body up with arms extended and body straight. Then they had to lower body to floor and immediately pushed body up as fast as possible. As the hands leave ground rapidly the subject had to clap hands together and to place back to original position, catching body before it fell. That process was repeated for 1 min. The subject had to keep hips and waist straight. After 1 min. of repetition, 2 min. of rest interval was allowed between two sets of repetitions.

Results and Analysis

The paired samples statistics for three groups such as, CG, EG1 and EG2 are presented in Table No.1. Pre and post test means of three groups are also presented in Fig. No.-1. Table N0.-2 shows the paired samples 't' test for control group, and Table No.3 & 4 show the same test result for EG1 and EG2 respectively. Fig. No.-2, 3 and 4 show the pre and post test performance of three groups.

Table No. 1
PAIRED SAMPLES STATISTICS OF THREE GROUPS

		Mean	S.D.	SEM
CG	Pre	7.9007	1.0288	0.2656
	Post	7.8867	1.0327	0.2667
EG1	Pre	7.6280	1.2242	0.3161
	Post	7.7053	1.2267	0.3167
EG2	Pre	7.8207	0.9297	0.2401
	Post	8.0273	0.9650	0.2492

TABLE NO.2
PAIRED SAMPLES 'T' TEST FOR CG

Paired Differences				
Mean	SED	95% Confidence Int. of the Diff.		't' ratio
		Lower	Upper	
0.0140	0.018	-0.0253	0.0533	0.7648

TABLE NO. 3
PAIRED SAMPLES 'T' TEST FOR EG1

Paired Differences				
Mean	SED	95% Confidence Int. of the Diff.		't' ratio
		Lower	Upper	
-0.0773	0.016	-0.1112	-0.0435	4.9006

TABLE NO.4
PAIRED SAMPLES 'T' TEST FOR EG2

Paired Differences				
Mean	SED	95% Confidence Int. of the Diff.		't' ratio
		Lower	Upper	
-0.2067	0.073	-0.3640	-0.0493	2.8172

According to Table No.-2, since calculated 't' for CG is lesser than tabulated't' at 0.05 levels. It may be concluded that the control group showed no significant improvement in putting the shot performance after 4 week. At the same time, Table No.-3 showed that calculated't' value is significant at 0.001 level, which indicated that 4 weeks of MBCT exercise had extremely

significant effect on explosive strength performance of the subjects (EG1). 4 weeks of CPU exercise had also some impact on explosive strength performance of EG2, but calculated't' was found significant at 0.05 only (Table No.-4). So, it may be concluded that MBCT exercise showed greater impact on arm and shoulder explosive strength performance than CPU exercise. Carter et al. (2007) concluded that 8 week course of high volume upper extremity plyometric training showed a significant improvement in baseball throwing velocity. Lachowetz et al. (1998) also reported significant improvement in throwing velocity after 8 weeks of generalized strength training routine in a group of collegiate baseball players. Present study is very much consistent with those studies and also tried to find out some specific plyometric exercises for upper extremities. Carter et al. (2007) again suggested that high volume upper extremity plyometric training can significantly improve throwing velocity and some measures of iso-kinetic strength. Bak et al.(1997) & Swanik et al.(2002) suggested that plyometric training protocols have resulted in increases in rate of torque development (power) and proprioceptive factors. Present study indicates that power of arm and shoulder can be improved through 4 weeks of plyometric exercises with other usual physical exercises.

Conclusion

Four weeks of short-term plyometric exercise significantly affects the explosive strength performance of the athletes.

Exercise should be framed according to the movement of the sports activities, i.e. the movement one have to perform in training should match, as closely as possible, the movements encountered during competition. Therefore, specificity of exercise should be the most important criteria while selecting the strength training means.

Medicine ball chest throw (MBCT) exercise may have greater influence on explosive strength performance over exercise by Clap push ups.

References

Bak, K., and S. Magnusson (1997) Shoulder strength and range of motion in symptomatic and pain-free elite swimmers. Am. J. Sports Med. 25:454–459.

Carter, A. B., Kaminsk, T.W., Al T. Douex Jr, Knight C. A., And Richards, J.G.(2007) Journal of Strength And Conditioning Research, 21(1), 208–215.

Chelly,MS,Cherif, N, BenAmar,M,Hermassi, S, Fathloun,M,Bouhlel,E, Tabka, Z, and Shephard, R.(2010) Relationships of peak leg power, 1-RM half back squat and leg muscle volume to 5-m sprint of junior soccer players, J Strength Cond Res 24: 266–271.

Chelly,M.S., Fathloun, M., Cherif, N, Ben Amar, M, Tabka, Z, and Van Praagh,(2009) E. Effects of aback squat training program on leg power, jump- and sprint performances in junior soccer players. J Strength Cond Res 23: 2241–2249.

Chelly, SM and Denis, C. (2001) Leg power and hopping stiffness: Relationship with sprint running performance. Med Sci Sports Exerc 33: 326–333.

De Villarreal, E.S., Gonza´lez-Badillo, J.J., and Izquierdo, M. (2008) Low and moderate plyometric training produces greater jumping and sprinting gains compared with high frequency. J Strength Cond Res 22: 715–725.

De Villarreal and E.S., Kellis, E, Kraemer, W.J., and Izquierdo, M. (2009) Determining variables of plyometric training for improving vertical jump height performance: A meta-analysis. J Strength Cond Res 23: 495–506.

Lachowetz, T., J. Evon, And J. Pastiglione.(1998) The effect of an upper body strength program on intercollegiate baseball throwing velocity. J.Strength Cond. Res. 12:116–119.

Swanik, K.A., S. Lephart, C. Swanik, S. Lephart, D. (2002) Stone, And F. Fu. The effects of shoulder plyometric training on proprioception and selected muscle performance characteristics. Journal Shoulder Elbow Surg. 11: 579–586.