E-ISSN: 2707-7020
P-ISSN: 2707-7012
JSSN 2020; 1(2): 37-39
Received: 25-05-2020
Accepted: 29-06-2020

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A comparative study of effect of sand and land plyometric training on speed and explosive power among basketball players

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Abstract
The aim of the present study was to compare the effects of 2 different training protocols—Sand and Land Plyometric training on vertical jump and speed among basketball players. Thirty- subjects were randomly assigned between 18 and 21 years of age volunteered as participants to 1 of 3 groups: Sand Plyometric training group (n = 10), Land Plyometric training group (n = 10), and control group (n = 10). 12 weeks of training, 3 days a week was employed on the subjects and Pre & post test on vertical jump and speed was administered. Data were analyzed by analysis of co-variance (ANCOVA). Schiff's test was used as a post hoc test to determine which of the paired mean differ significantly. Results showed that all training treatments elicited significant ($p < 0.05$) improvement in all tested variables. However, the Sand Plyometric training group produced improvements in vertical jump performance and leg strength that were significantly greater performance in compare with the land and control group. This study provides support for the use of a traditional and plyometric drills to improve vertical jumping ability and explosive performance in general.

Keywords: plyometric training, sand, land, speed, explosive power and basketball players

Introduction

Plyometrics is a type of exercise training that uses speed and force of different movements to build muscle power. Plyometrics training can improve your physical performance and ability to do different activities. Plyometrics can include different types of exercises, like pushups, throwing, running, jumping, and kicking. Athletes often use plyometrics as part of their training, but anyone can do these workouts. People who are in physical rehab after an accident or injury use plyometrics to get back into good shape and physical function. If you're in good shape and looking to ramp up your workout, you may enjoy the challenge of plyometrics. It's a great way to train if you're into high-impact sports that involve a lot of running or jumping, like tennis, skiing, or basketball.

When you're getting started, work with an experienced trainer who can show you how to safely jump and land. Start slow and low. Mix a few plyometric moves into your regular workout. Because plyometrics is high-impact and intense exercise, check with your doctor first if you aren't active now or if you have any health problems. Plyometrics isn't the workout for you if you don't like to sweat or are just looking to strengthen your core.

Plyometric exercise has been in practice for many years, to develop the explosive power of athletes. It is a type of training that develops the ability of muscles to produce force at high speeds (produce power) in dynamic movements; these movements involve a stretch of the muscle immediately followed by an explosive contraction of the muscle. This pattern of muscle contraction is known as the stretch-shorten cycle (SSC) (Norman 1979). Plyometric exercises include vertical jumps, during which the athlete jumps as high as possible ''on the spot,'' and bounds, during which the athlete leaps as high and as far as possible, thus moving the body in the horizontal and vertical planes. It is generally accepted that the more specific training exercises to a competitive movement, the greater the transfer of the training effect to performance. Athletes such as sprinters, who require power for moving in the horizontal plane, engage in bounding plyometric exercises, whereas athletes such as high jumpers and basketball players, who require power to be exerted in the vertical direction, train using vertical jumping exercises (CHU, 1992) [10]. Plyometric is a means of encouraging the muscle to achieve maximal force rapidly and therefore serving to increase explosive-reactive power through a range of motion and is a popular training approach.

Materials and Methods

Subjects

Thirty men basketball players were randomly assigned between 18 and 21 years of age volunteered as participants to 1 of 3 group's, the Mean ± SD: age 18 ± 3 years, height 1.74 ± 0.05m, body mass 73.2 ± 9.26 kg. Actively competing in Anna university volley ball team participated in the current study.

Procedures

The Plyometric training program is designed and is divided into three groups mainly, I Sand Plyometric training (n = 10), group II Land Plyometric training (n = 10), and group III control (n = 10). The Plyometric training box is 40cm height and 80cm with. The land Plyometric box is placed a smooth surface and sand Plyometric box is placed a designed Pit with filtered river sand the size of the pit 3feet length, 3feet Width and 2 feet depth. Subjects in each training group trained 3 days per week. A session and 60 min per day. All subjects continued with their normal Basketball training and games.

Results

Table 1: Analysis of Variance & Covariance of Pre, Post and Adjusted Post Test on Speed

	CG	ATWG	ATWOG	Source of	Sum of df	Mean		F-ratio
				Variance	Squares	Squares		
Pre-Test	7.56	7.56	7.58	BG	0.005	2	0.003	
Means								0.01
SD (±)	0.35	0.38	0.38	WG	8.06	57	0.42	
Post - Test	7.52	6.81	7.27	BG	5.11	2	2.55	
Means								14.28*
SD(±)	0.32	0.46	0.46	WG	10.19	57	0.17	
Adjusted				BG	5.06	2	2.53	
Post - Test	7.52	6.82	7.25					58.73*
Means				WG	2.41	56	0.04	

* * Significant at 0.05 level.

Table 1 shows the pre-test means of CG, SPTG, and LPTG on speed. The F-value needed for significance for df (2, 57) at a < 0.05 level was 3.15. The obtained F-value for the pre-test mean on speed was 0.05 which was not found to be significant. In post test analysis the F-ratio on the speed variable was 14.28. The analysis of covariance adjusted the differences in pre test means with post test means between the Sand and land plyometric training and control groups. The F-value needed for significance for df (2, 56) at a < 0.05 levels was. The F-value obtained from testing the adjusted means between the Sand and land plyometric training and control groups on speed was 58.73 which was statistically significant.

Table 2: Analysis of Variance & Covariance of Pre, Post and Adjusted Post Test on Explosive power

	CG	ATWG	ATWOG	Source of	Sum of	df	Mean	F-ratio
				Variance	Squares		Squares	
Pre-Test	46.20	45.30	45.75	BG	8.10	2	4.05	
Means								0.12
SD (±)	5.75	5.84	5.67	WG	1891.15	57	33.17	
Post - Test	47.40	51.00	48.90	BG	130.80	2	65.40	
Means								1.88
SD(±)	6.13	5.75	5.76	WG	1976.6	57	34.67	
Adjusted				BG	203.89	2	101.94	
Post - Test	46.94	51.45	48.90					160.24*
Means				WG	35.62	56	0.63	

* Significant at 0.05 level.

Table 2 shows that the pre-test means of CG, SPTG, and LPTG on explosive power. The F-value needed for significance for df (2, 57) at a < 0.05 levels was 3.15. The obtained F-value for the pre-test mean on explosive power was 0.12. It was found to not be significant. In post test analysis the F-ratio on the variables such as explosive power was 1.88. The analysis of covariance is adjusting the differences in pre-means with post-test means between the Sand and land plyometric training and control groups. The F-value needed for significance for df (2, 56) at a < 0.05 levels was missing number!. The F-value obtained from testing the adjusted means between the Sand and land plyometric training and control groups on explosive power were 160.24. It was found to be significant.

Discussion

The use of plyometric training has been advocated for several years as a means of improving performance in sports and activities in which lower-body power plays a key role in success (FATOUROS, 2000) [17]. During a plyometric movement, the muscles undergo a very rapid switch from the eccentric phase to the concentric phase. This stretch-shortening cycle decreases the time of the amortization phase that in turn allows for greater than normal power production (POTTEIGER, 1999). The muscles stored elastic energy and stretch reflex response are essentially exploited in this manner, permitting more work to be done by the muscle during the concentric phase of movement (HEDRICK, 1996) [19]. Training programs that have utilized plyometric exercises have been shown to positively affect performance in power- related movements such as jumping (BLATTNER, 1979) [7, 13]. In the present study, improvements were seen in vertical jump height, vertical jump power, and Margaria power, which support these earlier studies. The increases in power following a plyometric training program could be due in part to increases in muscle fiber size. Improvements in muscle force production have been associated with increases in muscle fiber size.

Conclusions

The present study reveals that the 12 weeks of plyometric training in a land and sand environment, sand plyometric training shown significant differences among the three groups with respect to speed, and explosive power measures. It is also concluded that the subjects with sand training group had shown greater improvement comparable to the subjects with land and control groups regard to all the parameters.

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