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Impact of plyometric training with and without weights on elastic strength among football players

Rajesh C. B.[1], George Abraham[2]*

[1]Department of Physical Education, N.S.S College of Engineering, Palakkad, Calicut University, Kerala, India.
[2]Department of Physical Education and Sports Sciences, Annamalai University, Tamil Nadu, India.
Corresponding author: *Dr. George Abraham, Department of Physical Education and Sports Sciences, Annamalai University, Tamil Nadu, India.

Abstract

The purpose of this study was to find out the impact of plyometric training with and without weights on elastic strength among men football players. To achieve this, twenty novice football players (n = 30) were selected as subjects and their age group ranged between 18 and 24 years. The subjects were categorized into three groups randomly. Group I plyometric training with weights (PWG), group II plyometric training (PG), group III control group (CG) and each group comprises of ten subjects (n = 10). Both experimental groups underwent their respective experimental treatment for eight weeks, 3 days per week and a session on each day. Control group did not exposed to any specific training apart from their regular activities. Elastic strength and was taken as criterion variable for this study. The collected data was analysed by using analysis of covariance (ANOVA) and Scheffe's post hoc test. The result revealed that there was a significant difference in elastic strength ($p \leq 0.05$) when compare to control group. This study also found out that plyometric training with weights is the best method to improve elastic strength of men football players.

Keywords: Plyometric training, elastic strength, football players

Introduction

Plyometric exercise involving repeated rapid stretching and contracting of muscles (as by jumping and rebounding) to increase muscle power (www.merriam-webster.com). It is a type of exercise training designed to produce fast, powerful movements and improve the functions of the nervous system, generally for the purpose of improving performance in sports plyometric movements, in 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 (Goran *et al*., 2007). This exercise stimulates several different muscle groups at the same time. Although plyos are generally used to improve athletic performance, they can also be used to improve fat loss, strength and endurance. Plyometric exercises are great for challenging your fast-twitch muscle fibers, coordination and agility. A plyometric contraction involves first a rapid muscle lengthening movement (eccentric phase), followed by a short resting phase (amortization phase), then an explosive muscle shortening movements (concentric phase), which enables muscles to work together in doing the particular motion. This training engages the myotactic reflex, which is the automatic contraction of muscles when their stretch sensory receptors are stimulated (Andrew, 2010). In order to realize the potential benefits of plyometric training the stretch shortening cycle must be involved.

Elastic strength or reactive strength is dependent on the stretch-shortening cycle and is the ability to exert maximal force during a high-speed movement (www science for sport). The use of elastic-resistance training to improve performance has risen in recent years; this training tool has been used in certain sporting environments for decades. Short-duration training programme have been repeatedly shown to improve strength and power in both trained and untrained athletes (www.springer.com/referenceworkentr.

High level le elastic strength requires good coordination and a combination of high speed and strength of muscle action of football players. It is important in explosive activities such as jumping and sprinting. Elastic strength is the ability to exert force quickly and to overcome resistance with a high speed of muscle action. Plyometric training helps to develop the contractile protein that gives the muscle in pulling power (Edwin & Gordon, 2000). Bunny hopping is a jump forward with both legs in a crouched position. The jumpers need great leg strength and power while jumping; the elastic strength mainly depends upon one's leg strength (www.google.co.in/webhp?sourceid).

In this study bunny hop is used as a test to measure the elastic strength and it is improved through plyometric training with the support of weights.

Materials and methods

To achieve this, thirty (*n* = 30) novice men football players of different colleges of Palakkad District, Kerala were randomly selected as subjects and their age ranged between 18 to 24 years. The subjects are categorized into three groups randomly: Group I plyometric training with weights group (PWG), group II plyometric training group (PG), group III control group (CG) and each group had ten (*n* = 10) subjects. Elastic strength was selected as dependent variables for this study. The elastic strength of the subjects was measured by using five bunny hops. Control group was not exposed to any special training. Both experimental groups underwent their respective experimental treatment for 8 weeks, 3 days per week and a session on each day. The subjects were instructed to wear a weight jacket which is filled with sand in 3 kg and 4 kg weights for PWG group and they have given 3 kg weight for first four weeks and increased load of 4 kg for last four weeks. The both groups performed the following plyometric exercises 1. Drop jump; 2. Tuck jump; 3. Split jump; 4. Bounding; 5. Single leg hop (alternative leg); 6. Hurdle jump.

Data Analysis

Mean and standard deviation were calculated for elastic strength for each training group. Analysis of covariance (ANOVA) and Scheffe's post hoc test were used to examine the level of significance. The statistical significance was set to a priority at $p < 0.05$.

Results and discussion

The analysis of covariance on elastic power of the pre and post test mean scores of plyometric training combined with weights group, plyometric training without weights group and control group have been analysed and presented in Table 1.

Table 1: Analysis of Variance (ANOVA) of Elastic Strength for Experimental Groups and Control Group.

Test	PWG	PG	CG	SOV	SS	df	MS	*F*
Pre-test								
Mean	9.46	9.29	9.44	B G	0.19	2	0.06	0.79
S.D (±)	0.32	0.49	0.11	W G	3.24	27	0.12	
Post-test								
Mean	10.85	10.34	9.23	B.G	13.71	2	6.86	75.40*
S.D (±)	0.35	0.13	0.36	W G	2.46	27	0.09	

*Significant F = (df 2, 27) (0.05) = 3.35; ($p \leq 0.05$).

Table 2: Multiple Comparisons. Scheffe's Post hoc Test for Experimental Groups and control Group on Elastic Strength.

(I) Groups	(J) Groups	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Exp. Gr.1	Exp. Gr.2	.5170*	.13485	.003	.1677	.8663
	Con. Gr.	1.6210*	.13485	.000	1.2717	1.9703
Exp. Gr.2	Exp. GR. 1	-.5170*	.13485	.003	-.8663	-.1677
	Con. Gr.	1.1040*	.13485	.000	.7547	1.4533
Con. Gr.	Exp. Gr.1	-1.6210*	.13485	.000	-1.9703	-1.2717
	Exp. Gr.2	-1.1040*	.13485	.000	-1.4533	-.7547
Based on observed means. *The mean difference is significant at the 0.05 level.						

The above table indicates that the pre and post test mean and standard deviation of experimental and control groups on elastic strength. The obtained '*F*' value for pre test mean on elastic strength was 0.79, which was lesser than table value of 3.35 at 0.05 level of confidence; hence there was no significant difference in pre test data of experimental and control groups. The analysis of post test mean data reveals that '*F*' value of 75.40, which was higher than table value; hence there exist difference in elastic strength among the experimental and control groups. The Scheffe's test was used as a post hoc test to found out the paired mean difference and it was presented in Table II.

The result of the study showed that there was a significant difference between experimental groups and control group and also significant difference between two experimental groups. The pre and post test mean values of experimental groups and control group on elastic strength were graphically represented in the Figure 1.

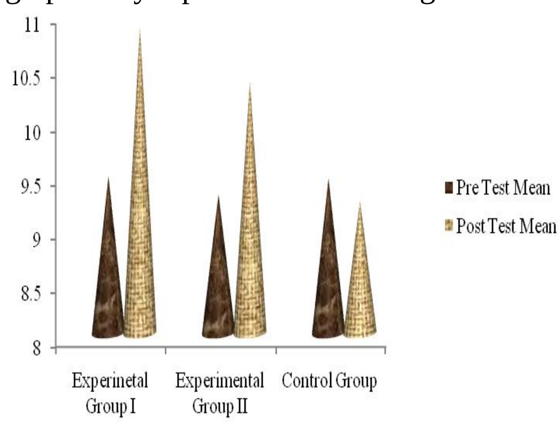

Figure 1: The pre and post test mean values of experimental groups and control group on elastic strength.

This study clearly found out that there was a significant difference on elastic strength between with and without weights plyometric training groups. Several studies suggested that plyometric training is very valuable for determining the variables such as elastic strength (Andrew *et al.*, 1996). These results concur with previous studies (utilising training duration between 4 to 24 weeks and various session frequencies), which found plyometric training with the support of weights to improve elastic strength performance (Riadh *et al.*, 2010). The development elastic power as result is supported by the findings of Roger *et al*., (2007). Finally Andrew (2010) reported increase in elastic strength after 12 weeks plyometric training. Our findings provide further support to the notion that plyometric training can demonstrate benefits in a short period of time, indicating that twenty four sessions of plyometric training suffice for initial improvements. This study also provides that plyometric training with weights is one of the best methods to improve elastic strength of men football players and that would help to improve the total performance.

Conclusion

The result revealed that the plyometric training has made significant improvement on elastic strength for both training groups. There was also significant difference between two experimental groups on elastic strength, in which the plyometric training with the support of weights and plyometric training without weights. It is concluded that the plyometric training with weights performed best followed by plyometric training without weights for improving elastic strength of football players as compared to control group.

References

1. Damon, P. S. Andrew. (2010). Effects of three modified plyometric depth jumps and periodized weight training on lower extremity power, *The Sports Journal of America's Sports University, 13* (4).
2. Hilfiker Roger., Hubner Klaus., Lorenz Tobias., & Marti Eernard. (2007). Effect of drop jump added to the warm- up of elite athletes with high capacity for explosive force development, *The journal of Strength and Conditioning Research, 21* (2), pp. 550-555.
3. http://www.scienceforsport.com/elastic-resistance-training/
4. https://link.springer.com/referenceworkentry/10.1007%2F978-3-540-29807-6_2325
5. https://www.google.co.in/webhp?sourceid=chrome-instant&ion=1&espv=2&ie=UTF-8#q=what+is+bunny+hopping&*&dobs=bunny%20hopping
6. https://www.google.co.in/webhp?sourceid=chromeinstant&ion=1&espv=2&ie=TF8#q=what+is+plyometric+training+program
7. https://www.merriam-webster.com/dictionary/plyometric
8. Khlifa Riadh., Aouadi, R., Hermassi, S., Chelly, M. S., Jlid, M. C., Hbacha, H., & Castagna, C. (2010). Effects of a plyometric training program with and without added load on jumpers ability in basketball players, *The Journal of Strength and Conditioning Research, 24* (11), pp. 2955-2961.
9. Lyttle Andrew, D., Wilson Gredg, J., & Ostrowski Karl, J. (1996). Enhancing performance: Maximal power versus combined weights and plyometrics, *Journal of Strength & Conditioning Research, 10* (3), pp. 173-179.
10. Markovic Goran., Jukic Igor., Milanovic Dragan., & Metikos Dusan. (2007). Effects of sprint and plyometric training on muscle function and athletic performance, *Journal of Strength and Conditioning Research, 21* (2), pp. 543-549.
11. Rimmer Edwin., & Sleivert Gordon. (2010). Effects of a plyometric intervention programs on sprint performance, *Journal of Strength and Conditioning Research, 14* (3), pp. 295-301.