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Comparative Analysis of Progressive Plyometric Training and Progressive Plyometric Training followed by Reversibility on Anaerobic Power

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Abstract

This study was designed to analyze the effect of progressive plyometric training and progressive plyometric training followed by reversibility on anaerobic power. To achieve the purpose of this study, 45 men students from bachelor's degree course in the department of physical education and sports sciences, Acharya Nagarjuna University Ongole Campus, Ongole, Andhra Pradesh, India were selected as subject. The subject were assigned at random into three groups of fifteen each (n=15). Group I underwent progressive plyometric training, Group II underwent progressive plyometric training followed by reversibility and Group III acted as control. Control group was restricted to participate in any specific training. The anaerobic power was selected as dependent variable. The pre and post test random group design was used as experimental design. The collected data from the three groups prior to and immediately after the training programme on selected criterion variables was statistically examined for significant difference, if any, by applying analysis of covariance (ANCOVA). Since three groups were involved whenever the 'F' ratio was found to be significant for adjusted means, Scheffe's test was followed as a post hoc test to determine which of the paired means difference was significant. The results of the reveals that due to the influence of progressive plyometric training (14.19%) and progressive plyometric training followed by reversibility (15.79%) the anaerobic power was significantly improved. It is also concluded that progressive plyometric training followed by reversibility group is significantly better than progressive plyometric training group in improving anaerobic power.

Keywords: Progressive plyometric training, Reversibility and Anaerobic power.

Introduction

One form of training that theoretically proposes to bridge the gap between speed and strength is plyometric training. The concept of plyometric training has been the focus of controversy among sports scientists and trainers in recent years. The research literature does not provide all the answers, and practitioners report different levels of success using a variety of resistance modes and techniques. The challenge of human muscle power enhancement for sports performance is based on the use of a variety of training approaches and it is generally agreed in the literature that some form of resistance exercise involving near maximal efforts will improve power output. Athletes from a wide range of sports use plyometric training to help them reach peak physical condition. Used correctly, it can be a highly effective form of power training, especially when combined with a suitable strength training program. Plyometric refers to exercise that enables a muscle to reach maximum force in the shortest possible time (Baechle, 2000). The muscle is loaded with an eccentric (lengthening) action, followed immediately by a concentric (shortening) action. Plyometric training involves and uses practicing plyometric movements to toughen tissues and train nerve cells to stimulate a specific pattern of muscle contraction so the muscle generates as strong a contraction as possible in the shortest amount of time. 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 movement (*concentric phase*), which enables muscles to work together in doing the particular motion. Plyometric training engages the myotatic reflex, which is the automatic contraction of muscles when their stretch sensory receptors are stimulated.

Muscular power and muscular strength are two different things. Power refers to the combined factors of speed and strength. Performance in many sports is based on different types of power. In American Football, a lineman and a receiver may have the same power, but they have different limitations in how their power is delivered. The lineman would be speed-limited, whereas the receiver would be strength-limited. The purpose of plyometric is to emphasize speed-based power. One

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activity that requires speed-favoured power is high jumping: ultimately, jump height is determined by how fast one is moving once one's legs have left the ground. Good jumpers may not have exceptional leg strength, but they can produce it at exceptional speeds**.** Sports coaches, trainers, scientists and performance consultants are growing in demand and employment numbers, with the ever-increasing focus within the sporting world on achieving the best results possible. Through the study of science and various sports training, researchers have developed a greater understanding on how the human body reacts to exercise, training, different environments and many other stimuli. The effect of progressive plyometric training and progressive plyometric training followed by reversibility on anaerobic power is useful research objectives and it has drawn the attention of the investigator. The present scientific study is one of the efforts to explore and suggest a best scientific method for the development of anaerobic power.

Methodology

Subjects and Variables

The purpose of the study was to investigate the effect of progressive plyometric training and progressive plyometric training followed by reversibility on anaerobic power. To achieve the purpose of the study 45 male students studying bachelor's degree course in the department of physical education and sports sciences, Acharya Nagarjuna University Ongole Campus, Andhra Pradesh, India during the academic year 2014-2015 were selected as subjects at random by lot method from total of 100 students. They were divided into three groups of fifteen each (n=15). Group I underwent progressive plyometric training, Group II underwent progressive plyometric training followed by reversibility and Group III acted as control. Control group was restricted to participate in any specific training. The purpose and nature and importance of experiment and testing periods were explained to the subjects. The data collected from the experimental and control groups as these students were new to plyometric training regime, the subjects cleared the minimum strength requirement test prescribed by Voight and Draovitch, which consisted of five push-ups, five squat thrust, standing long jump and skipping rope for thirty seconds.

Training Programme

The experimental group-I underwent progressive plyometric training for three days per week for twelve weeks and group-II underwent progressive plyometric training for three days per week for nine weeks and followed by reversibility for two days per week for remaining three weeks. The principle of overload for Group I had been applied at every four weeks up to the twelfth week to reach the high intensity whereas Group II was attained the high intensity at the ninth week itself and then for remaining three weeks the load was deliberately reduced. The duration of training sessions in all the days was between 45 minutes and an hour approximately, which included also warming up and limbering down. Group III acted as control who did not participate in any specific training on par with experimental groups. However, they performed the regular physical education programme of the course of the study. The experimental groups underwent their respective training programs during evening hours under strict supervision of the investigator. To reduce the possibility of injury the training was conducted on the grassland. The training schedules for the experimental groups were designed in response to the pilot study and also based on the guidelines by Donald A.Chu.

Statistical Procedure

The pre and post test random group design was used as experimental design in which forty-five men subjects were divided into three groups of fifteen each at random. No attempt was made to equate the group's in any manner. The collected data from the three groups prior to and immediately after the training programme on selected criterion variables were statistically examined for significant difference, if any, by applying analysis of covariance (ANCOVA). Since three groups were involved whenever the 'F' ratio was found to be significant for adjusted means, Scheffe's test was followed as a post hoc test to determine which of the paired means difference was significant. Magnitudes of improvements were computed for all the groups on selected criterion variables separately as suggested by Jerry Thomas and Jack Nelson. In all cases .05 level was fixed as level of confidence.

Result

The analysis of covariance on anaerobic power of experimental and control group have been analyzed and presented in table-1.

Table I. Analysis of Covariance on Anaerobic Power of Experimental and Control Group

	Progressive plyometric training group	Progressive plyometric training followed by reversibility group	Control group	Source of Variance	Sum of Squares	Df	Mean Squares	Obtained 'F' Ratio
Pre test Mean	90.97	92.17	95.96	Between	203.73	2	101.865	4.11*
S.D	6.0	4.45	4.29	Within	1040.24	42	24.767	
Post test Mean	103.88	106.72	97.13	Between	727.77	2	363.885	
S.D	4.81	3.48	4.19	Within	739.43	42	17.605	20.67*
Adjusted Post test Mean	105.45	107.38	94.91	Between Within s	1161.61 136.91	2 41	580.58 3.34	173.83*
Improvement	**14.19%**	**15.79%**	**1.22%**					

***Significant at .05 level of confidence.*
The table value required for significance at .05 level with df 2 and 42 and 2 and 41 are 3.22 and 3.23 respectively. (Anaerobic Power performance in kgm/sec).

Table-I shows that the pre test mean value of anaerobic power of progressive plyometric training group, progressive plyometric training group, progressive plyometric training followed by reversibility group and control group are 90.97, 92.17 and 95.96 kg m/s respectively. The obtained 'F' ratio of 4.11 for pre test is more than the table value of 3.22 for df 2 and 42 required for significant at .05 level of confidence. The post test mean values of anaerobic power for progressive plyometric training group, progressive ploymetric training followed by reversibility group and control group are 103.88, 106.72 and 97.13 kg m/s respectively. The obtained 'F' ratio of 20.67 for post test is more than the table value of 3.22 for df 2 and 42 required for significance at .05 level of confidence. The adjusted post test mean values of anaerobic power for progressive plyometric training group, progressive plyometric training followed by reversibility group and control group are 105.45, 107.38 and 94.91 kg m/s respectively. The obtained 'F' ration of 173.83 for adjusted post test is more than the table value of 3.23 for df 2 and 41 required for significance at .05 level of confidence. The magnitude of improvement of anaerobic power due to the influence of the respective training means of progressive plyometric training group, progressive plyometric training followed by reversibility group and control group are 14.19%, 15.79% and 1.22% respectively. The results of the study indicates that there is a significant difference among the adjusted post test means of progressive plyometric training group, progressive plyometric training followed by reversibility group and control group on anaerobic power. To determine which of the three paired means had a significant difference, Scheffe's test was applied as post hoc test and the results are presented in table-II.

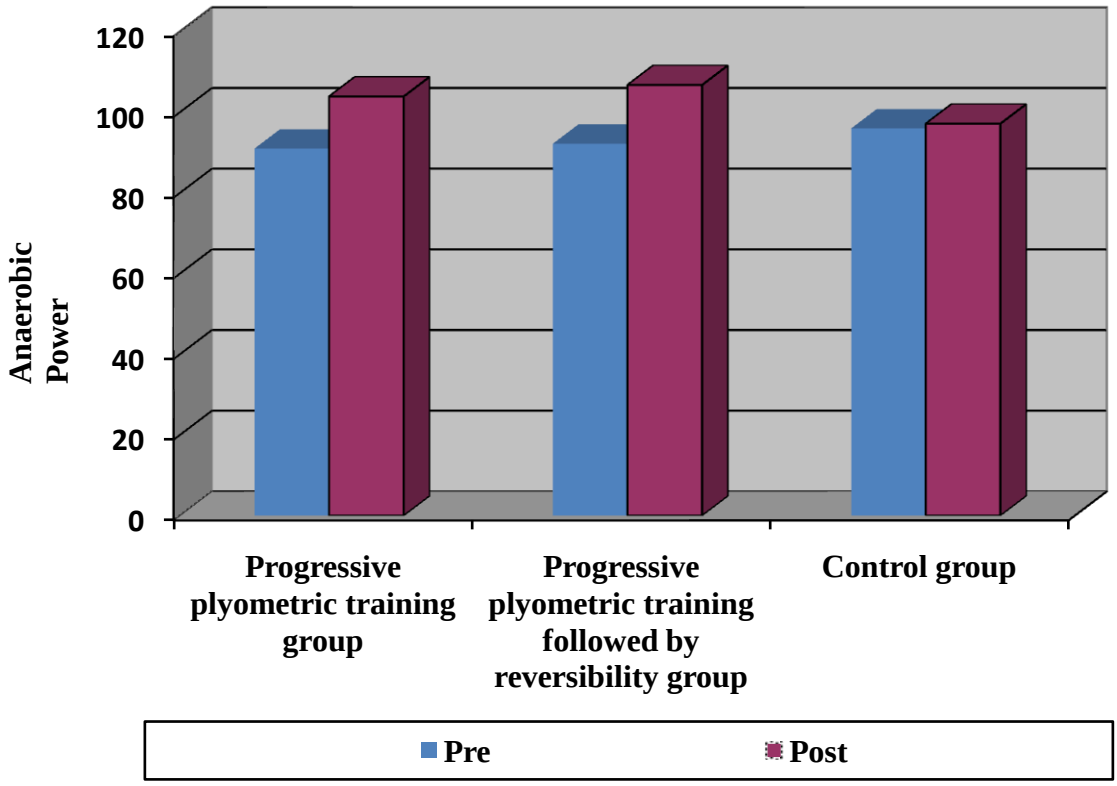
Table II. Scheffe's Test for the Differences Between the Adjusted Post Test Paired Means on Anaerobic Power

Adjusted Means			Mean Difference	Confidence Interval
Progressive plyometric training group	**Progressive plyometric training followed by reversibility group**	**Control Group**		
105.45	107.38	-	1.93*	1.67
105.45	-	94.91	10.54*	1.67
-	107.38	94.91	12.47*	1.67

**Significant at .05 level.* (Anaerobic power performance in kg m/s).

Table-II shows that the adjusted post test mean difference on anaerobic power between progressive plyometric training group and progressive plyometric training followed by reversibility group, progressive plyometric training group and control group and progressive plyometric training followed by reversibility group and control group 1.93, 10.54 and 12.47 respectively are higher than the confidence interval value 1.67 which shows significant difference at .05 level of confidence. It may be concluded form the results of the study that there is a significant difference between the adjusted post test means of progressive plyometric training group and progressive plyometric training followed by reversibility group, progressive plyometric training group and control group and progressive plyometric training followed by reversibility group and control group on anaerobic power.

Figure I. Mean Values of Experimental and Control Group on Anaerobic Power



Discussion

The results of the study indicates that both the experimental groups namely progressive plyometric training and progressive plyometric training followed by reversibility groups had significantly improved the selected dependent variable anaerobic power when compared to the control group as it did not participate in any of the special training programme apart from the regular physical education activities. According to Wilson et al., (1994) plyometric training is used as a means to enhance the muscular strength and size, power, speed and endurance, enhance muscle tone, and assist in rehabilitation injury prevention and to aid in the maintenance of muscular function. These findings are also in agreement with the findings of Brown et al., (1986) who conducted a study to find out the effects of plyometric exercises on 15 year old subjects in which plyometric group experienced significant gain in Speed, stride frequency and stride length.

According to Reddy, (1993) plyometric training increased speed, stride length, stride frequency and anaerobic power than that of the resistance training. Bompa (1999) experimented and suggested that plyometric exercise can often yield a significant gain in physical ability and optimization of athletic performance. Plyometric training influence the starting power and acceleration power during sprinting. Hatfied and Yessis (1998) point out that plyometric exercise involves powerful muscular contraction in response to the rapid, dynamic loading of the involving muscles. The rapid stretching of these muscles activates the muscle stretch reflex, which sends a powerful stimulus to the muscles causing them to contract faster and with more power. The faster a muscle is forced to lengthen, the greater tension, it exerts.

According to Gehri et al., (1998) plyometric training technique is the best for improving vertical jumping ability, positive energy production and elastic

energy utilization. Admas et al., (1995) quoted that plyometric training improves hip and thigh power production as measured by vertical jumping ability. Blakey et al., (1987) examined plyometric training improves strength power an anaerobic power. Because, the possibility of reducing the time between forced stretch at impact and initiation of contraction was improved by plyometric training. According to Wagner et al., (1997) and Medbo et al., (1990) plyometric training is effective for increasing lower body anaerobic power.

Conclusion

The results of the reveals that due to the influence of progressive plyometric training (14.19%) and progressive plyometric training followed by reversibility (15.79%) the anaerobic power was significantly improved. It is also concluded that progressive plyometric training followed by reversibility group is significantly better than progressive plyometric training group in improving anaerobic power.

References

1. Admas, K. et al., (1995). "*The Effect of Six Weeks of Squat, Plyometric and Squat Plyometric Training on Power Production*" New Athletics, 10:3, 71.
2. Blakey, J.G. and Southard, D. (1987). "*The Combined Effects of Weight Training and Plyometric Training on Dynamic Leg Strength and Leg Power*" , Journal of Applied Sports Science Research, 1, 14-16.
3. Bompa, Tudor O. (1999). *Perilodization: Theory and Methodology of Traning*, (4th ed.,) (Champaign, Illinois :Human Kinetics Publishers, p.3
4. Bourhcer, C. and Malina, R.M. (1993)."*Genetics of Physical Fitness and Motor Performance*", Exercise and Sports Sciences Reviews, 11, 3206
5. Brown, M.E., Mayhew, J.L. and Boleach, L.W. (1986). "*Effect of Plyometrci Training on Vertical Jump Performance in High School Basketball Players*," *Jornal of Sports Medicine and Physical Fitness, 26:1*, 1-4.
6. Chu, Donald A. (1992). Jumping in to Plyometrics, (Champaign, Illinois: Human Kinetic Publishers, pp 1-6.
7. Douge, Brain. (1993) "plyomertics", *Sports Coach*, 21:3, 4.
8. Gehri, Daniel J. et al., (1998) "*A Comparison of Plyometric Training Techiniques for Improving Vertical Jump Ability and Energy Production*", Journal of Strength and Conditioning Research, 12:2, 85-89.
9. Hatfield and Yessis, (1998) "Plyometric Training: Achieving Explosive Power in Sports", as cited by George Dintiman et al., Sports Speed, (2nd ed.,), p.124
10. John Bloomfield, Timothy R. Ackland and Burce C.Elliott, (1994). *Applied Anatomy and Blomechanics in Sport*, (Melbourne: Blackwell Scientific Publiations, p.145.
11. Medbo, J.J. and Burgers, S. (1990). "Effect of Training on the Anaerobic Capacity", *Medicine and Science in Sports and Exercise*, 22:4, 501-507.
12. Radcliffe, James C. and Farentions, Robert C. (1999). *High-Powerd Plyometrics* (Champaign, Illinois: Human Kinetics Publishers, p.viii.
13. Reddy, Sathya Narayana. (1993). "*Relative Effects of Plyometric and weight Training Followed by Plyometric Training on Power, Speed, Stride Length and Stride Frequency*", Unpublished Doctoral Thesis, Annamalai University.
14. Wagner, D.R., and Kocak, M.S. (1997). "A Multivariate Approach to Assessing Anaerobic Power Following a Plyometric Training Programme", *Journal of Strength and Conditioning Research*, 11:4, 251-255.
15. Wilmore Jack H. and Costill, David L. (1988). *Training for Sport and Activity: The Physiological Basis of the Conditioning Process*, (3rd ed.,), (Champaign, Illionois: Human Kinetics Publishers, p.I
16. Wilson, Grig J. (1994). "*Strength and Power in Sport*" as cited by John Bloom Field et al., *Applied Anatomy and Biomechanics in Sport*, p.111.

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