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Comparative Analysis of Progressive Plyometric Training and Progressive Plyometric Training followed by Reversibility on Stride Frequency

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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 stride frequency. The 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 stride frequency 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 (3.71%) and progressive plyometric training followed by reversibility (6.87%) the stride frequency 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 stride frequency.

Keywords: Progressive plyometric training, Reversibility and Stride frequency.

Introduction

The human body is an amazing creation. During rest, countless events are occurring simultaneously in perfect co-ordination, allowing complex functions such as seeing, hearing, smelling, tasting, breathing and thinking to continue without conscious effort. The transition from rest to exercise is accompanied by substantial changes in a number of bodily functions, allowing the body to successfully adapt to additional stress. At the body experiences repeated bouts of exercise, such as in a physical conditioning programme, long-term adaptations occur in the body allowing higher performance levels without undue fatigue as well as providing the body with a feeling and/or sense of well being (Wilmore & Costill, 1988). Human beings have consistently tried to run faster, jump higher, and exhibit greater strength, endurance and skill. We are naturally competitive and ambitious for excellence in athletic performances. As a result of practical experience, observation and scientific experimentation, old method of conditioning though fascinating and rich in tradition, have been discarded and replaced by new methods based on insight and understanding. For centuries, this evaluation towards better methods of conditioning was slow, but in the recent years the dramatic changes that have taken place have brought about some astounding results in performance (Bourhcer & Malina, 1993).

Athletic performance has dramatically progressed over the past few decades. Performance levels unimaginable before are now common and the number of athletes capable of outstanding results is increasing. One among the contributing factors are that athletics is a challenging field, and intense motivations has encouraged long, hard hours of work. Also, coaching has become more sophisticated, partially from the assistance of sports specialists and scientists. Sports sciences have progressed from descriptive to scientific. A broader base of knowledge about athletes now exists, which is reflected in training methodology (Bompa, 1999). Most scientific knowledge, whether from experience or research aims at to understanding and improving the effects of exercise on the body. Exercise is now the focus of sports science. Research from several sciences enriches the theory and methodology of training, which has become a science of its own. The

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athlete is the subject of the science of training. The athlete represents a vast source of information for the coaches and sports scientists.

The major objective in training is to cause biological adaptation in order to improve performance in a specific task. To enhance physiological improvement effectively and to bring about a change, specific exercises and overload must be followed. By exercising at a level above normal, variety of training adaptations take place in the body that makes it function more efficiently. Numerous training procedures are in practice to improve each and every physical and motor fitness quality at various levels. These basic training procedures will serve better when utilized with modifications suited to the individual. The best training programme is that which increases the desired quality at a higher rate without causing unwanted effects **(**Boucher & Malina, 1993). Any Physical activity leads to anatomical, physiological, bio-chemical and psychological changes. The efficiency of a physical activity results from its duration, distance and repetitions, load and velocity and the frequency of performance. While planning the dynamics of training, consider these aspects, referred to as the variables of training model, all these variables according to the functional and psychological characteristics of a competition. Throughout the training phases preceding a competition, define which component to emphasize to achieve the planned performance objective.

Strength gains can be transformed into power only by applying specific power training. Perhaps one of the most exciting training innovations of the past 25years has been plyometric training. As with any training innovations there was much mystique and some confusion surrounding the method. Much of these occurred, because plyometrics was first protracted as a secret Russian training method. In reality, plyometic training was not a particularly new training method, nor was it the exclusive domain of the Russian sport machine. Plyometric training involves a number of advantages over traditional heavy weight training method. Plyometric exercise tends to be performed in a more explosive way than traditional strength training. Consequently plyometric training requires the athletes to rapidly develop force, promoting the development of muscular power. Dynamic mature of plyometric training allows for greater improvement in the maximal rate of force development, in comparison to traditional weight training method. Plyometric exercise do not involve a large deceleration phase during concentric movement, which occurs in traditional strength training , as the body does not have to achieve zero velocity at the end of the exercise. Thus Plyometric exercises involve the production of high force and acceleration throughout the entire range of motion, specific to most competitive movements. Plyometric exercises are performed at higher velocities than those achieved using traditional strength training. This increased velocity enhances the specificity of the training modality to competitive performance, improving the transference of training gains to the competitive situation.

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 stride frequency. 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

During the training period, the experimental groups underwent their respective training programmes in addition to their regular physical education programme of the course of study as per the curriculum. Group I had undergone progressive plyometric training for three days per week for twelve weeks and group II had undergone 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. Group I underwent progressive plyometric training and Group II underwent progressive plyometric training followed by reversibility and Group III acted as control. The subjects were tested on selected criterion variable stride frequency prior to and immediately after the training programme. 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.

Results

The analysis of covariance on stride frequency of progressive plyometric training group, progressive plyometric training followed by reversibility group and control group have been analyzed and presented in table-I.

Table I. Analysis of Covariance on Stride Frequency of Experimental and Control Groups

	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	3.828	3.756	3.846	Between Mean	1.170	2	0.585	1.79
S.D	0.088	0.158	0.104	Within Group	13.71	42	0.326	
Post test Mean	3.970	4.014	3.866	Between Mean	0.176	2	0.040	9.78*
S.D	0.078	0.108	0.090	Within Group	0.384	42	0.206	
Adjusted Post test Mean	3.93	4.02	3.84	Between Set Within Set	0.15 0.44	2 41	0.075 0.011	6.82*
Magnitude of Improvement	**3.71%**	**6.87%**	**0.52%**					

***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. (Stride Frequency performance in numbers)

Table-I shows that the pre test mean values of stride frequency for progressive plyometric training group, progressive plyometric training followed by reversibility group and control group are 3.828, 3.756 and 3.846 respectively. The obtained 'F' ratio of 1.79 for pre test is less than the table value of 3.22 for df 2 and 42 required for significance at .05 level of confidence. The post test mean value of stride frequency for progressive plyometric training group, progressive plyometric training followed by reversibility group and control group are 3.970, 4.014 and 3.866 respectively. The obtained 'F' ration of 9.78 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 stride frequency for progressive plyometric training group, progressive plyometric training followed by reversibility group and control group are 3.93, 4.02 and 3.84 respectively. The obtained 'F' ratio of 6.82 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 stride frequency 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 3.71%, 6.87% and 0.52% 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 stride frequency. 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.

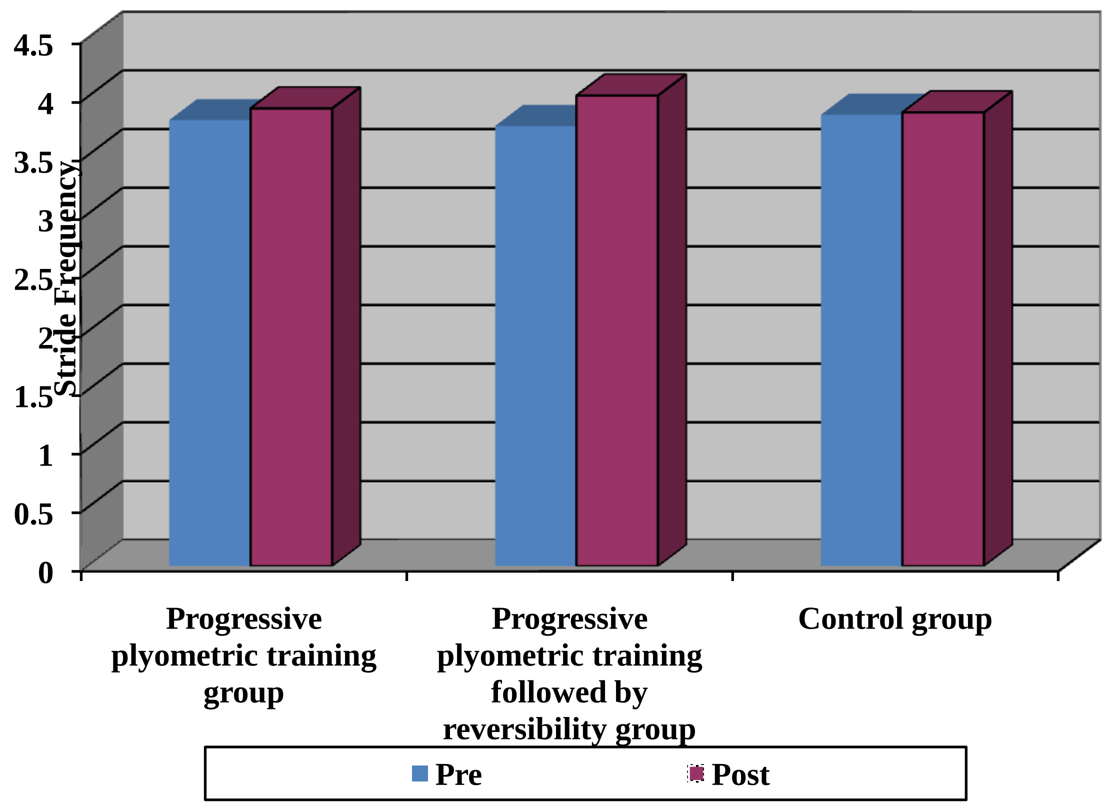
Table II. Scheffe's Test for the Differences between the Adjusted Post Test Paired Means on Stride Frequency

Adjusted Means			Mean Difference	Confidence Interval
Progressive plyometric training group	Progressive plyometric training followed by reversibility group	Control Group		
3.93	4.02	-	0.09*	0.09
3.93	-	3.84	0.09*	0.09
-	4.02	3.84	0.09*	0.09

**Significant at .05 level.*
(Stride Frequency performance in numbers).

Table-II shows that the adjusted post test mean differences on stride frequency 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 are 0.09, 0.09 and 0.09 respectively are equal and higher than the confidence interval value 0.09 which shows significant difference at .05 level of confidence. It may be concluded from 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 stride frequency. It reveals that due to the influence of progressive plyometric training and progressive plyometric training followed by reversibility the stride frequency was significantly improved however, progressive plyometric training followed by reversibility group is significantly better than progressive plyometric training group in improving stride frequency.

Figure I. Mean Values of Progressive Plyometric Training Group, Progressive Plyometric Training Followed By Reversibility Group and Control Group on Stride Frequency



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 stride frequency 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 (3.71%) and progressive plyometric training followed by reversibility (6.87%) the stride frequency 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 stride frequency.

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