



Effect of plyometric resistance and sprint training on acceleration speed flight time and jump height of male basketball players

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Abstract

The aim of this study was to evaluate and compare the effect of plyometric resistance and sprint training on acceleration speed, flight time and jump height of male basketball players. To achieve the purpose of the study thirty basketball players were selected affiliated colleges from Bharathiar University, Coimbatore. The results reveal that the 8 weeks of plyometric training, resistance training and sprint training programme significantly improved the acceleration speed, flight time and jump height of basketball players, plyometric training group performed better jump height and flight time compared with RTG and STG after training and the sprint training improved the acceleration speed better than RTG and STG after 8 week training programme.

Keywords: Plyometric, resistance, sprint, acceleration speed, flight time and jump height.

Introduction

In Basketball the ability to generate maximum strength levels in the shortest period of time (muscular power) has been considered as essential to obtain high sport performance level (Hedric, 1993). Moreover, strength training is part of basketball preseason programs with a background of related benefits that improve sports performance, reduce injury rate and provide higher motivation level for the athletes (NBCCA, 1997). Two methods, resistance and plyometric training are usually referred in the literature as improving the most powerful strength characteristics (explosive strength) in basketball players.

Plyometrics is a type of exercise training designed to produce fast, powerful movements, and improve the functions 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 muscle and surrounding tissues to jump higher, run faster, throw further, or hit harder, depending on the desired training goal. Plyometrics is used to increase the speed or force of muscular contractions, providing explosiveness for a variety of sport-specific activities. Plyometrics are training techniques used by athletes and players in all types of sports to increase strength and explosiveness. Researchers have shown that plyometric training can contribute to the improvement in vertical jump performance, acceleration, leg strength, muscular power, increased joint awareness and overall Proprioception. Plyometric drills usually involve stopping, starting and changing direction in an explosive manner (Baechle *et al.*, 2008).

Speed and sprint is the ability to reach a high velocity of movement in whatever mode locomotion – running, cycling, skating, swimming etc. Another element of fitness closely related to

speed training is speed endurance. Many athletes must maintain a high velocity for longer than 6 seconds or produce repeated sprints with minimal rest periods in between. The combination of speed, agility and speed endurance and athlete requires is determined by his or her sport. But regardless of the event, there are several modes of training that are integral to developing a fast athlete (Narasimham, 2009).

Resistance is the ability to exert maximal force is commonly referred to as the strength of the muscles that control particular body movements. However, the muscles may perform maximal effort as either isometric, concentric, or eccentric actions and the two dynamic actions may be performed at a wide range of velocities. An infinite number of values for the strength of muscle may be obtained with an isolated muscle preparation or for a human movement as related to the type of action, the velocity of the action and the length of the muscle (Komi, 1991).

Several investigators have analyzed positive effect of complex training for the higher improvement in acceleration speed and explosive strength. No study was found on individual training effect for these variables in Jump height and flight, the aim of this study was to understand how basketball players respond to a individual training different and which one is better to improve the acceleration speed, flight time and jump height.

Methodology

For the present study thirty basketball players were selected from affiliated colleges of Bharathiar University, Coimbatore. Their age ranged between 19 and 25 years. The subjects were divided into three equal groups. The group I was considered as plyometric training group (PTG=10) group II was considered as resistance training group (RTG=10) and group III was considered as sprint training group (STG=10).

Basketball players were assessed before and after 8 weeks training period on acceleration speed, flight time and jump height, acceleration speed was measured by 20 meters acceleration sprint test, flight time was measured by squat jump and jump height was measured by sargent jump.

Training Protocols

The training protocols include only leg exercise. General warm up and warm down was performed prior to each training session. All training group performed three days per week for the period of 8 weeks. Lower extremities training designed to leg muscles involved in the vertical jumping motion and explosive movement.

Plyometric drills like depth jump, the split squat jump, the rim jump the box to box jump. The depth jump height started at 22 centimeters on the first week and progressed to 50 centimeters in the last week. The distance between boxes started at 1 meter on the first week and progressed to 2 meter in the last weeks. Resistance exercises selected to stress the major muscle group in the following order, leg extension, leg press half squard and seated calf raise. The training consisted of 2-4 sets of weigh training for 4 stations and at an intensity corresponding to 60 -90 percentage of 1Rm in each station by 6-12 repetitions for 8 weeks. The sprint training group selected repeated sprint training consist of running 40 m with different intensities and duration from week to week. 4 set of 5x40 meters with 90 second recovery between repletion and 10 min recovery between sets.

Statistical Technique

The collected data on acceleration, flight time and jump height statistically analyzed with 't' ratio to find out significant improvement of pre test and post test of each variables and analysis of variance (ANOVA) was used to determine whether difference existed between groups in the

changes in each variables from the baseline to the post test at 0.05 level of confidence.

Analysis of data and results of the study

The result between the pre and post test for acceleration speed, flight time and jump height scores in both groups and result between groups at baseline and after the training program are presented in tables 1 and 2.

Table-1 shows that the ‘t’ ratio for acceleration speed, flight time and jump Height variables of plyometric training group. The obtained ‘t’ ratios on acceleration speed, flight time and jump height were 7.60, 9.34, and 10.14 respectively. Since the values were higher than the required table value of 1.83, it was found to be statistically significant at 0.05 level of confidence for degrees of freedom 1 and 9.

The ‘t’ ratio for acceleration speed, flight time and jump height variables of resistance training group. The obtained ‘t’ ratios on acceleration speed, Flight time and Jump Height were 5.51, 5.87 and 4.62 respectively. Since the values were higher than the required table value of 1.83, it was found to be statistically significant

at 0.05 level of confidence for degrees of freedom 1 and 9.

And the ‘t’ ratio for acceleration speed, flight time and Jump Height variables of sprint training group. The obtained ‘t’ ratios for acceleration speed, Flight time and Jump Height were 12.39, 4.42 and 5.52 respectively. Since the values were higher than the required table value of 1.83, it was found to be statistically significant at 0.05 level of confidence for degrees of freedom 1 and 9.

From the result it was inferred that, Plyometric training, Resistance training and Sprint training produced significant improvement in acceleration speed, Flight time and Jump Height due to the influence of 8 weeks training for basketball men.

Table - 2 reveals the computation of ‘F’ ratio on post test of PTG, RTG and STG on acceleration speed, flight time and Jump height of men basketball players.

The obtained ‘F’ ratio for the post test value on acceleration speed was 1.49 and flight time was 0.565 Since, these values were less than

Table – 1. Computation of ‘t’ ratio between pre test and post test means on acceleration speed, flight time and jump height in all groups of men basketball players

S.No	Variables	Pre test Mean	Pre test S.D	Post test Mean	Post test S.D	‘t’ ratio
Plyometric Training Group						
1.	Acceleration speed	4.166	.0295	4.136	.0241	7.60*
2.	Flight time	578.15	11.24	588.45	16.62	9.34*
3.	Jump height	27.78	1.42	33.79	2.63	10.14*
Resistance Training Group						
1.	Acceleration speed	4.167	.0125	4.138	.0132	5.51*
2.	Flight time	578.19	7.032	585.05	5.99	5.87*
3.	Jump height	27.47	1.23	30.30	1.80	4.62*
Sprint Training Group						
1.	Acceleration speed	4.191	.029	4.123	.024	12.39*
2.	Flight time	578.87	3.33	586.03	3.73	4.42*
3.	Jump height	27.99	1.62	31.40	1.194	5.52*

*Significant at 0.05 level (2.14) Table value 1.83

Table – 2. Analysis of variance on post test value on acceleration, flight time and jump height of plyometric training group resistance training group and sprint training group of men basketball players

S.No	Variables	Source of variance	Sum of Squares	Df	Mean squares	F- ratio
1.	Acceleration	B.G	0.001	2	0.001	1.49
		W.G	0.012	27	0.000	
2.	Flight time	B.G	61.27	2	30.64	0.565
		W.G	1465.05	27	34.27	
3.	Jump height	B.G	64.09	2	32.05	8.30*
		W.G	104.35	27	3.87	

*Significant at 0.05 level (2.14) Table value 2.51

the required table value of 2.51 for the degrees of freedom 2 and 27, it found to be statistically not significant at 0.05 level of confidence.

Further, the obtained 'F' ratio for the post test value on Jump height was 8.30. Since, the 'F' value was higher than the required table value of 2.51 for the degrees of freedom 2 and 27, it was found to be statistically significant at 0.05 level of confidence.

The results revealed that Acceleration speed, Flight time and Jump height improved after polymeric, resistance and sprint training. But Acceleration speed and Flight time was not significantly difference between PT, RT and ST groups. However, changes in jump height was statistically different between PT, RT and ST groups.

Discussion

The findings from this study were plyometric, resistance and sprint training significant improvement (reduction in time) in Acceleration speed, Flight jump and Jump height of basketball players. Acceleration speed and Flight time was not significantly difference between PT, RT and ST groups and changes in jump height was statistically different between PT, RT and ST groups. Hence, the plyometric training was better improvement (reduction in time) in jump height than RT and ST.

Tonnessen *et al.* (2011) have reported that the repeated sprint training program had a positive effect on the parameters.

Ognijen Andrejic (2012) has showed short-term plyometric and strength training program significantly increases motor performance skill in young basketball players.

Carlos Balsalobre-Fernández *et al.* (2013) published that strength training with a maximum power load is an effective means of increasing strength and acceleration in high-level hurdlers.

The results of the present study indicate that the plyometric training, resistance training and sprint training programme is effective method to improved acceleration, Flight time and Jump height of men basketball players. Due to the influence of 8 week plyometric training, resistance training and sprint training increased more jump height and plyometric training is appropriate training to improve jump height than RT and ST groups of men basketball players.

Conclusion

Based on the results of the study the following conclusions have been arrived.

1. It was concluded that 8 week plyometric training, resistance training and sprint training improved acceleration speed, flight time and Jump height of men basketball players.

2. Plyometric training is better improvement on flight time and jump height of basketball players compare with other training group RTG and STG.
3. Acceleration speed was high improvement due to the effect of 8 weeks sprint training for basketball players compare with other training group PTG and STG.
4. Further, it was concluded due to the influence of 8 week plyometric training, resistance training and sprint training increased more jump height of men basketball players.

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