Research Paper Physical Education

Impact of Combined Training Modulates Technical Parameters of Basketball Players

Mrs. Princy Sebastian Ph.D., Scholar, Department of Physical Education, The HH Rajah's College, Pudukkottai, Tamilnadu, India.

Dr. A.S. Nageswaran Associate Professor, Department of Physical Education, The HH Rajah's College, Pudukkottai, Tamilnadu, India.

ABSTRACT

The purpose of the study is to find out the impact of combined training modulates on selected technical parameters of basketball players. To achieve the purpose, thirty women basketball players were randomly selected as subjects. The age of the subjects were ranged between 18 to 24 years. The selected subjects were assigned into two groups of 15 subjects each. Group I underwent combined plyometric plus strength training for three days per week for six weeks and group II acted as control. Among the technical parameters in basketball, shooting ability and defensive movement were selected as criterion variables. The combined plyometric plus strength training was selected as independent variable. The shooting ability and defensive movement were assessed by speed spot shooting test and defensive movement test respectively. All the subjects of two groups were tested on selected dependent variables at prior to and immediately after the training programme. The data was analyzed using Analysis of covariance (ANCOVA). The .05 level of confidence was fixed as the level of significance to test the "F" ratio obtained by the analysis of covariance, which was considered as an appropriate. The results of the study showed that the combined plyometric plus strength training for six weeks is more effective in increasing the shooting ability and defensive movement of women basketball players.

KEYWORDS : Combined plyometric plus strength training, Shooting ability and Defensive movement.

Introduction

Basketball is a team game, individual execution of fundamental skills is essential for team success. Basketball is one of the most popular teams based sports played and watched throughout the world. It is the fastest–growing sport in the world for many reasons (Hal Wissel, 2012). Basketball is an extremely dynamic sport that requires movements in multiple planes of motion as well as rapid transitions from jogging to sprinting to jumping (Scott Lucett, 2013). Increasing interest in basketball in the world requires from specialists to continuously discover new means and methods in working with basketball players. The complexity and sensitivity of training of basketball players are undeniable; hence, the scientific and professional approaches are very important in developing the process and controlling the effects of training (Magma, 2009).

Plyometric training (also called stretch-shortening cycle exercises) is often used during the off-season basketball training program (Adkins, Bain, Dreyer & Starkey, 2007; McKeag, 2003) as an effective method for improving motor performance (Andrejić, 2009; Fulton, 1992; Matavulj *et al.,* 2001; Radcliffe & Farentinos, 1999). Strength training is also a very important part of basketball off-season programs (Fulton, 1992, Price, 2006) with a background of related benefits that improve motor performance (Fleck & Kraemer, 2004; Micheli, & Purcell, 2007) and reduce injury rate (McKeag, 2003). Plyometric and strength training are referred to as improving the most powerful motor performance skills in young basketball players (Fulton, 1992; Matavulj *et al.,* 2001; Radcliffe & Farentinos, 1999) and they are a significant component of most conditioning program designs.

Plyometric exercises are often combined with strength training, with the presumption that motor performance may be enhanced to a significantly greater extent than each program performed alone (Adams, O'Shea, O'Shea & Climstein, 1992; Faigenbaum *et al.,* 2007; Fatouros *et al.,* 2000; Myer, Ford, Palumbo & Hewitt, 2005; Santos & Janeira, 2008). Plyometric training may "prime" the neuromuscular system for the demands of strength training by activating additional neural pathways and enhancing the neuromuscular system to a greater degree of readiness (Linnamo *et al.,* 2000). The use of both plyometric and strength trainings in the same workout is also an adequate strategy of training process organization, which has highly positive effects on practice and training time management. Because of the growing popularity of youth strength and conditioning programs, along with the potential health benefits associated with this methods (Faigenbaum & Westcott, 2009), it is important to find the most efficient method for enhancing fitness performance in young athletes.

Methods

Subjects

Thirty women basketball players were selected as subjects at random. The age of the subjects were ranged between 18 to 24 years. They were divided into two equal groups and each group consisted of 15 subjects. Group-I underwent combined plyometric plus strength training for three days per week for six weeks and Group-II acted as control who did not participate any special training apart from the regular curricular activities.

Variables

Among the technical parameters in basketball, shooting ability and defensive movement were selected as criterion variables. The combined plyometric plus strength training was selected as independent variable. The shooting ability and defensive movement were assessed by speed spot shooting test and defensive movement test respectively.

Training Programme

During the training period, the experimental group (Group-I) underwent (n = 15) combined plyometric plus strength training for three days per week (alternative days) for six weeks and subjects in Group II as control were instructed not to participate in any strenuous physical exercise and specific training throughout the training programme apart from the regular curricular activities. The training was done under close supervision with frequent adjustments in training intensity to maintain the desired training stimulus. The training duration for combined training group was 90 minutes. The participants in training group took part in a 15 minute warm-up period which consisted of a moderate-intensity dynamic exercises session. After the warm-up period the combined training group performed plyometric exercises, following that took part in the strength training program (45 min). Each training session ended with 5 minutes of cool-down activities (static stretching).

Plyometric Training: The volume ranged from 90 foot contacts to 120 foot contacts per session. The plyometric training program consisted of three levels. The participants performed 9 plyometric exercises during weeks one and two (1 set of 5 repetitions) and 11 plyometric exercises during weeks three through six (weeks three and four; 1 set of 4 repetitions, and weeks five and six; 1 set of 3 repetitions). The following plyometric exercises are given in the training programme in Table 1.

Table 1 - Plyometric Training Program

Week 1 & 2 1 Set / 5 Repetitions	Week 3 & 4 1 Set / 4 Repetitions	Week 5 & 6 1 Set / 3 Repetitions
Two-Foot Ankle Hop	Side-to-Side Ankle Hop	Double Leg Hops
Standing Long Jump	Diagonal Cone Hops	Lateral Jump Over Barrier
Hexagon Drill	Standing Jump Over Barrier	Cone Hops with Change-of-Direction Sprint
Pullover Pass (Medicine Ball)	Single Leg Bounding	Depth Jump to Rim Jump
Two-Foot Ankle Hop	Backward Throw (Medicine Ball)	Lateral Cone Hops
Side-to-Side Ankle Hop	Standing Long Jump with Lateral Sprint	Low Post Drill (Medicine Ball)
Standing Jump-and-Reach	Rim Jumps	Lateral Jump Over Barrier
Front Cone Hops	Double Leg Hops	Standing Long Jump with Sprint
Overhead Throw (Medicine Ball)	Step-Close Jump-and-Reach	Cone Hops with 180-Degree Turn
	Lateral Jump with Single Leg	Depth Jump with Stuff
	Kneeling Side Throw	Catch and Pass with Jump-and-Reach (Medicine Ball)

Strength Training: Following plyometric training, the participants took part in the strength training program. One RM (repetition maximum) was measured and the load was fixed. The strength training program also consisted of three levels. The participants performed 10 strength exercises during week one through six weeks (week one and two 1 set of 5 repetitions; weeks three and four; 1 set of 4 repetitions, and weeks five and six; 1 set of 3 repetitions). The following strength exercises are given in the training programme in Table 2.

Table 2 - Strength Training Program

Week 1 & 2 1 Set / 5 Repetitions	Week 3 & 4 1 Set / 4 Repetitions	Week 5 & 6 1 Set / 3 Repetitions
Leg press	Leg extension	Forward Lunge
Barbell Bench Press	Dumbbell Bench Press	Dumbbell Fly
Leg curl	Back Squat	Front Squat
Lat Pull down	Bend over Barbell Row	Lat Pull down
Standing calf raise	Seated calf raise	Standing calf raise
Dumbbell Biceps curl	Barbell Biceps curl	Seated Dumbbell Biceps curl
Wrist curl	Reverse Wrist curl	Wrist curl
Barbell Triceps Close-grip bench press	Bench Dip	Triceps Push down
Abdominal Crunch (Feet Up)	Abdominal Rotary Crunch (Feet Up)	Quick Touches (Straight Legs)
Barbell Shoulder Press	Dumbbell Front Raise	Dumbbell Lateral Raise

Statistical Procedures

All the subjects of two groups were tested on selected dependent variables at prior to and immediately after the training programme. The analysis of covariance (ANCOVA) was used to analyze the significant difference if any, between the groups on each selected criterion variables separately. In all the cases, .05 level of confidence was fixed to test the significance, which was considered as an appropriate.

Results

It is clear from Table 2 that there is no significant difference combined plyometric plus strength training group and control group on shooting ability and defensive movement before commencement of training, as obtained *F* ratio of 0.11 and 0.12 are less than the required table value of 4.20 at 0.05 for the df of 1 and 28. It denotes that the random assignment of subjects for the two groups is successful; however initial difference is not elicited in shooting ability and defensive movement.

Table 2
ANCOVA on Shooting Ability and Defensive Movement

Variables	Test	Specific Footwork Training Group	Control Group	'F' ratio
Shooting Ability (Point)	Pre-test	13.27 ± 3.59	13.73 ± 3.86	0.11
	Post-test	17.13 ± 3.44	14.73 ± 4.46	2.45
	Adjusted	17.36	14.50	21.25*
Defensive Movement (Sec)	Pre-test	20.36 ± 0.89	20.47 ± 0.87	0.12
	Post-test	18.97 ± 18.97	20.26 ± 0.78	19.89*
	Adjusted	19.02	20.22	51.14*

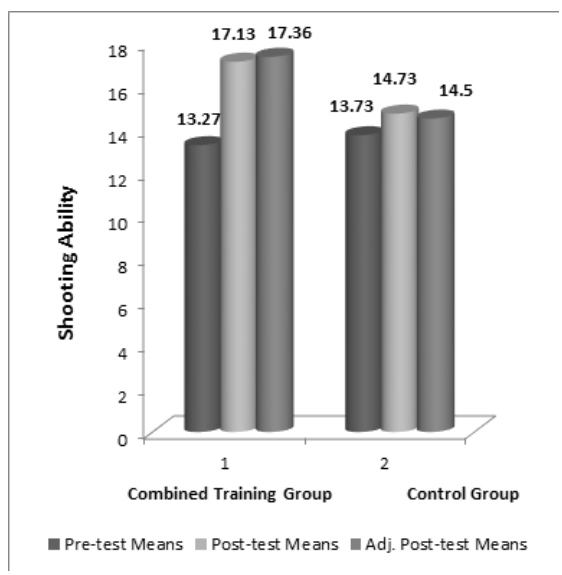
Table 2 also reveals that there is no significant difference on shooting ability and there is a significant difference on defensive movement during post test. The obtained "f" ratio of 2.45 for post test scores is less than the table value of 4.20 for df 1 and 28 required for significance at .05 level of confidence on shooting ability. The obtained "f" ratio of 19.89 for post test scores is greater than the table value of 4.20 for df 1 and 28 required for significance at .05 level of confidence on defensive movement.

Further, table 2 clearly shows that shooting ability and defensive movement differ between the groups after adjusting the pre test scores, as obtained *F* ratio of 21.25 and 51.14 are greater than the required table value of 4.21 at 0.05 for the df of 1 and 27, indicating that after adjusting pre-test scores, there was a significant difference between the two groups on adjusted post test scores on shooting ability and defensive movement. Thus, it is concluded that six weeks of combined plyometric plus strength training significantly increased both shooting ability and defensive movement.

Discussion

In the present study, six weeks of combined plyometric plus strength training significantly increased shooting ability and defensive movement are presented in Figure 1 & 2.

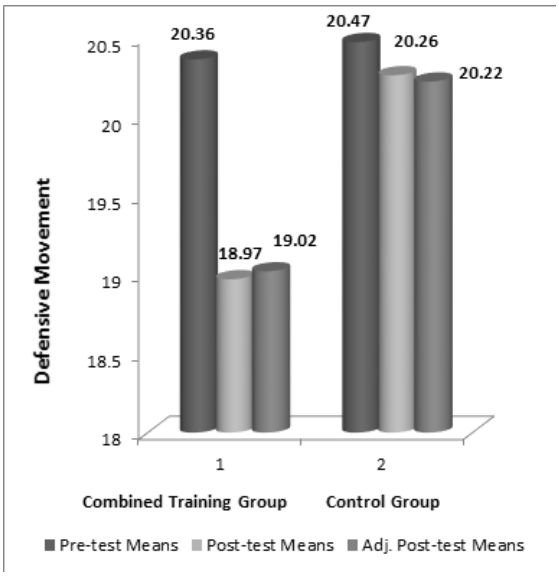
Figure 1
Mean Values of Combined Plyometric Plus Strength Training Group and Control Group on Shooting Ability



According to (Kilinç, F.,2008) a 10-week intensive combined training program performed on university women basketball players had a significant effect on improving their physical, physiological, biomotor, and skill- technical features. The specific basketball training program was significantly improved the physical variable and skill performance of basketball players (Parimalam and Pushparajan, 2013). These findings support the theory of Franciosi, *et al.,* (2010), that greater explosive leg power had significant positive contribution in shooting (64%, p = 0.01). This implies that practicing specific skills in basketball does not only produce skill efficiency but also increase fitness scores as

well (Bompa & Carrera, 2005). Sharma *et.al.,* (2012) found that to improve the specific skills, specific training procedures should be incorporated during the basketball training sessions. They further recommended that the players should be involved in some type of plyometric training and resistance training programme to improve their skills in the game.

Figure 2
Mean Values of Combined Plyometric Plus Strength Training Group and Control Group on Defensive Movement



Conclusions

The game of basketball needs sudden burst of speed, unexpected stops, jumps, turns, changes in direction and pace with and without the ball, in response to the direct action of the opponent. All fundamental skills in basketball namely dribbling, passing & receiving, shooting, rebounding and defensive movements need a sound strength and power to achieve high level performance. Studies have proved that the ability to use the proper conditioning programme has the greater impact in performing defense, rebounding, handling the ball or moving in to different offensive and defensive positions. Hence, it was concluded from the results of the study, that six week combined plyometric plus strength training is efficient enough to improve shooting ability and defensive movement. And also the combined plyometric plus strength training is very essential and inter related to selected technical parameters in basketball.

References

(1). Adams, K., O'Shea, J.P., O'Shea, K.L., & Climstein, M. (1992). The Effect of Six Weeks of Squat, Plyometric and Squat-Plyometric Training on Power Production. ***Journal of Strength and Conditioning Research,*** 66, 36-41.

(2). Adkins, K., Bain, S., Dreyer, E., & Starkey, R. (2007). ***Basketball Drills, Plays and Strategies: A Comprehensive Resource for Coaches.*** Cincinnati, OH: Betterway Books.

(3). Andrejić, O. (2009). The Impact of Explosive Muscle Power and Flexibility on Situational Mobility Speed in Young Basketball Players. ***Unpublished Master's Thesis***, University of Niš: Faculty of Sport and Physical Education. In Serbian.

(4). Bompa, T., & Carrera, M. (2005). ***Periodization for Strength Training and Sports (2nd edition)***. Champaign, IL: Human Kinetics.

(5). Faigenbaum, A.D., & Westcott, W.L. (2009). ***Youth Strength Training: Program for Health, Fitness and Sport***. Champaign, IL: Human Kinetics.

(6). Faigenbaum, A.D., McFarland, J.E., Keiper, F.B., Tevlin, W., Ratamess, N.A., Kang, J., & Hoffman, J.R. (2007). Effects of a Short-Term Plyometric and Resistance Training Program on Fitness Performance in Boys Age 12 to 15 Years. ***Journal of Sport Science and Medicine***, 6, 519-525.

(7). Fatouros, I.G., Jamurtas, A.Z., Leontsini, D., Kyriakos, T., Aggelousis, N., Kostopoulos, N., & Buckenmeyer, P. (2000). Evaluation of Plyometric Exercise Training, Weight Training, and their Combination on Vertical Jump Performance and Leg Strength. ***Journal of Strength and Conditioning Research***, 14, 470-476.

(8). Fleck, S.J, & Kraemer, W.J. (2004). ***Designing Resistance Training Programs - 3rd Editions***. Champaign, IL: Human Kinetics.

(9). Franciosi, *et al.,* (2010). Contributions of Selected Fundamental Factors to Basketball Performance in Adult Players with Mental Retardation. ***J Strength Cond Res,*** 24(8): 2166-2171.

(10). Fulton, K.T. (1992). Off-season Strength Training for Basketball. ***National Strength & Conditioning Association Journal***, 14, 31-34.

(11). Hal Wissel, **Basketball Steps to Success - 3rd Edition**, (USA: Human Kinetics, Champign, 2012), p.1.

(12). Kilinç, F. (2008). An Intensive Combined Training Program Modulates Physical, Physiological, Biomotor and Technical Parameters in Basketball Player. ***J Strength Cond Res,*** 22 (6): 1769-1778.

(13). Linnamo, V., Newton, R., Hakkinen, K., Komi, P., Davie, A., McGuigan, M., & Triplett-McBride, T. (2000).Neuromuscular Responses to Explosive and Heavy Resistance Loading. ***Journal of Electromyography and Kinesiology***, 10, 417-424.

(14). Magma, (2009).Effects of Ten-day Programmed Training on Specific-Motor Abilities of 15-year-old Basketball Players, ***Serbian Journal of Sports Sciences,*** 4: 224-228.

(15). Matavulj, D., Kukolj, M., Ugarković, J., Tihanyi, J., & Jarić, S. (2001). Effects of Plyometric Training on Jumping Performance in Junior Basketball Players. ***Journal of Sports Medicine and Physical Fitness***, 41, 159-164.

(16). McKeag, D. (2003). ***Basketball: Olympic Handbook of Sports Medicine***. Malden, MA: Blackwell Publishing.

(17). Micheli, L., & Purcell, L. (2007). The Adolescent Athlete: A Practical Approach. New York, NY: Springer.

(18). Myer, G., Ford, K., Palumbo, J., & Hewitt, T. (2005). Neuromuscular Training Improves Performance and Lower Extremity Biomechanics in Female Athletes. ***Journal of Strength And Conditioning Research***, 119, 51-60.

(19). Parimalam. S and A. Pushparajan .A., (2013). Effect of Specific Basketball Training Program on Physical Fitness and Skill Performance Variables of Inter Collegiate Women Basketball Players, ***International Journal of Advanced Life Sciences (IJALS),*** 6 (1): 33 -34.

(20). Price, R.G. (2006). ***The Ultimate Guide to Weight Training for Basketball - 4th editions***. Cleveland, OH: Price World Enterprises.

(21). Radcliffe, J.C., & Farentinos, R.C. (1999). ***High-Powered plyometric***. Champaign, IL: Human Kinetics.

(22). Santos, E., & Janeira, M. (2008). Effects Of Complex Training On Explosive Strength in Adolescent Male Basketball Players. ***Journal of Strength and Conditioning Research***, 22 (3), 903-909.

(23). Scott Lucett, (2013).Speed and Agility Training for Basketball, ***Strength Cond Res,*** 12(2): 212-6.

(24). Sharma, Deepti, Kaur Multani, Narinder (2012) Effectiveness of Plyometric Training in the Improvement of Sports Specific Skills of Basketball Players.