Section 9. Physical Education

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THE EFFECTS OF PLYOMETRIC ON MALE BASKETBALL PLAYERS

Abstract: This study aims to evaluate and compare the effects of the plyometric training method of force, in improving the ability of basketball players. In this study participated 20 basketball players of the “Partizani-basket” team participating in the Albanian Basketball Championship for adults (2017–18). Participating basketball players of this activity were made aware of the purpose of this study and the invitation to participate in it. They were involved in this study with their own desire. The team would be trained for 12 weeks, according to a defined physical fitness program for the preparatory period, focusing twice a week on plyometric exercises in addition to other elements of physical preparation as a whole. All the basketball players taken in this study were measured before and after the 12 week period of conditioning in the off season on vertical jump, long jump, and parameters associated with these tests. The data subjected to statistical processing using the IBM SPSS Statistics software 22 method. The overall team at the end of the preparation period had a significant improvement in propensity ($p < 0.05$) in the vertical jump (< 14.3 cm) on the longest (< 15.8 cm). The results of this study showed that the effects of the plyometric training method of the force increased with significant indicators especially in the motors of ability performance in the basketball team of the “Partizani-basket” team.

Keywords: Basketball; Preparation Time (Conditioning); Plyometric Force Training Method; Conditioning Program; High Jump; Long Jump.

Introduction

The plyometric training of force training has now been recognized as one of the most effective and full-fledged improvement techniques in basketball, especially jumping in basketball and at the same time a significant component of most of the programs designed for physical condition. The plyo-

metric training method of the force (or often referred to as group exercise of muscle extension and muscle contraction) is often used during basketball training programs in preparatory period (off season) as an effective method for improving motor performance [1, 159; 2, 86].

Exercise of the force as a whole is also an important part of the training program during the preparatory period for basketball players with a background experience related to benefits that improve motor performance and undoubtedly reduces in any case injuries to basketball players [3, 123; 4, 47].

Use the exercises of the method of force plyometric, certainly not excluded, but instead combine them with force exercise in general, thinking that motor performance can be increased with a greater speed quite significant, than any other program performance [5, 219; 6, 170].

Exercise of the plyometric method affects the “first” neuromuscular system (pro-perceptive). Force training requirements by the increased activation of nerve pathways, certainly increase the neuromuscular system’s readiness to a higher degree [7, 117–118].

The use of not only plyometric exercises, but the whole of strength exercises to jointly involved and also in training, is an adequate strategy for the organization of the training process, which has positive effects, high, in the training practice, especially in management as rationally as her time. Also, the growing demand and popularity that have gained strength conditioning programs to basketball players have undoubtedly increased besides the potential for health benefits [8, –66] and these efficient methods for increasing winner performance, athletes in general and basketball players especially.

Hypothesis of this study

Was that in addition to other methods of developing strength of the coordinated plyometric method of force development education will undoubtedly result in an improvement of the skills of the great sinful performance motors.

Methodology

In this study participated 20 basketball players of the “Partizan” team participating in the Albanian Basketball Championship for adults, who would be trained according to a defined physical condition program, for 12 weeks of the preparatory period,

focusing twice on week to develop mainly plyometric exercises for intensity, combined with other strength training exercises for other parts of the body like arms, backs, belly, or the latter known as “core” muscles. So during the entire preparation period, it would work to increase physical condition for the performance of the basketball game in the championship. Changes in all indicators (variables) were measured before and after 12 weeks of the training program.

Participating subjects are chosen randomly and at their own discretion. The team received in this study had these parameters: no. = 20; age 21.5 ± 0.8 , weight 85.6 ± 2.6 kg; stature 188.9 ± 1.4 cm; BMI 23.9 ± 0.6 and a basketball training experience of 8.4 ± 3.5 years.

Team participants received in this study experienced a relatively significant training ground, but often trained in the preparation period the overall training programs rather than focusing to increase indicators of the parameters to the lowest motor skills such as jumping, speed, flexibility, etc.

Basketball participants of this team were informed about the nature as this project and had been approached by them prior to the start of the study. Undoubtedly the team’s technical team staff was informed and prepared about the study procedures, possible risks if the exercise requirements and the potential benefits of this study project were neglected. All the training sessions were held in the respective halls in Tirana. (“Partizan-basket” team often at its own club hall and planned to develop force in the S.U.T. Fitness hall).

Procedures: Five tests were selected for assessment of physical fitness performance. Such tests are often used in assessing the performance of athletes. Test procedures; for vertical high jump, long jump, 4×15 m (from high starts running) and flexibility test. All these can be found [9, 181] and 20 m sprint.

The training program used in this study was compiled by the author of this research study and is based on the following publications [10, 45].

The team was training 2 times a week with alternatives between days for 12 consecutive weeks. From the technical staff basketball players were recognized through demonstrations with the technical, rational requirements of each exercise during the study period. The training was largely supervised, directed and regulated the nature of the training intensity stimuli in accordance with the duty for training. Extension of training sessions for this purpose was 90 minutes for the team received in this study.

Basketball players participating in the training sessions developed for 15 minutes the heating period, which consisted of a moderate intensity with a complex of dynamic exercises that were different from each other. Recent surveys suggest that this may be more effective (ie heating) with the heating protocol for growth, intensification of power performance (ie force-speed ratio). After the good warm-up period with the team began with the planned plyometric exercises, divided into several repeating sets in optimal ratios with the time of rest (approximately 30–35 minutes). After that they continued the program with other elements of the force (approximately 35–40 minutes). Each training session ended with exercises for cooling, mostly stretching exercises, which lasted (approximately 5–10 minutes) [11, 60–64].

During the execution of this planned program, no change or permission of any other program offered by other entities is allowed.

Protocol warm-up: The warm-up protocol consists of 10–15 minutes with moderate intensity in the fast walking (jogging) followed by a moderate intensity not, but slightly higher dynamic exercises. They include, course “skip” Running with knees up, themrat touch the buttocks, “karaoke” side ploy during jogging, hiking precipitate front, side kick (from both sides and shot to step forward or back (the withdrawal) Descriptions details of stretching exercises can be found at the national basketball training association – NBCCA (2007).

The game with basketball elements for physical preparation in this period throughout the field requires carefulness because often this type of exercise adds monotony and above all exerts a chronic stress on the skeleton muscle system [12,248].

Plyometric training: The plyometric training program consists of three levels. The participants perform 10 plyometric exercises from the first to the fourth week (1 set of 10 reps per week 1–2 and 12 reps per week 3–4) and 12 plyometric exercises during the fifth to the tenth week (1 set of 10 Repeat for the week 5–6 and 8 reps per week 7–8). For the third level, 12 exercises have been re-selected for the week 9–12 (1 set of 8 repetitions per week 9–10 and 6 repetitions per week 11–12). The exercises were according to the protocols outlined by: [13,36].

Table 1.– Overview of plyometric training program

Week 1–4 1 Set / 12–10 repeats	Week 5–8 Set 1 / 10–8 repeats	Week 9–12 Set 1 / 8–6 repeats
1	2	3
1 – “Skip” running fast	1 – Dance and kick with the heels and behinds	1 – Jump gallop with great step forward
2 – “Pogo” (Jump-up, knee to chest)	2 – Jump-up	2 – Alternate jump 1 foot on the box
3 – “Rocket jump”	3 – Jump with open legs	3 – Fast jump
4 – Jump with ball / medicine over and above	4 – Jump scissors	4 – Jump of depth
5 – Jump with turn 360° over medicine ball.	5 – Jump alternating legs	5 – Jump with pod “box” (CR) multiple answer

1	2	3
6 – Jump with MB from the chest	6 – Throwing MB with jump and turn	6 – MB throwing from down-up-behind
7 – Fast jump with two legs	7 – MB before-up running to catch it	7 – Jump and throwing MB over heads and await (CR)
8 – Progressive fast jump on both legs	8 – Jump-up, knee to chest and sprint	8 – Jump and throwing MB below hand
9 – Jump side	9 – Jump with one leg and kick	9 – Jump side
10 – Jump side – sprint	10 – Jump with one leg and progressive kick	10 – Box – skip
	11 – Jump with one leg diagonal	11 – Box – bound
	12 – Jump with one leg side	12 – Jump of depth

MB = Medicine ball CR = Consecutive repeats

Statistical analysis: The Statistical Analysis was performed using the IBM SPSS Statistics software 22. The statistical techniques used include: general descriptive analysis, evaluation of data distribution, and search hypothesis search through differential techniques between two measurements, using t-test. T-test was used to identify the effect of the training plan applied to the “Partizani-basket” team during the preparatory training period. The size of the study selection includes 20 basketball players aged 18 ± 0.8 .

Results

In the table below are given the performance data motors before the start of the training process of the preparatory period and at the end with the team “Partizani basket”. Participating basketball players in this study carried out almost 100% of the training sessions, with the consent of each of them, without causing any injury during the realization of this training process. In general, the data obtained from the variables after the realization of the program of study result positive, with the increase of initial values, though not significant and significant in some cases. Let's take them apart and discuss each one of them.

Table 2. – Motor performance results before and after the training period.

No.	Tests	IT	FT	Benefits	
				Absolute	%
1.	High jump vertical (cm.)	41.9 ± 6.8	56.2 ± 5.7	14.3 *	34.1%
2.	Long jump (cm.)	240.1 ± 10.1	255.9 ± 12.3	15.8 *	6.6%
3.	Running 20 m. sprint (sec.)	3.29 ± 0.2	3.21 ± 0.1	– 0.08	2.4%
4.	Running 4×15 m. (sec.)	12.94 ± 0.6	12.41 ± 0.5	– 0.53	4.1%
5.	Throwing MB (cm.)	793.7 ± 50.7	873.7 ± 66	80.0 *	10.1%
6.	From sit trunk flexibility (cm.)	5.65 ± 4.1	12.85 ± 3.9	7.20 *	127.4%

Note: * Significant improvements compared to the measurement before the start of the training process

Discussion

The hypothesis that a combined plyometric training program results in relatively significant improvements in motor performance abilities. Basket-

ball players in this study have made a significant improvement to strength in the upper and lower body parts, which are seen as essential requirements for basketball performance [14, 53]. Vertical jump in

the first measurement to the second comparison results in a significant increase in the average absolute benefit of 14.3 cm, which in percentage 34%. These results are a testimony of previous achievements demonstrated by: [15, 86–87].

We can also say that we have a more even increased improvement in the long-jump distance of 15.8 cm from basketball, which in percentage 6.6% achieved the same results [12, 248].

Regarding the speed of 20 m (sprint test), study showed that plyometric and strength training improved the performance of basketball players taken in this study and concretely with the following results: – 0.08 sec. which in the percentage results 2.4% [16, 221–222].

The performance of the 4x15m running start-up test consists speed of start frequency with non-stop, as well as change in direction and apparent detectability in the level of muscle strength and flexibility we have pointed out, the plyometric training and strength training program increases the muscular power and flexibility, which is related to success in the 4x15m agility test. As we have pointed out, the plyometric training and strength training program increases the muscular power and flexibility, which is related to success in the 4 × 15 m agility test [17, 74].

Basketball players in this study have a significant improvement in throwing medicine balls by 80 cm and in percentage 10.1%. The same can be said for the flexibility test, where the improvement is significant of 7.20 cm with a profit of 127.4%. Thus, the strengths and power of the basketball players have already been proved, after applying, merging or joining some types of training of the force in the content of the training sessions in basketball [18, 230–231]. This reality is similar to previous studies which suggest that regular participation in a well force development program will obviously result in some levels of motor performance improvement [17, 76].

Correct and fully supervised application of training programs, far from overload (extra) in the skeleton muscles of the athletes, proves and eliminates injury during the training process. Therefore, contemporary of condition programs, which include plyometric and force training, and which are applied correctly and rigorously, have proven to be an effective way to avoid or reduce injuries to athletes [19, 113; 20, 60].

Conclusions

- The discovery, the selection of the most efficient ways to increase the performance of athletes, in our case of basketball players, is the first and very important step in the progress of the training process.

- The results of this study are a potential added value in the application of the plyometric method and force program for the preparatory period, with the sole purpose of maximizing the performance of basketball players in the game.

- Design of the training program by us in combination with plyometric method with that of forces, provides an efficient time in modalities, rational movements in training, associated with significant improvements in motor performance in the following matches.

- On this basis and the preliminary achievements of this study, conclude that the effects of plyometric training and strength are often synergistic in the impact of engine performance increase on basketball players rather than the effects of using a single strength training program.

- The offered study also confirms that it is important to achieve significant statistical progress in providing performance motors, from the training program applied to basketball players in our case.

- Finally, we think that combined plyometric training with that force is a very useful tool for innovative trainers in the field of strength training, as well as contributing to other timely efficient training.

References:

1. Matavulj D., Kukolj M., Ugarković J., Tihanyi J., & Jarić S. "Effects of plyometric training on jumping performance in junior basketball players"; *Journal of Sports Medicine and Physical Fitness*, 11, 2001.– 159 p.
2. Radcliffe J. C., & Farentinos R. C. "High-powered plyometric" Champaign, IL: Human Kinetics, 3, 1999.– 86 p.
3. Fleck S. J., & Kraemer W. J. "Designing resistance training programs" – 3rd edition. Champaign; Human Kinetics. 7, 2004.– 123 p.
4. Price R. G. "The Ultimate Guide to Weight Training for Basketball"; – 4th edition. Cleveland, OH: Price World Enterprises. 2006.– 47 p.
5. Faigenbaum A. D., McFarland J. E., Keiper F. B., Tevlin W., Ratamess N. A., Kang J., & Hoffman J. R. "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, 2007.– 219 p.
6. Fatouros I. G., Jamurtas A. Z., Leontsini D., Kyriakos T., Aggelousis N., Kostopoulos N., & Buckenmeyer P. "Evaluation of plyometric exercise training, weight training, and their combination on vertical jump performance and leg strength"; *Journal of Strength and Conditioning Research*; 14, 2000.– 70 p.
7. Linnamo V., Newton R., Hakkinen K., Komi P., Davie A., McGuigan M., & Triplett-McBride T. "Neuromuscular responses to explosive and heavy resistance loading"; *Journal of Electromyography and Kinesiology*; 10, 2000.– P. 117–118.
8. Faigenbaum A. D., & Westcott W. L. "Youth strength training: program for health, fitness and sport". Champaign, IL; Human Kinetics. 5, 2009.– 66 p.
9. Safrit M. "Complete guide to youth fitness testing"; Champaign, IL: Human Kinetics. 1, 1995.– 181 p.
10. Faigenbaum A. D., & Westcott W. L. "Strength and power for young athletes"; Champaign, IL: Human Kinetics. 4, 2000.– 45 p.
11. Cometti G. Cometti D. "La pliometria" (origini, teorie, allenamento) 2a edizione italiana, Capitolo V: I TEST; Test di Bosco; 2009.– P. 60–64.
12. Faigenbaum A. D., Milliken L. A., Moulton L., & Westcott W. L. "Early muscular fitness adaptations in children in response to two different resistance training regimens"; *Pediatric Exercise Science*; 17, 2005.– 248 p.
13. Radcliffe J. C., & Farentinos R. C. "High-powered plyometric" Champaign, IL: Human Kinetics. 2, 1999.– 36 p.
14. Fulton K. T. "Off-season strength training for basketball"; *National Strength & Conditioning Association Journal*, 14, 1992.– 53 p.
15. Adams K., O'Shea J. P., O'Shea K. L., & Climstein M. "The effect of six weeks of squat, plyometric and squat-plyometric training on power production"; *Journal of Strength and Conditioning Research*; 6, 1992.– P. 86–87.
16. Kotzamanidis C. "Effect of plyometric training on running performance and vertical jumping in prepubertal boys"; *Journal of Strength and Conditioning Research*; 20, 2006.– P. 221–222.
17. National Basketball Conditioning Coaches Association "Complete conditioning for basketball"; Champaign, IL: Human Kinetics. 11, 2007.– P. 19, 74–76.
18. Vamvakoudis E., Vrabas I., Galazoulas C., Stefanidis P., Metaxas T., & Mandroukas K. "Effects of basketball training on maximal oxygen uptake, muscle strength, and joint mobility in young basketball players"; *Journal of Strength and Conditioning Research*; 21, 2007.– P. 230–231.
19. Koutures C. G., & Gregory A. J. M. "Injuries in youth basketball"; *Pediatric*; 25, 2010.– 113 p.
20. Myer G., Ford K., Palumbo J., & Hewitt T. "Neuromuscular training improves performance and lower extremity biomechanics in female athletes"; *Journal of Strength and Conditioning Research*, 12, 2005.– 60 p.