ORIGINAL ARTICLE

The effectiveness of two types of resistance training program and plyometric on the performance of female basketball players

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ABSTRACT

Background: Basketball is the most popular sport in the world, played by many different levels of competition. The aim of this study was to investigate the effect of two types of 4-week plyometric and resistance training programs on the performance of 19 to 24 year-old female basketball players.

Materials and methods: For this purpose, 30 basketball students, members of university teams in Erzurum province were randomly divided into three groups of 10, including plyometric, strength (with weight) and control. Strength (dynamometer), 60 sprint meter and agility were measured on the first day of the pretest. Then, the two resistance and plyometric groups performed selected resistance and plyometric exercises with basketball for 4 weeks (two sessions per week) and the control group with specialized basketball exercises. At the end of the training period, the same tests were performed in the same way as the pre-test in two days, respectively, and the raw data were one-way analysis of variance, repeated measures analysis of variance, paired t-test and Tukey post hoc test. It was analyzed as follows:

Results: Both plyometric and strength training significantly increased the maximum strength, but specialized basketball exercises (control group) did not have a significant effect on the maximum strength factor. There was a significant increase in sprint and agility in plyometric and control, but no significant increase was seen in the strength group.

Conclusion: Specialized basketball exercises, for the full development of physical capacity can be used in female students.

Key words: speed, power, agility, strength

INTRODUCTION

Basketball is the most popular sport in the world, played by many different levels of competition. During the game, elite players run hard to close to the anaerobic threshold. Among these activities, the player performs many explosive moves such as jumps, shoots, spins, starts, position changes and most importantly activities in which the player is directly involved in playing with the ball and competing for possession and needs. In basketball, as in many sports, physical fitness plays a crucial role in optimal performance. Having the right physical condition requires a proper training program that can improve factors such as cardiorespiratory endurance, muscular endurance, strength, speed, explosive power and flexibility of athletes. Therefore, basketball is a sport that requires aerobic and anaerobic training.[1] One of the important topics in physical education that has focused the thoughts of experts in the world, is the role of activities in physical programs on different systems of the body, and since muscle strength as one of the factors of physical fitness plays an important role in Health plays a role, familiarity with different methods of increasing muscle strength will lead to the development and expansion of health. Although man has found for thousands of years that hard work increases physical strength, but only in recent years, with the help of scientific studies and research has been able to realize the benefits of various types of strength training.[10] In a coach's effort to nurture athletes, strength training is an essential factor. All athletes who are somehow active in competitive sports follow an annual schedule that brings them to peak performance during the competition or major competitions.

Therefore, among the set of factors that form the physiological framework for achieving peak performance, strength training is a key factor.[3] Strength training is physical activity that leads to increased muscle strength and muscle mass.[4] In connection with the performance of each exercise and to achieve the desired preparation, it is necessary to perform special exercises. In physics, power is: doing a certain thing in a unit of time, in other words, power is the speed of doing work. According to this definition, anaerobic power, maximum muscle power, and explosive power are similar concepts of power. Since each sport requires one of the factors of strength, endurance, power, flexibility, speed or a combination of them, which differ depending on the type of sport. For this reason, physical fitness is essential for performing movements, having high speed, power and explosive power. Plyometric training is one of the common training methods that is very important in boosting explosive strength by properly combining speed and muscle strength. One of the best ways to increase explosive power in speed disciplines is plyometric exercises.[11]

Undoubtedly, it can be claimed that in most countries, basketball is the first and favorite sport of most young people. On the other hand, the successes and failures of the national basketball of the country can affect the mood of the whole society. Therefore, the importance of addressing the category of basketball from various scientific aspects is well felt.[5]

We all know that the progress and order that exists in basketball today is not only the result of basketball training alone, but also the research findings of various sciences including physiology, sports nutrition, biomechanics, psychology and even software sciences. Various have played in this sport.[6]

Although technical and tactical issues can be taught to players based on the findings and experiences of acting

and coaching, successful training of physical fitness on which the technical and tactical elements are based undoubtedly requires the scientific support of the trainer.[7] The main goal of the training process is definitely to increase performance. This goal is of the highest value for athletes and coaches. However, it is not easy to achieve. Performance enhancement is actually a process that leads to adaptation.[8] As a result of physical exercise, many adaptations occur in the nervous and muscular system. The degree of adaptation depends on the type of exercise program.[8] Strength is a necessary ability to perform more movements and physical activities. The biological basis of strength is the muscular structure that is the largest system in the body. About 35% of women's body weight and 45% of men's body weight is composed of muscle tissue.[9]

Various findings and developments in the field of muscle strength have led to the completion of training programs in various sports. Various scientific findings, some of which examine the student age group, indicate the positive and important effects of resistance training on the development of athletic performance, and progressive strength training leads to an increase in maximum strength and muscle mass, even in men and women get older[10] Internal research indicates a lack of strength and power in the upper torso of students of different levels of education. For example, Hoff, Helgerud (2004) in a study of boys aged 9-17 years, concluded that the average horizontal stretch in all these age groups is lower than their peers in American schools.[12]

The American National Association of Orthopedic Strength and Physical Fitness and the American Academy of Pediatrics have shown that students can benefit from a well-planned resistance training program. The benefits of using such a program are: increase muscle strength, local strength and endurance of muscles, reduce injuries in sports and leisure activities, increase performance in sports and leisure activities, muscle hypertrophy, increase flexibility, improve body composition Reduce blood lipids, lower blood pressure and improve cardiorespiratory function.[13] Considering the importance of resistance and plyometric training in basketball and the effect of the benefits of this type of training, we decided to see if the effect of these two types of selected resistance and plyometric training methods, with basketball training for four weeks can affect some performance factors, such as strength (dynamometer), 60 sprint meter and agility of 19- to 24-year-old female basketball students.

Statistical population and selection method of subjects: The statistical population of this study consisted of high school male basketball students aged 19 to 24 years who were members of school teams in Erzurum. Out of 80 volunteers to participate in the study, 30 met the inclusion criteria. In this study, the experiments were randomly divided into three groups: control group, plyometric group and resistance group. Each group consisted of ten basketball students.

Exercise protocol: At the beginning of the work, one day before the initial measurements (pre-test), a briefing session was held to describe the work plan, and the subjects completed the consent form for participating in the research, as well as a medical questionnaire to confirm their health. On the morning of the pre-test, subjects were measured for height, mass, body composition, and body fat percentage. The subjects then performed physical activity for 15 minutes in order to warm up, which included soft running, stretching, and flexion with emphasis on the lower torso. The subjects then performed general jump tests, respectively; Illinois dynamometer and agility were performed and their recordings were recorded**.**

On the morning of the third day, the 60-meter sprint, agility and strength. Then, for four weeks, all three groups started the training intervention, and after a day of rest, the subjects were measured for the tests.

Data analysis: One-way analysis of variance was used to examine the differences between groups in the pretest. Analysis of variance with repeated measures was used to examine between-group and within-group changes. SPSS 18 software was used for statistical analysis at level of $p < 0.05$.

RESULTS

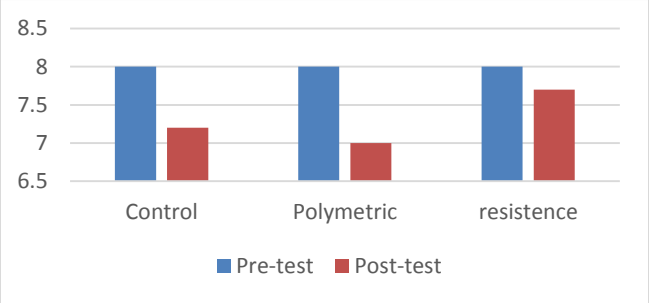

Fig.1. 60 sprint meter

The results showed that the record speed of the subjects in all three groups showed a significant effect. There was a significant difference between the plyometric and control groups with the resistance group. But there was no significant difference between the control and the plyometric group.

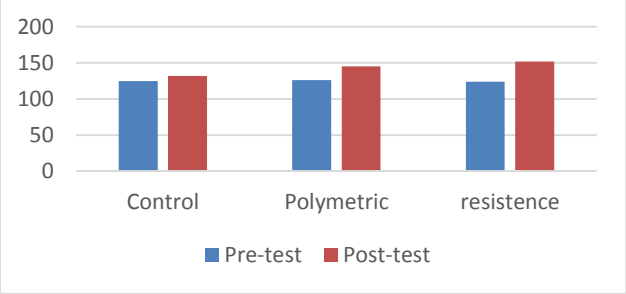

Fig. 2. Maximum Power

The results showed that the record of maximum power in plyometric and resistance groups a significant effect. There was a significant difference between the plyometric and resistance with control group.

The results showed that the agility of the subjects in plyometric and control groups showed a significant effect. There was a significant difference between the plyometric and control groups with the resistance group. But there was

no significant difference between the control and the plyometric group.

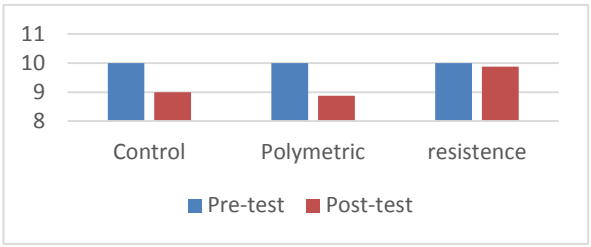

Fig. 3. Agility

DISCUSSION AND CONCLUSION

The results showed that the record speed of the subjects in plyometric and control groups showed a significant effect. There was a significant difference between the plyometric and control group with the resistance group. Regarding the effectiveness of plyometric as well as specific basketball training on the record running time of research, Greg. (2000), Greg (2009), are not consistent with the present study may be due to the age difference between the subjects and the different training programs.

At maximum speed, fast-moving units engage, and since the execution of the movement is without load, there is no need for slow-moving units to engage.[12] As a result two groups experienced a significant reduction in two-speed time due to the involvement of fast motion units. Since plyometric exercises in the contraction stretching cycle change the velocity in each phase of extroverted and introverted contraction, increasing and strengthening these two phases causes neuromuscular coordination, improving reflective electrical activity, increasing the contraction rate and using the unit. More motor skills therefore, reduce the time interval between extroverted and introverted contraction phase. As a result, plyometric exercises increase and improve speed.[13] Studies show that plyometric exercises can improve biomechanical technique and neuromuscular control during rapid activity.[14]

The record of maximum power (dynamometer) in the power and plyometric groups has changed significantly. But no significant difference was observed in the control group. There is no significant difference between the groups in the record of the strength and plyometric groups. It has also led to the development of power. In the control group, because strength training did not have a special place, therefore, no significant difference was observed in the record, which makes the importance of strength training when preparing teams.

Considering the importance of power in basketball and the need to strengthen the related energy production systems, the reason for the increase in maximum power in the resistance training group compared to the other two groups is due to possible mechanisms such as: increasing the number of nerve impulses of motor units. Increase in the number of nerve units, increase in the size of type I and II muscle fibers, and increase in anabolic hormone levels.[15] Therefore, in the present study, the combination of basketball exercises with plyometric movements has increased the maximum strength. Finally, experimental evidence suggests that plyometric exercises focus not only on neuromuscular adaptations but also on bone and tendon-muscle adaptations.[16]

The results showed that the agility of the subjects in plyometric and control groups showed a significant effect. There was a significant difference between the plyometric and control groups with the resistance group. But there was no significant difference between the control and the plyometric group. Plyometric activities cause neuromuscular coordination and increase the speed range. In addition, exercise causes changes in the neuromuscular system and allows the athlete to have more control over muscle contraction and change its direction. This action is attributed to the automatic increase of the nervous system.[17]

Specialized basketball exercises, for the full development of physical capacity can be used in female students.[18] Special agility exercises are more influenced by movement control factors than by the amount of muscle strength and power. The researchers concluded that the improvement in performance in the agility test due to plyometric exercises could be due to better use of motor force or due to neural adaptation (Adams et al., 1992).

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