International Journal of Religion
2024
Volume: 5| Number 4 | pp. 97 –102
ISSN: 2633-352X (Print) | ISSN: 2633-3538 (Online)
ijor.co.uk
DOI: https://doi.org/10.61707/hb6yzp87

The Effect of Core Strength Training on Free Throw and Vertical Jump Performance in Basketball

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Abstract

The aim of this study is to investigate the effect of core training on free throw and vertical jump performance in basketball. The study sample consisted of 18 female basketball players with an average age of 11.36 ± .505 years who had been playing basketball for 2 years and voluntarily participated in the study. The sample group was selected using the convenience sampling method, so no power analysis was performed. The athletes were randomly divided into two groups, the experimental group and the control group, with 9 athletes in each group. The average age of the experimental and control groups was 11.36 ± 0.505 years and 12 ± 0.632 years, respectively, the average height was 151.64 ± 9.124 cm and 142.45 ± 4.634 cm, respectively, and the body weight was 40.55 ± 7.461 kg and 45.55 ± 5.298 kg, respectively. While the participants in the experimental group completed the core training program twice a week for eight weeks, no training program was carried out in the control group. Participants were asked to make 10 free throws each, including before and after the test, and those who hit 10 were recorded. The t-test for independent samples was used to analyze the data (p < 0.05). As a result of the study, it was found that core training positively influenced the free throw performance of 11-13 year old basketball players (p=.017), while no statistical significance was reached for vertical jump performance (p=.351).

Keywords: *Basketball, Core Strength Training, Vertical Jump, Free Throw*

INTRODUCTION

Basketball is one of the most popular sports today (Ünlü et al., 2024). For this reason, all studies carried out in this industry are very important and are followed and carefully examined by the coaches, athletes and even managers of the basketball industry. Team sports are not areas where success can only be achieved by reaching a physically sufficient level. It requires a harmonious interplay of sporting and social components (Samur, 2018; Erail & Uzun, 2023). At the same time, the athletic components of the individual sports differ from one another. In order to achieve an optimal level of fitness, the load phase must be properly controlled and the core area must be strong in order to perform the load correctly (Savaş, 2013). Basketball is a sport that emphasizes skill, coordination, speed and agility. Good basketball skills are possible if one optimally fulfills the analysis requirements specific to this sport (Kızılet et al., 2011; Gunes, 2023).

Fatigue is an important factor in athletes' ability to adequately demonstrate their technical skills. Athletes' level of fatigue during competition directly affects their performance and determines the degree of clarity in game design and technical skills (Göktepe, 2020). Basketball is generally a sport that utilizes the aerobic energy system. The percentage of athletes using their energy system is reported in the literature as 80% aerobic and 20% (Kaçar, 2019). However, attacking, shooting, passing, etc. Power, which is an extremely important parameter in skill execution, is mainly provided by the anaerobic energy system in basketball (Göktepe, 2020). Most of the balance and postural control through power transmission is provided by the core region (Willardson, 2013).

The trunk region, or the region that connects the arms and legs, comprises the center of gravity of the body, includes the waist, hips, pelvic region and abdominal region, and is formed by the combination of 29 different muscles, is called the core region (Dilber et al., 2016; Samson, 2005). In short, this region, which is also defined as the center of the body's functional kinetic chain, is crucial for the coordinated movement of the lower and upper units of the body. For this reason, it is also known as the center of power, which can control the movements of all the limbs of the body (Egesoy et al., 2018). Balance is the process of maintaining the current

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position of the body or adapting to a new position. The core muscles and correct posture are also of great importance in maintaining the body's balance (Scott, 2008). They are also very important in preventing injuries that can occur during sporting activities as they affect core development, posture and balance maintenance. Training specifically aimed at activating the core can be referred to as core training (Savaş, 2013). Core training methods have been among the most popular types of training in recent years, which are performed using the body's own weight. The core muscles can also be affected by a sedentary lifestyle and lose their functions. In short, exercises that target the core increase performance and reduce the risk of injury while helping to demonstrate higher quality movement skills by facilitating movement transitions.

Consistent with all of this information, the aim of this study is to make a positive contribution to athletic performance by examining the effects of 8 weeks of core training on free throw performance in female basketball players aged 11-13 years.

MATERIAL AND METHOD

Participants

Research group 18 female athletes between the ages of 11 and 13 who had been playing basketball for 2 years took part in the study. The sample group was selected using the convenience sampling method, so no power analysis was performed. The female athletes were randomly divided into two groups, the experimental group and the control group, with 9 athletes in each group. The inclusion and exclusion criteria for the athletes participating in the study were as follows;

Inclusion Criteria For The Participants

a) Be between 11 and 13 years old,

b) No health problems

c) They must have been playing basketball for at least two years

Exclusion Criteria

a) You must had suffered an injury or surgery in the last 6 months

b) Failure to participate in 10% of the total training sessions

c) Non-participation in one of the measurements

d) The participant voluntarily withdraws from the study at any time during the study.

Core Training

While the experimental group trained twice a week for 8 weeks, the control group took part in technical-tactical exercises during the transition period. Before training, the athletes were informed about core training, how to perform the movements correctly and what to look out for. The training exercises were carried out at the same times every day, after a 10-minute warm-up. A break is taken between the movements and sets. The movements selected for the training program were plank, obluque plank, crunch, plank with leg raise, Russian twist, mountain climber and squat, which are among the most commonly used core exercises. The exercise time and the number of repetitions of the movements were increased every two weeks. Two instructors took part in all studies. The first trainer ensured general order and monitored the duration and number of movements in the workout. The second trainer helped the athletes to perform the movements correctly. In this way, an attempt was made to achieve full efficiency.

Table 1. Core Training Program

Periodization												
	1-2 Weeks			**3-4 Weeks**			**5-6 Weeks**			**7-8 Weeks**		
	Reps (sec)	**Set**	**Rest**	**Reps (sec)**	**Set**	**Rest**	**Set**	**Reps (sec)**	**Rest**	**Set**	**Reps (sec)**	**Rest**
The Plank	30	3	20	40	3	30	3	50	40	3	1 min	50
Reverse plank	30	3	20	40	3	30	3	50	40	3	1 min	50
Oblique Plank Right	30	3	20	40	3	30	3	50	40	3	1 min	50
Oblique Plank Left	30	3	20	40	3	30	3	50	40	3	1 min	50
Cruch	20	3	20	25	3	30	3	30	40	3	35	50
Bicycle Crunch	20	3	20	25	3	30	3	30	40	3	35	50
Plank With Leg Raises Right	7	3	15	10	3	20	3	12	30	3	15	40
Plank With Leg Raises Left	7	3	15	10	3	20	3	12	30	3	15	40
Russian Twist	30	3	20	40	3	30	3	50	40	3	1 min	50
Mountain Climber	30	3	20	40	3	30	3	50	40	3	1 min	50
Squat	10	3	15	13	3	20	3	15	30	3	18	40

Data Collection Tools

Free Throw Test

Participants went to the free throw line on the basketball court and made 10 compliant free throws with the "FIBA-approved No. 7 basketball "MOLTEN B7g 5000". Of the 10 throws, those that were correct were recorded.

Vertical Jump Test

In the test application, participants stand sideways with one shoulder touching the wall, raise their arms sideways from the wall, and the highest point their fingers reach is determined. The participants move 30 cm away from the wall, jump with the strength of their legs and touch the highest point they can reach with their finger. The difference between the height determined before the jump and the jump height is recorded as the vertical jump height.

Statistical Analysis

In the statistical analysis of the data, descriptive analyzes of the basic characteristics of the basketball players were calculated as mean and standard deviation. The Shapiro-Wilk test was used to check the normality of the data. Since the data showed a normal distribution during data entry and statistical analysis, the t-test for independent samples, one of the parametric tests, was used. The analyzes were performed using the SPSS 22.0 program, with $p < 0.05$ assumed as the significance level.

RESULTS

Table 2. Table with the descriptive data of the participants

Groups	Experimental Group (N=11)	Control Group (N=11)
	Avg ± Sd	Avg ± Sd.
Age (year)	11,36 ± ,505	12 ± ,632
Height (cm)	151,64 ± 9,124	142,45 ± 4,634
Weight (kg)	40,55 ± 7,461	45,55 ± 5,298

The descriptive data of the participants were examined. The average age of the experimental and control groups was 11.36 ± 0.505 years and 12 ± 0.632 years, respectively, the average height was 151.64 ± 9.124 cm and 142.45 ± 4.634 cm, and the body weight was 40.55 ± 7.461 kg and 45.55 ± 5.298 kg.

Table 3. Pre-test/post-test results of the free-throw accuracy of the experimental and control groups

Groups	Pre-test (N=11)		Post-test (N=11)		p
	x	sd	x	sd	
Experimental Group	20,91	20,226	35,45	11,282	,017*
Control Group	28,18	12,160	29,09	9,439	,898

*p<0,05

The free-throw hit rates of the experimental and control groups were compared as a pretest and posttest, and a statistically significant increase in favor of the experimental group was found

($p < 0.05$).

Table 4. Pre-test/post-test results of the vertical jump test of the experimental and control groups

Groups	Pre-test (N=11)		Post-test (N=11)		p
	x	sd	x	sd	
Experimental Group	215,45	17,078	216,36	16,518	,351
Control Group	198,18	8,875	200,09	6,920	,401

p<0,05

No statistically significant result was obtained in the pretest/posttest comparison of the vertical jump parameter of the experimental and control groups.

DISCUSSION

The aim of this study is to investigate the effect of core training on free throw and vertical jump performance in basketball. The training methods that are carried out at a young age form the basis for an athlete to perform at a high level. Among these training methods, core training is one of the training methods that support basic motor skills, improve the body in terms of posture and body statics and help prevent injuries. This study was conducted to investigate the effects of an 8-week core training program on the free throw accuracy and vertical jump performance of female basketball players. Many methods are being developed and implemented to improve the performance of athletes. It is very important for athletes to become stronger, improve their balance and increase their aerobic and anaerobic capacities. It can be stated that scientific studies that have a positive impact on performance are very important for exercise science. It is a fact that advancing technological developments are very beneficial if they are supported by exercise science and the studies are conducted with modern measurement methods.

Yuksel et al. concluded that the "core" training program he used for 8 weeks had a positive effect on the dynamic balance of basketball players and consequently increased 2- and 3-point field goal accuracy. Looking at the literature, it can be said that core exercises are beneficial for all sports and that these exercises should be included in training programs (Egesoy et al., 2018; Savas et al., 2020; Savaş, 2013).

There are numerous studies in the literature that demonstrate the benefits of core exercises. In a study conducted with 10-12-year-old swimmers, statistically significant results were obtained for the parameters of vertical jump, balance, speed, vertical jump, paw grip strength and flexibility after 8 weeks of core training (Öz Doğru, 2018). In another study in which static and dynamic core training was applied to swimmers, a decrease in the athletes' swimming times was observed (Karakurt, 2020). Considering these results, it can be said that core training has a positive effect on the performance of swimmers. In the study, in which core training was performed for 8 weeks, body fat percentage, flamingo balance, standing long jump and 30 seconds were examined in male badminton athletes aged 0-13 years. It was found that there was a significant difference between the pre- and post-test measurements in the shuttle test. When looking at the changes between the experimental and control groups, a statistically significant difference was found in favor of the experimental group in terms of body weight, speed, and zig-zag agility test scores, and it was concluded that the core training

group showed greater changes in fat percentage, body weight, strength, balance, speed, and agility than the experimental group. The overall study found that eight weeks of core training effectively influenced the physical performance parameters of badminton athletes (Aydın, 2019).

Gür and Ersöz (2017) investigated the core strength, stability and balance levels of tennis athletes and concluded that although 12-week core training was not very effective on the balance parameter of tennis athletes, it was very effective in terms of core strength and stability in terms of athletic performance (Gür & Ersöz Ersöz, 2017). Dilber et al. get. They observed a significant increase in physical fitness parameters of male soccer players as a result of the core training they performed over 8 weeks and suggested that core training should be integrated into soccer training (Dilber et al., 2016). When examining the studies in the literature, it was found that core training had a positive effect on the motor characteristics of athletes and it was found that the literature was consistent with the study results. Carpes et al. (2008) also found in their study, in which they used a core training program, that "regular core training improves back and leg strength."

Similar results were obtained when the effects of core training on athletic performance were investigated. In a study conducted with swimmers, it was found that the athletes' swimming times over 25, 50 and 100 meters decreased significantly after static and dynamic core exercises ($p < 0.05$). In the control group, a significant increase was only observed in the 100-meter performance. As a result, it can be said that static and dynamic core exercises lead to an improvement in some anthropometric variables and motor skills of swimming athletes and also have an effect on swimming performance (Karakurt, 2020).

These include joint stabilization exercises targeting neuromuscular control, contraction-specific exercises, balance exercises, proprioception exercises, plyometric exercises and sport-specific skill exercises. It is believed that it would be beneficial to include core training exercises in the training programs of almost all sports and individuals who participate in sports.

CONCLUSION

It is concluded that strength and balance parameters have an important place in the sport of basketball. It is assumed that it is a preferred training method in addition to the training models used in training these parameters, which are also included in basketball coordination and conditioning training. It is assumed that it can be adapted to appropriate training models in basketball training programs. The literature states that core exercises not only affect balance, but also more than one parameter.

According to the results of the 8-week training study applied to the athletes in the experimental group in the research;

1. Core training positively increased the free throw, vertical jump and shuttle performances of 11-13 year old basketball players,

2. 8 weeks of core training is sufficient for good throwing accuracy and good jumps,

3. Athletes' core training, especially in addition to their normal basketball training, was found to have a major impact on their performance.

It can be suggested that these studies be conducted in industries close to basketball, but the necessary measurements and analysis should be done beforehand. It can be included in the training programs determined by obtaining scientifically reasonable results.

AUTHOR CONTRIBUTIONS

Conceptualization –Y.A, and C.S.; Methodology –C.S..; Formal analysis –V.O.Ç, Y.A, and C.S.; Data curation –C.S.; Writing–original draft preparation –C.S., Y.A; Writing–review and editing –C.S,and V.O.Ç.

SUPPORTING AGENCIES

No funding agencies were reported by the authors.

DISCLOSURE STATEMENT

No potential conflict of interest werereported by the authors.

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