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Effect of an 8-Weeks Core Training Program Applied to 12-14 Years Old Basketball Players on Strength, Balance and Basketball Skill

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ABSTRACT

Aim: This study aimed to provide the effects of 8-weeks core training program applied to 12-14 years old male basketball players on general strength, balance and psychomotor development level.

Methods: Thirty voluntary subjects (experimental group n=16; control group n=14) with an understanding toward the aims of this study were selected and Basketball Psychomotor Development Level, Sport Specific Core Muscle and Stabilization, Stabilometer (static balance) and Y Balance (dynamic balance) abilities, before and after Core Training Program, were measured. In the study, groups were assessed by using paired samples T-Test analysis at the levels of Basketball Psychomotor Development Level, Sport Specific Core Muscle Strength and Stabilization, Stabilometer and Y-Balance parameters. Intergroup Tests were assessed by Independent Samples T-test analysis at pre-test and post-test evaluations.

Results: As a result, statistically significant difference was found in favor of the experiment group in the core strength training program applied for 8 weeks, in the Sports Specific Core Strength and Stabilization, in the Basketball Psychomotor Development level, in the Stabilometer and in the Y-Balance between the groups.

Conclusion: As a result of the measurements, it is suggested that the applied training program has an effect on the development of core strength and core stabilization, static and dynamic balance and basketball psychomotor development level. In order for the development to be sustainable, the core training program should be included in the training routines. As it is applied in the program, it is considered that it would be appropriate to perform it three days a week every other day, and to upgrade the program regularly.

Keywords: Core Stability, Core Strength, Dynamic Balance, Static Balance, Strength Training, Basketball.

INTRODUCTION

Basketball is a contact sports that requires many conditional features while applying technical skills in offense and defense. It is predicted that the static and dynamic balance of the athlete who is in contact with the athlete at the same time while applying these basic technical skills is important. In addition, it is thought that the core strength and core stabilization skills that help the transfer of movement during a movement can affect the technique applied by the athlete.

In sports sciences, the core is the midpoint of the body, including the center of gravity of the human body[1]. Core part of the body is considered to be the area between the knees and the sternum (rib cage) having the abdomen, waist and hips as the focal point [2, 3]. Core strength can be defined as the resistance of the muscles in the core part during a sportive activity. Core endurance is the ability of core muscles to maintain this resistance [4].

Core training includes exercises to train the muscles that control and stabilize abdominal, waist and hip movements. All of these muscles work together to keep the body in balance during an activity. The strength generated during an activity can be transferred efficiently from the leg to the trunk or from the trunk to the leg by increasing the strength of these coordinated muscles. Although the core training method differs from the weight training method in practice, it is aimed at increasing athletic performance and maintaining strength during the rehabilitation process.

The core muscles connect the lower extremity, pelvis, spinal cord, ribs and upper extremities in a kinetic sequence [5, 6]. Movements starting through the core muscular system enable motor control by activating and deactivating, and also ensure being prepared for gravity or torques due to an opponent and reacting dynamically. Developing core is essential for efficient performance from young athletes to professional level [7].

Core stabilization has a positive effect on sport performance. Tong et al. [8] examined the relationship between respiratory muscles and core muscles in high severity runs and stated that fatigue in the core muscles adversely affects running performance due to insufficient levels of respiratory muscles.

Core strength is the ability to perform challenging physical tasks that require good condition and control. As it includes all the deep and superficial core muscles, it plays an important role in core training, but it is important to remember that a good core strength primarily requires a good core stabilizing basis [9].

Core strength and stabilization play an important role in efficiently transmitting the power generated during an activity from the trunk to the extremities or from the extremities to the trunk. When it is considered in terms of performance, it is thought that planned and programmed core training will contribute to improve performance.

Nowadays, physical and technical experts, coaches and athletes at home and abroad have incorporated core strength into strength training, which has a certain effect on the special achievements of each project. The main role of core strength in sports is to generate strength, transmit power and control power, especially for systemic sports projects [10].

Basketball players achieve various activity models (activity patterns) during competition and training. During the activities such as dribbling positions, box-out and rebounding involving basketball-specific sudden shifts, the core represents the biomechanical connection between the

extremities and the trunk and is responsible for generating stabilization and mobility during power generation and absorption at different levels [1].

Basketball is a sport that requires many changes in the position of the body. A defender requires different activations of the core muscular system while changing body positions during defense (for example, while sprinting when returning to defense area, in the stance when defending the dribbler, in the hip extension that provides explosive force in the shot or block, or in the body position taken for rebound (box-out). On the offense, the bowler needs the core muscular system during the dribbling movements for different directions [5]. The shifting movements require different loads on the core muscles, even when passing or preparing the body for the shooting position. The power generated in basketball-specific movements, such as shot and layup, pass through the core area to stimulate multiple muscle movements to maintain postural control and balance [6]. It is necessary to understand the synergistic aspects of functional human movements in order to prepare the athlete physically for the competition. Sports-specific movement models (patterns) and exercises are done to strengthen and enhance functional synchronization of the core muscular system [11].

When implementing an athletic development program aimed at athletes' needs, in order to improve performance and prevent disability the core muscular system should be arranged to include a multi-level movement model (pattern) [7].

It is expected that a core strength training program, which is planned to improve the core strength, core stabilization, static and dynamic balance parameters that basketball athletes need, will meet the athlete's sport specific requirements and also affect their technical skills. Therefore, there has been a curiosity to do this research in order to examine effect of an 8-week core strength training program on 12-14 years old male basketball players on core strength, static and dynamic balance and basketball skill development level.

MATERIAL & METHODS

Participants: 30 male athletes participated in the study voluntarily. These athletes were divided into two groups and one group was determined as experimental group (n = 16) and one group as control group (n = 14).

Procedure: The Pre-Tests were applied to the athletes in the selected Experimental and Control groups before starting the research. In addition to the regular basketball training program, the pre-planned 8-week core strength training program was implemented in two stages to the athletes in the Experimental Group. The control group continued their basketball training program regularly for 8 weeks. Three days after the end of the 8-week training program, the data collection phase was completed by applying Post-Tests to both groups.

The training program given in Table 2 was applied to the experimental group.

Table 1. Descriptive Statistics

Groups	Parameter	N	Min	Max	X± Sd
Experimental Group	Height	16	150,8 cm	180,9 cm	165,4±7,9 cm
	Weight	16	41,4 kg	66,2 kg	53,3±7,3 kg
	BMI	16	16,9 m^2/kg	22,2 m^2/kg	19,4±1,5 m^2/kg
Control Group	Height	14	140,8 cm	163,2 cm	152,4±7,6 cm
	Weight	14	39,6 kg	53,5 kg	44,9±4,4 kg
	BMI	14	17,3 m^2/kg	23,1 m^2/kg	19,3±1.5 m^2/kg

Data Collection: Basketball Psychomotor Development Level, Sport Specific Core Power and Stabilization, Stabilometer (static balance) and Y-Balance (dynamic balance) tests were applied to the subjects.

Statistical Analysis: In the study, the pre- test and post- test evaluation of the groups were made and the developmental values (<0.001 and <0.005) of Basketball Psychomotor Development Level, Sport Specific Core Muscle Strength and Stabilized, Stabilometer and Y-Balance parameters were examined by Dependent Sample T-Test analysis.

Intergroup pre-test- post-test values (<0,001 and <0,005) were analyzed by Independent Sample T-Test analysis.

Table 2. Exercise Protocol

Duration	8 weeks
Intensity	3 days per week
Unit Training Time	45-60 minutes.
Severity	% 40-60
Load- Relaxation	1:1
Loading Range	Min. 48 hours
Training plan:	
Warm- up Protocol:12 min. Jogging – 8 min Dynamic Stretching – 5 min. Static Stretching	
Number of Sets **:**1. and 2. Week 3 sets	
3. and 4. Week 4 sets	
5. and 6. Week 5 sets	
7. and 8. Week 6 sets	
1.-4. Week Training Plan	
1. Prone Plank	20 sec.
2. Side Bridge (Left and Right) / Plank	20 sec.
3. Bridge	20 sec.
4. Swimmer	20 sec.
5. JackKnife	20 sec.
6. Superman	20 sec.
7. Flutter Kick	20 sec.
8. Squat	20 sec.
9. Russian Twist	20 sec.
10. Side Double-Leg Lift (Left and Right)	20 sec.
5. - 8. Week Training Plan	
1. Dynamic Plank (Bird Dog)	20 sec.
2. Dynamic Side Plank (Left and Right)	20 sec.
3. Thera-Band Squat	20 sec.
4. Body Rotation with Medicine Ball	20 sec.
5. Single Foot Pass (Left and Right) with Bosu Ball + Medicine Ball	20 sec.
6. Thera-Band Torso Rotation (Left and Right)	20 sec.
7. Thera-Band	20 sec.
8. Thera-Band Abduction	20 sec.
9. Bosu-Ball + Medicine Ball (Left and Right)	20 sec.

RESULTS

Table 3. Sport Specific Core Muscle Strength Pre and Post Test Results of Independent T Test

Groups	N	Pre- Test			Post- Test		
		X±Sd	t	P	X±Sd	t	P
Control	14	85,15±37,65	1,836	0,077	91,10±38,11	2,866	0,008
Experimental	16	105,87±23,37			122,44±20,18		

When Table 3 was examined, in the comparison of intergroup pre- test averages it is seen that there is no statistically significant difference (p = 0,077, p <0,05). There is a statistically significant difference in the comparison of the post-test mean scores between the groups (p = 0,008, p <0,05).

Table 4. Sport Specific Core Muscle Strength Pre and Post Test Results of Paired Sample T Test

Core	N	Pre- Test X±Sd	Post- Test X±Sd	t	P
Control	14	85,15±37,65	91,10±38,11	-2,996	0,010
Experimental	16	105,87±23,37	122,44±20,18	-5,572	0,000

When Table 4 is examined; it is seen that there is a statistically significant difference in the comparison of experimental and control groups pre-test and post-test averages (p <0.05).

Table 5. Stabilometer Balance Pre and Post Test Results of Independent T Test

Stabilometre	Groups	N	Pre- Test X±Sd	t	P	Post- Test X±Sd	t	P
Limit of Stability	C	14	48,50±10,71	2,831	0,008	49,85±10,96	3,598	0,001
	E	16	60,31±11,96			65,62±12,78		
Overall Right Leg	C	14	0,935±0,329	0,647	0,523	0,857±0,327	0,040	0,968
	E	16	1,02±0,413			0,862±0,396		
Overall Left Leg	C	14	1,30±0,477	-1,477	0,151	1,13±0,430	-1,800	0,083
	E	16	1,06±0,406			0,881±0,342		

When Table 5 is examined; in the comparison of Stabilometer Limit of Stability intergroups pre-test and post-test averages it was found that there is a statistically significant difference (p <0,05), while in the comparison of Overall Right Leg and Overall Left Leg pre-test and post-test averages there was not a statistically significant difference (p <0,05). p> 0,05).

Table 6. Stabilometer Balance Pre and Post Test Resutls of Paired Sample T Test

Stabliometre	Groups	N	Pre- Test X±Sd	Post Test X±Sd	t	P
Limit of Stability	C	14	48,50±10,71	49,85±10,96	-0,831	0,421
	E	16	60,31±11,96	65,62±12,78	-2,498	0,025
Overall Right Leg	C	14	0,935±0,329	0,857±0,327	1,808	0,094
	E	16	1,02±0,413	0,862±0,396	2,719	0,016
Overall Left Leg	C	14	1,30±0,477	1,13±0,430	1,164	0,265
	E	16	1,06±0,406	0,881±0,342	4,204	0,001

When Table 6 is examined in the comparison of Stabilometer Equilibrium Limit of Stability, Overall Right Leg and Overall Left Leg averages and in-group pre-test and post-test averages, it was found that there is a statistically significant difference in favor of the experimental group (p <0.05).

Table 7. Y-Balance Pre and Post Test Results of Independent T Test

Y- Balance	Groups	N	Pre- Test			Post- Test		
			X±Sd	t	P	X±Sd	t	P
Dominant Lower	C	14	112,59±13,72	3,585	0,001	114,33±13,79	4,615	0,000
	E	16	129,04±11,41			136,30±12,28		
Non-Dominant Lower	C	14	112,58±15,45	-0,441	0,662	113,93±15,45	0,819	0,420
	E	16	130,15±13,13			138,09±13,34		
Dominant Upper	C	14	85,42±5,72	3,367	0,002	86,37±5,61	4,596	0,000
	E	16	84,36±7,24			88,30±7,11		
Non-Dominant Upper	C	14	78,62±4,33	0,169	0,867	80,16±4,93	1,605	0,120
	E	16	79,12±10,06			84,37±8,66		

When Table 7 is examined, and Y-Balance Dominant Lower Extremity and Dominant Upper Extremity averages are compared with the inter group pre-test and post-test averages, it was found that there is a statistically significant difference (p<0,01), while in the comparison of the Non-Dominant Lower Extremity and Non-Dominant Upper Extremity averages and inter group pre-test and post-test averages there was no statistically significant difference (p>0,05).

Table 8. Y-Balance Pre and Post Test Results of Paired Sample T Test

Y- Balance	Groups	N	Pre- Test X±Sd	Post- Test X±Sd	t	p
Dominant Lower	C	14	112,59±13,72	114,33±13,79	-2,753	0,016
	E	16	129,04±11,41	136,30±12,28	-6,517	0,000
Non-Dominant Lower	C	14	112,58±15,45	113,93±15,45	-4,439	0,001
	E	16	130,15±13,13	138,09±13,34	-4,989	0,000
Dominant Upper	C	14	85,42±5,72	86,37±5,61	-4,807	0,000
	E	16	84,36±7,24	88,30±7,11	-8,264	0,000
Non-Dominant Upper	C	14	78,62±4,33	80,16±4,93	-4,453	0,001
	E	16	79,12±10,06	84,37±8,66	-3,218	0,006

When Table 8 is examined in the comparison of Control and Experimental groups Y- Balance in group pre-test and post-tests it was found that that there is a statistically significant difference in both the experimental and control groups (p<0,05).

Table 10. Basketball Psycho-Motor Skill Pre and Post Test Results of Independent T Test

Basketball	Groups	N	Pre- Test X± Sd	t	P	Post- Test X± Sd	t	P
Dribbling with Right Hand	E	16	3,44±0,964	2,498	0,019	3,94±0,854	4,394	0,000
	C	14	2,64±0,745			2,64±0,745		
Chest Pass	E	16	2,94±0,929	2,830	0,009	3,69±0,793	5,534	0,000
	C	14	2,00±0,877			2,00±0,877		
V-Cut	E	16	3,19±1,109	2,371	0,025	3,75±0,856	3,970	0,000
	C	14	2,36±0,745			2,57±0,756		
Taking Pass	E	16	3,13±1,204	1,995	0,056	3,75±1,183	2,014	0,054
	C	14	2,36±0,842			3,00±0,784		
Jab-Step	E	16	2,13±0,885	-,771	0,447	3,25±1,065	2,403	0,023
	C	14	2,36±0,745			2,43±0,756		
Dribbling and Right Layup	E	16	2,75±0,775	,363	0,719	3,63±1,147	1,880	0,070
	C	14	2,64±0,842			2,93±0,829		
Rebound	E	16	2,56±0,964	1,554	0,131	3,50±1,095	4,137	0,000
	C	14	2,07±0,730			2,07±0,730		
Overhead Pass	E	16	2,81±0,911	1,995	0,056	3,38±0,957	3,569	0,001
	C	14	2,21±0,699			2,21±0,802		
Cut Towards Left	E	16	3,38±0,719	4,121	0,000	3,88±1,088	3,697	0,001
	C	14	2,29±0,726			2,71±0,469		
Taking Pass and Dribbling with Left Hand	E	16	3,00±0,894	2,160	0,039	3,69±1,078	3,113	0,004
	C	14	2,29±0,914			2,57±0,852		
Dribbling with Left Hand Between The Legs	E	16	2,63±0,957	2,396	0,023	3,63±1,204	4,580	0,000
	C	14	1,86±0,770			1,93±0,730		
Cross Over Dribbling (Right)	E	16	2,81±1,047	2,811	0,009	3,75±1,125	5,295	0,000
	C	14	1,86±0,770			1,86±0,770		
Cross Over Dribbling (Left)	E	16	2,69±1,078	1,805	0,082	3,75±1,183	4,699	0,000
	C	14	2,07±0,730			2,00±0,784		
Dribbling with Right Hand Between The Legs	E	16	2,56±1,031	2,242	0,033	3,69±1,138	4,137	0,000
	C	13	1,77±0,832			2,14±0,864		
Left Lay Up	E	16	2,69±0,873	3,290	0,003	3,56±0,964	5,703	0,000
	C	14	1,71±0,726			1,79±0,699		
Rebound	E	16	2,63±0,957	2,214	0,035	3,63±0,957	6,086	0,000
	C	14	1,93±0,730			1,71±0,726		
Cross Over Dribbling Behind the Back with Left Hand	E	16	2,88±0,806	3,701	0,001	3,44±0,892	3,501	0,002
	C	14	1,79±0,802			2,43±0,646		
Reverse Dribbling with Right Hand	E	16	2,44±1,153	2,897	0,007	3,56±0,892	6,542	0,000
	C	14	1,43±0,646			1,57±0,756		
Hesitation (Dribbling)	E	16	2,94±1,124	4,002	0,000	3,69±0,946	8,119	0,000
	C	14	1,57±0,646			1,29±0,611		
Jump Shot	E	16	2,63±0,885	2,657	0,013	3,56±0,964	4,886	0,000
	C	14	1,86±0,663			2,14±0,535		
TOTAL	E	16	56,19±15,136	3,405	0,002	72,69±17,024	5,918	0,000
	C	14	40,93±7,661			44,00±6,598		

When Table 9 is examined and Control and Experimental groups Basketball Observation Scale pre- test intergroup means are compared, in the average score of Taking Pass, Jab- Step, Dribbling and Right Layup, Rebound, Overhead Pass, Cross Over Dribbling (Left) it was found that there was not a statistically significant difference (p<0,05), while statistically significant differences were found in all other parameters. In the comparison of the post-test averages, only in Taking Pass and Dribbling and Right Layup parameters statistically no significant difference was found (p<0,05) and statistically significant differences were found in all other parameters.

When Table 10 is examined and Control and Experimental Groups Basketball Observation Scale in- group means are compared, in the parameters of V- Cut, Jab- Step, Overhead Pass, Dribbling with Right Hand Between The Legs, Cross Over (Right), Left Layup, rebound, Reverse (Right) and Jump Shot statistically no significant difference was found (p>0,05), while in all other parameters a statistically significant difference was observed (p<0,05). In addition, there was a statistically significant difference in Basketball Observation Scale Pre-test and Post-test averages in both groups (p <0,05).

Table 10. Basketball Psycho-Motor Skill Pre and Post Test Results of Paired Sample T Test

Basketball	Groups	N	Pre- Test X± Sd	Post- Test X± Sd	t	p
Dribbling with Right Hand	E	16	3,44±0,964	3,94±0,854	-3,873	0,002
	C	14	2,64±0,745	2,64±0,745		a
Chest Pass	E	16	2,94±0,929	3,69±0,793	-4,392	0,001
	C	14	2,00±0,877	2,00±0,877		a
V-Cut	E	16	3,19±1,109	3,75±0,856	-4,392	0,001
	C	14	2,36±0,745	2,57±0,756	-1,883	0,082
Taking Pass	E	16	3,13±1,204	3,75±1,183	-3,101	0,007
	C	14	2,36±0,842	3,00±0,784	-3,798	0,002
Jab-Step	E	16	2,13±0,885	3,25±1,065	-6,260	0,000
	C	14	2,36±0,745	2,43±0,756	-1,000	0,336
Dribbling and Right Layup	E	16	2,75±0,775	3,63±1,147	-3,656	0,002
	C	14	2,64±0,842	2,93±0,829	-2,280	0,040
Rebound	E	16	2,56±0,964	3,50±1,095	-3,758	0,002
	C	14	2,07±0,730	2,07±0,730		a
Overhead Pass	E	16	2,81±0,911	3,38±0,957	-3,093	0,007
	C	14	2,21±0,699	2,21±0,802	,000	1,000
Cut Towards Left	E	16	3,38±0,719	3,88±1,088	-2,449	0,027
	C	14	2,29±0,726	2,71±0,469	-3,122	0,008
Taking Pass and Dribbling with Left Hand	E	16	3,00±0,894	3,69±1,078	-3,467	0,003
	C	14	2,29±0,914	2,57±0,852	-2,280	0,040
Dribbling with Left Hand Between The Legs	E	16	2,63±0,957	3,63±1,204	-4,899	0,000
	C	14	1,86±0,770	1,93±0,730	-1,000	0,336
Cross Over Dribbling (Right)	E	16	2,81±1,047	3,75±1,125	-4,858	0,000
	C	14	1,86±0,770	1,86±0,770		a
Cross Over Dribbling (Left)	E	16	2,69±1,078	3,75±1,183	-5,506	0,000
	C	14	2,07±0,730	2,00±0,784	1,000	0,336
Dribbling with Right Hand Between The Legs	E	16	2,56±1,031	3,69±1,138	-5,582	0,000
	C	13	1,77±0,832	2,14±0,864	-2,739	0,018
Left Layup	E	16	2,69±0,873	3,56±0,964	-5,653	0,000
	C	14	1,71±0,726	1,79±0,699	-1,000	0,336
Rebound	E	16	2,63±0,957	3,63±0,957	-3,873	0,002
	C	14	1,93±0,730	1,71±0,726	1,385	0,189
Cross Over Dribbling Behind The Back with Left Hand	E	16	2,88±0,806	3,44±0,892	-2,764	0,014
	C	14	1,79±0,802	2,43±0,646	-3,229	0,007
Reverse Dribbling with Right Hand	E	16	2,44±1,153	3,56±0,892	-5,084	0,000
	C	14	1,43±0,646	1,57±0,756	-1,472	0,165
Hesitation (Dribbling)	E	16	2,94±1,124	3,69±0,946	-2,818	0,013
	C	14	1,57±0,646	1,29±0,611	2,280	0,040
Jump Shot	E	16	2,63±0,885	3,56±0,964	-4,858	0,000
	C	14	1,86±0,663	2,14±0,535	-1,472	0,165
TOTAL	E	16	56,19±15,136	72,69±17,024	-12,077	0,000
	C	14	40,93±7,661	44,00±6,598	-5,924	0,000

a-The correlation and t cannot be computed because the standard error of the difference is 0.[a]

DISCUSSION

This study aimed to determine find way to develop children core strength and balance. Correct training methods are needed while aiming at high performance of athletes. However, the correct training method should not only aim for high performance, but also should ensure that athletes do not experience injures. Therefore, the work to be done in this age group athletes is very important and sensitive. Motor skills can be easily developed, but athletes may easily be injured, too. For this reason, it is thought that with a training program that will improve both core strength and core stabilization, athletes will achieve the desired improvement in their conditional properties and also reduce the risk of injury.

Muscle strengthening and motor control enhancement of core muscle structure involves a process utilizing core training programs [12]. Although there is not enough scientific research on performance development in the relevant age group after core strength training, it can be said that it is preferred more in rehabilitation programs [13-15]. There are very few studies in basketball includes core strength training.

In the study, it is seen that there is a statistically significant difference between the experimental and control groups in the comparison of the pre-test and post-test averages of the Sports Specific Core Muscle Strength and Stabilized in-groups. It is seen that the average of the experimental group increased more than the control group (Table 3 and Table 4).

When the related literature and the study are examined, it is observed that the stabilization and the core strength of the athletes improves with the core strength training [16], and that even when assessing performance and strength estimation can be carried out based on core strength [17], and that the increase in the strength and stability of the core part can contribute to the improvement in the kinetic chain of the movements [18], and that core training program can make Transversus Abdominis more functional [19], and that the core strength training programs can be suitable for the selection of strength training programs aimed at adaptation to specific postural and locomotor muscles [20], and also has a positive effect from the sportive aspect. The inclusion of neuromuscular training in the training routines for basketball players may contribute to improvement [21].

In the study, it was seen that there was a statistically

significant difference in the Experimental group when the pre-test and post-test of Stabilometer in group mean values are compared, whereas there was no statistically significant difference in the control group (Table 5 and Table 6).

When the related literature is examined, it can be concluded that static, dynamic balance and muscle performance will improve with the core strength training program [22] and dynamic balance ability will progress with Pilates core stabilization training [23].

When the study is examined in terms of Y-Balance, it was seen that there was a statistically significant difference in favor of the experimental group when the pre-test and post-test averages within the group are compared (Table 7 and Table 8).

When the related researches are examined, it can be said that multiple screening tests should be used for a comprehensive analysis in adolescent athletes [24], and an 8-week training program (neuromuscular) which is designed according to the body weight increases functional mobility and dynamic postural control [21, 25, 26]. Improvement is more prominent in athletes with weak mobile abilities [25].

In the study, it was seen that there was a statistically significant difference between the experimental and control groups when comparing the pre-test and post-test averages of Basketball Psychomotor Development levels. It was seen that the average of the Experimental group increased more than the Control group (Table 9 and Table 10).

When the literature is analyzed, sports and physical activities are important for the development of motor skills[27, 28]. Ocak et al. (2014), found that 8-week basketball training developed some physical and physiological features in their study [29]. Gencer and Asma (2017), in their study, worked with male basketball players aged 10-12, and found a significant difference in physical and motor characteristics of athletes after six months of basketball training [30].

CONCLUSION

According to the findings of this study, when the Basketball psychomotor development levels are examined in terms of in group pre-tests and post-tests after the 8-week core training program, a significant difference was found in favor of the experimental group. When the pre-test and post-test between groups were examined, significant differences were also found in many parameters. According to these findings, in addition to the basic technical training program in basketball, it can be said that the strength training program which is arranged according to age group and branch has a positive effect on the performance improvement of the athletes. As a result of the measurements, it can be commented that the applied training program has an effect on the development of core strength and core stabilization, static and dynamic balance and basketball psychomotor development level. In order for the development to be sustainable, the core training program should be included in the training routines. As it is applied in the program, it is considered that it would be appropriate to perform it three days a week every other day, and to upgrade the program regularly.

When the pre-test and post-test of within group static balance levels were examined, there was a statistically significant difference in the experimental group, but no difference was found in the control group. When the post-test of the groups was examined in terms of Limit of Stability, a statistically significant difference was found in favor of the experimental group. According to these results, it can be commented that 8-week core strength training has a positive effect on static balance. Core stabilization trainings may be preferred when balance-related improvement is aimed or when a related deficiency is detected.

When the pre and post-tests of dynamic balance levels were evaluated, a statistically significant difference was found in both groups. In addition, the experimental group had a higher average. When the intergroup post-tests were evaluated, a significant difference was found in Dominant Lower Extremity and Dominant Upper Extremity measurements in the experimental group. The absence of a significant difference in non-dominant extremities is thought to be due to the deficiency previously experienced by athletes. According to these results, it can be concluded that dynamic balance can be improved with 8-week core strength training.

When the Sport Specific Core Strength and Stabilized levels were evaluated in terms of pre and post-tests within the group, a statistically significant difference was found in both groups. There was no significant difference in the mean of the pre- tests between groups. This suggests that both groups were homogeneous. There was a significant difference in the mean of the post- tests between the groups in favor of the experimental group. It can be concluded that applied core strength training program affected the experimental group in the desired way. In addition, the experimental group had a higher average. The improvement that was observed in the control group is thought to be due to regularly attending their technical training. Basketball may be the cause of this result because it is a sport that includes multi-faceted muscle activations.

Research findings and literature review show that improvement can be achieved in static and dynamic balance parameters with the planned 8-week core training program. In addition, the implemented program can also improve core strength and stabilization. Improving these parameters is considered to be important in terms of sport-specific conditions. However, it is thought that their transfer to technical skills is as important as the development of conditional properties.

As a result, it can be concluded that core strength training programs that will be planned in addition to the existing technical training programs to improve the psychomotor development level of basketball or basketball technique will contribute to this development.

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