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The Effect of the Core Training to Physical Performances in Children

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Abstract
The aim of is this study is to analyze the effect of the core training on physical performances in young football players. Experimental group consists registered football players in a professional football club's football academy (n=20, age=13,17±0,86 year, height= 134,7±10,04 cm, kilo=45,11±7,75 kg) and control group (n=20 age=13,03±0,50 year, height= 136,7±10,04 cm kilo=46,11±6,12 kg), totally (n=40) athletes voluntarily participated. In order to analyze the effect of the applied core training on the children, two groups from similar aged children have been formed in the same group by having permission from the parents. Before the studies, test measurements of the groups (sit-up, push-up, 20mt sprint, plank, vertical jump, throwing medicine ball, standing long jump and balance) have been taken. Core training to the experimental group and normal football training have been applied for 12 weeks. In the end of the 12 weeks, post-test measurements have been taken. By being computerized the gathered data; averages (X), standard deviation (SD) have been taken and the correlation between the pre and post-test measurements viewed with test "t" in significance level of $p<0.05$. In conclusion, the core trainings in addition to football trainings have provided positive development ($p<0.05$) in measured physical characteristics of the football players.
Keywords: Football player, performance, core training, , motor skills, children

1. Introduction

The aim of the training in all sports branches is to reach a particular motor, physiological level, keep and develop it (Muratlı and his friends, 2007). The development of a basic motor skill is specific and methodical. Force, other motor skills, speed and endurance indirectly get affected in development process of any skill. "The need of force" is different for each branch of sports due to its feature. Thus, force play a significant role in determining the performance (Dündar, 2003). "Force training" is generally required to be applied with self-body weight in children (Muratlı, 2007).

Core training can be defined as a training which is privately designed for muscles or muscle activity. Core consists of sub-abdominal and dorsi muscles and it is responsible for transmission of force between upper and lower parts of the body. Core muscles play a significant role in immobilizing the spine during force trainings besides daily activities in terms of the health of the lower dorsi area (Fig, 2005). The control and the balance of the body can be developed, the risk of injury can be decreased by many big and small muscles' getting stronger and the productivity between transmissions between and in moves depending on the increase of the balance (Herrington and Devies, 2005). Additionally, core training is called for an exercise program which is done with self-body weight, balancing the spine and aiming to empowering the core muscles (Atan, 2013). Core trainings dwell on development of force and condition of zonal and superficial muscles (Clark, 2001). Core force trainings has drawn great interest in recent years and it has started to become an essential part of the training programs (Riewald, 2003). In the study, the effect of trainings applied for core to the physical performance will be analyzed in young athletes.

2. Method

In the study, pre-test post-test patterned method with control group have been used. Population and sample of the study consist all children playing football as registered in football academy of Bodrumspor (B.B. Bodrumspor), county of Bodrum and province of Muğla and the sample consists of 40 registered football players in an age group of 12-14.

Experimental group has been formed from football players (n=20) (age= 13,17±0,86 year, height= 134,7±10,04 cm, kilo=45,11±7,75 kg). 10 core moves (Table 1) in addition to football training has been applied to them twice a week for 12 weeks by two expert trainers in synthetic pitch. Before the training program, by taking pre-test and post-test measurements of some parameters showing physical performance, the data has been computerized. Control group of (n=20) has been formed from football players aged between 12-14 (age=13,03±0,50 year, height= 136,7±10,04 cm kilo=46,11±6,12 kg). After the same expert people took their pre-test measurements, the football players trained for 12 weeks according to their annual plan without additional core training, and in the end of the 12 weeks, their post-test measurements were taken.

Data Collection Tools

The measurements of both groups have been taken in the same day and time. Before the measurements of the pre-test, the tests have been explained to each group and information about the to be applied training program has been given. Self- weight core force training has been applied to experimental group, pre-test measurements of both experimental and control group has been taken in order to define the effect of trainings on performance. After the 12 weeks training program, post-test measurements of both groups have been taken. Physical parameters, applied tests and training program are as follows.

Measurement of Height and Weight: The measurements have been taken with a thin stick that touches to head and parallel to the ground with bare foot in upright position during deep inspiration and in sensitive of 0.5cm margin between sole and the apex of the head. The measurement of the weight has been taken with light sporty outfit by using precision scales which is sensitive to 100gr. The measurements have been taken ambulant and on an empty stomach (Ergün, 1999).

Measurement of Vertical Jump: The athletes jump vertically with all their power without rebounding and stepping on a time and distance sensitive ground and the distance that they jumped has been determined in terms of cm. After the athletes jump twice, the better score has been recorded as vertical jump score (Arthur and his friends, 1998).

Measurement of Sit-Up and Push-Up: The athletes twist their arms from their elbows in push-up position, they lean and arise. By counting how many push-ups and sit-ups they completed, the performance has been recorded in terms of numbers. Sit-up measurement has been conducted with flat sit-up move. The child has been kept with his hands on his nape, tense body and his legs united while lying back, then he is asked to move his body forward without any support. The performance has been recorded in terms of numbers (Biçer et al., 2004).

Standing Long Jump (SLJ): A line is drawn to the area where the test is going to be conducted. The experts put a tape measure of which degree of precision is 0,01 forwardly, the child stands upright position, he sets his tiptoes as they touch to the line in the same position, he jumps. The children are stopped where their feet first touch and the distance from the line to the first touch is recorded in terms of cm. The better score of 2 is recorded (Sevim, 1977).

Flamingo Balance Test (FBT): In order to determine the static balance of the athletes, Flamingo Balance Test has been used. The athletes have been asked to get on a metal balance tool, which is 50cm long, 4cm high and 3cm wide, stand in balance with their dominant foot. They twist the other foot from their knee, push back to the hip and hold with their hands in that side. They try to stand in balance for a minute in that way. When the balance breaks down (they may leave the foot while holding, fall from the tool, or touch any parts of the body), the time is stopped. When the athlete gets back to the tool and provides his balance, the time continues from where it stopped. The test goes this way and when the time is over, each attempt to provide balance will be counted (after he falls) and one-minute time is completed when the test ended, this score will be recorded as balance score of the athlete (Hazar and Taşmektepligil, 2008).

Measurement of 20 Meters Sprint: The athletes run high-start and maximal speed in a stated 20-meter area. The runtime is recorded with photocell in terms of seconds (sec). By repeating the test twice, the better score is recorded (Sevim, 1997).

Throwing Medicine Ball Test While Sitting (TMB): The athlete stretches his legs parallel to the ground while his hip, dorsi and head. He throws the ball with both hand over his head in order to throw the ball as far as possible in a parallel way. The distance from the start point to the first touch on the ground is measured in terms of cm. The medicine ball used in the study is 2 kg. The test is conducted twice and the better score is recorded (Sevim, 1977).

Plank Move Measurement: "It is based on the face-down position heels and head will have a straight line with over elbow and feet". The athlete gets his positions with the command "start" and the time duration that that athlete could stand has been recorded in terms of seconds (Handzel, 2006).

Training Program

In the study, the Core training program has been formed by analyzing related literature (Sato, and Mokha, 2009, Brungardt and his friends, 2006, Afyon and Boyacı, 2013, Afyon, 2014a, 2014b). A 12-week program including 10 moves for development of the Core area and time and repetition properly for age group has been formed. The training program has been applied twice a week for 25-30 minutes in addition to training hours. Core exercises have been planned from easy to hard by applying wavy method. The details of the Core training details are in Table 1. Control group has attended three times a week for 60-70-minute annual program term trainings.

Table 1. 12 Weeks Core Training Program

Core Movements	1.-3. Weeks	4.-6. Weeks	7.-9. Weeks	10.-12. Weeks
	Time / Repeat	Time / Repeat	Time / Repeat	Time / Repeat
Side Bend	*25 sec x 3 Repeat*	*30 sec x 3 Repeat*	*35 sec x 3 Repeat*	*30 sec x 3 Repeat*
Alternate Legs Jump	*15 Repeat*	*20 Repeat*	*20 Repeat*	*25 Repeat*
Squat	*20 Repeat*	*25 Repeat*	*20 Repeat*	*25 Repeat*
Crunch	*20 Repeat*	*25 Repeat*	*20 Repeat*	*25 Repeat*
Lying Twist Trunk	*15 sec x 2 Repeat*	*20 sec x 2 Repeat*	*20 sec x 3 Repeat*	*25 sec x 2 Repeat*
Power Shiver	*20 sec x 3 Repea*	*25 sec x 3 Repeat*	*20 sec x 3 Repeat*	*25 sec x 3 Repeat*
Side Bridge	*20 sec x 2 Repeat*	*25 sec x 2 Repeat*	*20 sec x 3 Repeat*	*25 sec x 2 Repeat*
Alternate Plank	*15 sec x 2 Repeat*	*20 sec x 3 Repeat*	*20 sec x 3 Repeat*	*25 sec x 2 Repeat*
Alternate Superman	*15 sec x 2 Repea*	*20 sec x 2 Repeat*	*20 sec x 2 Repeat*	*25 sec x 2 Repeat*
Twist With Med. Ball	*15 sec x 3 Repeat*	*20 sec x 2 Repeat*	*20 sec x 3 Repeat*	*25 sec x 2 Repeat*

The progressive training method, which is used for development of motor parameters like durability and permanence of force, ascending and descending loads in a progress, are applied (Sevim, 1990). The development of a basic motor skill is specific and methodical. In order to increase and keep the force of the contestant athletes, the progressive training method has been used among training methods that develop force.

Statistical Analysis

By computerizing the data in the study; descriptive statistics, averages (X), standard deviation (SD) has been entered and the difference between pre-test and post-test measurements of experimental and control groups have been analyzed. In the end of 12-weeks training program, differentiation between experimental and control groups' pre-test and post-test, and intra-group and inter-groups have been analyzed. Paired-Samples t-test has been used for pre-test and post-test analysis. The gathered data evaluated in the confidence interval of %95 and significance level of %5 (0.05).

3. Findings

The analyzes of the measurements of age, height, weight, sit-up, push-up, 20mt sprint, plank, vertical jump, throwing medicine ball, standing long jump and balance of experimental and control groups taken before and after the core training program have been given in tabular form.

Table 2. Demographic Characteristics of Experimental and Control Groups

Variables	N	Experimental Group X±SD	Control Group X±SD	p
Age (Year)	40	*13,17±0,86*	*13,03±0,50*	,650
Height (cm)	40	*134,7±10,04*	*136,7±10,04*	,591
Weight (kg)	40	*45,11±7,75*	*46,11±6,12*	,428

p<0,05, Cm: Centimeter, Kg: Kilogram

The participating football players of experimental group's age average (n=20) is 13,17±0,86 year, control group's age average (n=20) is; 13,03±0,50 years. The experimental group's height average is 134,7±10,04 cm, the control groups' is 136,7±10,04cm; the weight average of the experimental group is 45,11±7,75 kg, control groups' is 46,11±6,12 kg. No discrepancy has been found between groups (p>0.05).

Table 3: Pre-Test Comparison Chart of Experimental and Control Groups

Variables	n	Contro Group's Pre-Test X±SD	Experimental Group's Pre-Test X±SD	t	p
20 m Sprint Test (sec)	40	*3,46±0,12*	*3,45±0,33*	,303	,218
Push-up Test (sec)	40	*20,31±9,35*	*21,11±10,74*	,611	,247
Sit-Up Test (sec)	40	*30,86±2,39*	*32,49±4,23*	,128	,135
S.L.J. Test (cm)	40	*1,41±0,07*	*1,43±0,24*	,309	,438
T.M.B Test (cm)	40	*4,01±0,28*	*3,47±0,91*	,112	,462
V.J.Test (cm)	40	*30,92±12,3*	*32,22±10,28*	,314	,428
Plank Test (sec)	40	*40,31±6,44*	*39,38±5,23*	,255	,522
F.B Test (sec)	40	*3,97±1,68*	*4,43±2,64*	,130	,687

p>0,05, Sec: Second, Cm: Centimeter, S.L.J: Standing Long Jump, T.M.B: Throwing Medicine Ball, V.J.: Vertical Jump, F.B: Flamingo Balance.

Before 12-Weeks Core training, statistically no significant discrepancy has been identified in parameters of sit-up, push-up, 20mt sprint, plank, vertical jump, throwing medicine ball, standing long jump and balance (p>0,05). This study shows that study groups were homogeneous before the program.

Table 4: Pre-Test Post-Test Comparison Chart of the Control Group

Variables	n	Control Group's Pre-Test X±SD	Control Group's Post-Test X±SS	t	p
20 m Sprint Test (sec)	40	*3,46±0,12*	*3,43±0,24*	-1,16	**,24***
Push-up Test (sec)	40	*20,31±9,35*	*21,29±8,37*	,216	,112
Sit-Up Test (sec)	40	*30,86±2,39*	*32,74±3,21*	,214	,185
S.L.J. Test (cm)	40	*1,41±0,07*	*1,43±0,12*	,354	,182
T.M.B Test (cm)	40	*4,11±0,28*	*4,18±0,42*	,111	,264
V.J.Testi (cm)	40	*30,92±12,3*	*31,02±7,01*	,156	,241
Plank Test (sec)	40	*40,31±6,44*	*41,54±4,31*	,325	,252
F.B Test (sec)	40	*3,97±1,68*	*2,92±0,22*	,256	,137

p<0,05*, Sec: Second, Cm: Centimeter, S.L.J: Standing Long Jump, T.M.B: Throwing Medicine Ball, V.J.: Vertical Jump, F.B: Flamingo Balance.

Although no significant discrepancy has been seen in pre-test and post-test's sit-up, push-up, 20mt sprint, plank, vertical jump, throwing medicine ball, standing long jump and balance values, it is seen that there is an increase in all parameters. The reason behind this increase can be the aerobic and anaerobic loads existing in annual football training program. On the other hand, it is stated that there is a statistically significant discrepancy between 20mt sprint performances of football players in control group (p<0,05).

Table 5: Pre-Test Post-Test Comparison Chart of the Experimental Group

Variables	N	Experimental Group Pre-Test X±SS	Experimental Group Post-Test X±SS	T	p
20 m Sprint Test (sec)	40	*3,45±0,33*	*3,41±0,09*	-6.72	**,000***
Push-up Test (sec)	40	*21,11±10,74*	*28,31±5,72*	-8.34	**,000***
Sit-Up Test (sec)	40	*32,49±4,23*	*43,42±2,55*	-12.19	**,000***
S.L.J. Test (cm)	40	*1,43±0,24*	*1,72±0,12*	-9.72	**,000***
T.M.B Test (cm)	40	*3,47±0,91*	*4,52±0,27*	-8.80	**,000***
V.J.Testi (cm)	40	*32,22±10,28*	*37,92±15,02*	-11.41	**,000***
Plank Test (sec)	40	*39,38±5,23*	*50,31±6,44*	-3,45	**,000***
F.B Test (sec)	40	*4,43±2,64*	*1,27±0,25*	-4,65	**,000***

p<0,05*, Sec: Second, Cm: Centimeter, S.L.J: Standing Long Jump, T.M.B: Throwing Medicine Ball, V.J.: Vertical Jump, F.B: Flamingo Balance.

In the result of the performance measurements of pre-test and post-test's sit-up, push-up, 20mt sprint, plank, vertical jump, throwing medicine ball, standing long jump and balance taken before and after the core training, it is stated that there is a statistically significant discrepancy in all parameters(p<0,05).

Table 6: Post-Test Comparison Chart of the Experimental and Control Groups

Variables	N	Control Group's Post-Test X±SS	Experimental Group's Post-Test X±SS	T	p
20 m Sprint Test (sec)	40	*3,43±0,24*	*3,41±0,09*	-2,74	**,000***
Push-up Test (sec)	40	*21,29±8,37*	*28,31±5,72*	-11,36	**,000***
Sit-Up Test (sec)	40	*32,74±3,21*	*43,42±2,55*	-7,365	**,000***
S.L.J. Test (cm)	40	*1,43±0,12*	*1,72±0,12*	-1,322	**,000***
T.M.B Test (cm)	40	*4,18±0,42*	*4,52±0,27*	-,975	**,000***
V.J.Testi (cm)	40	*31,02±7,01*	*37,92±15,02*	-14,22	**,000***
Plank Test (sec)	40	*41,54±4,31*	*50,31±6,44*	-13,24	**,000***
F.B Test (sec)	40	*2,92±0,22*	*1,27±0,25*	-4,22	**,000***

p<0,05*, Sec: Second, Cm: Centimeter, S.L.J: Standing Long Jump, T.M.B: Throwing Medicine Ball, V.J.: Vertical Jump, F.B: Flamingo Balance.

When post-tests of experimental and control groups are compared, it is stated that football players who attend to the core training have statistically provided development(p<0,05).

4. Discussion

Many researches have been conducted over development of Core area force in order to "increase performance" in providing sportive success. Core area consists core muscles in frontal part of the body, back muscles in the posterior, diaphragm in the upper part and pelvic floor muscles in the lower. Core area's being strong provides posture to be proper by protecting the spine (Stanton, Reaburn ve Humphries, 2004, Handzel 2003). In this context, core exercises need to be carried out correctly. Exercises done in correct angles activate the intended muscle groups (McGill, 2010). Core area's being strong can be important in terms of "preventing the sports injuries", the control of the body, proper posture and development of the body balance (Koz and Ersöz, 2010). As core muscles are located in the center of the body, they actively play a part in most of the body movements (Schiffer and his friends, 2009). Related to this topic in the literature, it is stated that core training has a positive way contribution on the performances of vertical jump (Butcher and his friends, 2007), development of balance (Sato and Mohka, 2009, Aggarwal and his friends, 2010, İmai and his friends, 2014), abdominal muscle

activation (Cowley et al., 2007), standing long jump (Kean et al., 2006), development of sprint, throwing medicine ball (Cowley and his friends, 2007, Kean et al., 2006).

It is indicated that the sprint performance the football players do need during the matches have developed in a positive way with applied core training (Balaji and Murugavel, 2013, Cowley and his friends 2007, Ken et al., 2006, İmai and his friends 2014, Afyon, 2014). It is stated that there is a development in maximal speed in parallel with progressing length of stride depending on increasing force between ages 11-14 (Acar, 2000). In the end of the 12-week core training, it is determined that there is a positive way development in speed performances of the football players. The 12-14-year-old football players' being in adolescence stage in the study may have triggered the performance increase. These results have parallel with some findings in the literature.

With the Core training, "the control and the balance" of the body develops. Besides, by providing force development of major and minor muscle groups, the possibility of injury degraded to the minimum and productivity in the moves or between transmission of them is increased depending on the development of balance (Aşçı, 2001, İmai and his friends, 2014, Aggarwal, and his friends, 2010, Cosio-Lima and his friends, 2003). It is stated that balance parameters can be developed with core training applied to sedentary individuals and athletes (Sekendiz ve ark. 2010, Sharma ve ark. 2012, Çuğ, 2012, Afyon ve Boyacı 2013, Afyon, 2014a, Afyon, 2014b). Balance performance has a significant role in human life. It is seen that there is a development in balance performances of football players after applied 12-week core training. This development is in the same direction with some findings of studies in the literature.

Push-up and sit-up is a test used for abdominal zone muscle force measurements, which is upper-extremity and core area of the athletes (Biçer and his friends, 2004). It is known that core training partakes activation of center zone (Schiffer and his friends, 2009). It is notified that there is a development in push-up and sit-up performances of the attending young football players after core training program (Cowley and his friends, 2007, Kean et al., 2006, Afyon and Boyacı, 2013). It is determined that there is a development in push-up and sit-up values of the young football players who attend this study after core training program. With these results, it is seen that some researchers' results are the same.

Throwing medicine ball can be practiced in determining the upper extremity fulminating forces of the athletes (Sevim, 1997). "Upper extremity muscles" located in core area is an assistant factor in tackles of the football player (Atıcı and Afyon, 2014, Stanton, Reaburn and Humphries, 2004, Handzel, 2003). It is stated that developing core area provides development of upper extremity propelling muscle force (Saeterbakken ve Fımland, 2011, Afyon ve Boyacı, 2013, Afyon, 2014a, Afyon, 2014b). When we check the development after the core training applied to the football players, it shows parallel with some of the studies in the literature.

In the study, double leg standing long jump and vertical jump tests have been applied. These tests reflect the lower extremity muscle force and power of the football players. It is reported that regularly applied core trainings develop the fulminating force of the leg edilmiştir (Atıcı ve Afyon, 2016, Moresi ve ark. 2011, Sharma ve ark. 2012, Afyon ve Boyacı, 2013, Aşçı, 2011, Balaji ve Murugavel, 2013, Sekendiz ve ark. 2010). In the result of 12-weeks core training program applied to football players, it is seen that performances of standing long jump and vertical jump have developed. These results show similarity with other conducted studies.

Plank exercise is static posture position used in measuring the muscular endurance and developing it (Hanzel, 2003). In some studies, conducted on sedentary individuals and football players, it is stated that core training has a significant contribution in development of muscular endurance (Afyon and Boyacı, 2013, Afyon, 2014a, Afyon, 2014b). In the study, it is determined that there is a significant discrepancy between muscular endurance measured before the 12-weeks core training and after it. The results support the literature.

5. Conclusion

In conclusion, in adolescent period when physical performance development accelerates, it is statistically stated that there is a significant discrepancy between 12-weeks core trainings prepared according to age groups' parameters of 20mt sprint, push-up, sit-up, throwing medicine ball, vertical jump, standing long jump, plank and balance. Applied program can be suggested for the trainers who work with age group of 12-14 in order to develop the physical performances of the registered contestant athletes.

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