Available online at ijci.wcci-international.org

International Journal of Curriculum and Instruction 14(3) (2022) 2132- 2140

IJCI
International Journal of Curriculum and Instruction

An investigation of the effects of static and dynamic core exercises applied to football players aged 10–12 years on some physical fitness characteristics

Sadettin Erol[a] *

[a] *Bursa Uludag University, Faculty of Sports Sciences, Bursa, Turkey*

Abstract

In this study, it was aimed to examine the effects of static and dynamic core exercises applied to football players aged 10-12 years on some physical fitness characteristics. The mean age of 12,4±0,4 years, average body weight of 43,2±0.31 kg, average height of 153,5±0.32 cm and average age of 4.32 years in sports, 32 male football players who regularly trained participated voluntarily. The athletes participating in the study were randomly divided into two groups as control and experimental groups. Different training programs were applied to these groups; Experimental group (EG) was given routine volleyball training (3 days/week) for 8 weeks, static and dynamic core exercises for 30 minutes total training time. The control group (CG) only did routine volleyball training. Before the studies, pre-test measurements (agility, (20m) speed, balance, strength and vertical jump) of both groups were carried out. At the end of 8 weeks, the last test measurements of the groups were taken. A t-test was used to compare the preliminary and final values of the groups (dependent sample). When the first and last test measurements of the groups were compared between the groups; According to the analysis of the data, a statistically significant difference was observed in the balance test value ($p<0.05$). In the comparison between the groups, no significant difference was found in the agility test, (20m) sprint test, strength test and vertical jump measurement values ($p > 0.05$). In addition to regular football training, dynamic and static core programs applied within the scope of conditioning hand exercises contributed positively to some measured physical fitness characteristics of the athletes.

Keywords: Football, core, speed, balance, strength

1. Introduction

The development of competitive power in football requires a high improvement of physical condition, especially strength, power and speed (Stolen et al., 2005). It is estimated that in one match, the average athlete performs between 150 and 250 high-intensity 1000 to 1400 movements, depending on age and position (Stolen et al., 2005). In a football match, athletes play every 3-5 sec. at one, 30-40 m. Sprinting performs short-distance runs with slowing down, dribbling and jumping 30-40 times (Bangsbo et al.,

* Corresponding author: Sadettin Erol. ORCID ID.: https://orcid.org/0000-0002-1544-4128
E-mail address: a serol@uludag.edu.tr

2006). It has been suggested that muscle strength in football is a determining factor in high-speed runs and vertical jumps to head a ball or lateral strikes by goalkeepers (Sander et al., 2013; Hammami et al., 2016). These features (speed, deceleration, turns, kicks, bounce and balance) in a 90-minute football match are closely related (Psotta et al., 20011). For this reason, power and strength in the central region muscles are important for football players. Such high physical demands increase the need for programs that develop strength, balance, agility and speed (Bangsho et al., 2016). The progress in football in the last decade resulted in e.g. increased physical contact between players. In view of the technological and scientific developments that often exceed the physiological limits in order to increase the players' performance (Gümüşdağ et al., 2011). While core exercises cause structural changes in the muscles, they also cause neuromuscular adaptation. At the same time, core exercises affect the development of features such as dynamic-static balance, versatile anatomical development and flexibility. At the same time, core exercises affect the development of features such as dynamic-static balance, versatile anatomical development and flexibility. Core exercises are a very effective working method for muscular recovery and body control, as they develop strength, proprioceptive senses and balance very well (Hibbs et al., 2911). While the relationship between core control and single-limb task control in preadolescent subjects is clear, specific program effects have only recently been investigated in young athletes (Sannicandro & Cofano, 2017). Evidence-based training approach is critical in pre-adolescent athletes, and the application of macro-micro cycles that utilize complex, multi-joint and rational resistance training can increase competitive success. The hypothesis of this study is that static and dynamic core exercise applications applied to football players may be advantageous for pre-adolescents on some physical fitness features compared to only certain football trainings.

The aim of this study was to examine the effects of static and dynamic core exercises applied to 10-12-year-old football players on agility, (20m) speed, balance, strength and vertical jump performances.

2. Method

2.1. Participants

32 male football players aged 10-12 from Nilüfer Municipality Sports Club operating in Bursa province voluntarily participated in the research. The experimental group and control group participating in this study consisted of football players with an average sports age of 4.32 years, who regularly trained with club trainers 4 days a week and participated in local and national tournaments. Different training programs were applied to these groups. The study was carried out in two sessions, familiarity and experimental. They were done at the same time in the morning, one week apart. Static

and dynamic core exercises was introduced in a sample session (Table 1.) Static and dynamic core exercises was performed 2 days a week for 1 week and became familiar with the exercise procedures. In addition to regular football training, static and dynamic core training is given to his EG for 30 minutes, 3 times a week for 8 weeks. While CG was applied, only regular weekly football trainings were applied. Rest between sets is between 2-3 minutes, rest between repetitions is between 30-60 seconds. This study was approved by Bursa Uludağ University Health Sciences Research and Publication Ethics Committee (date 05.01.2022, 2022-1/15) decision.

Table1. 8 Week Static and Dynamic Core Training

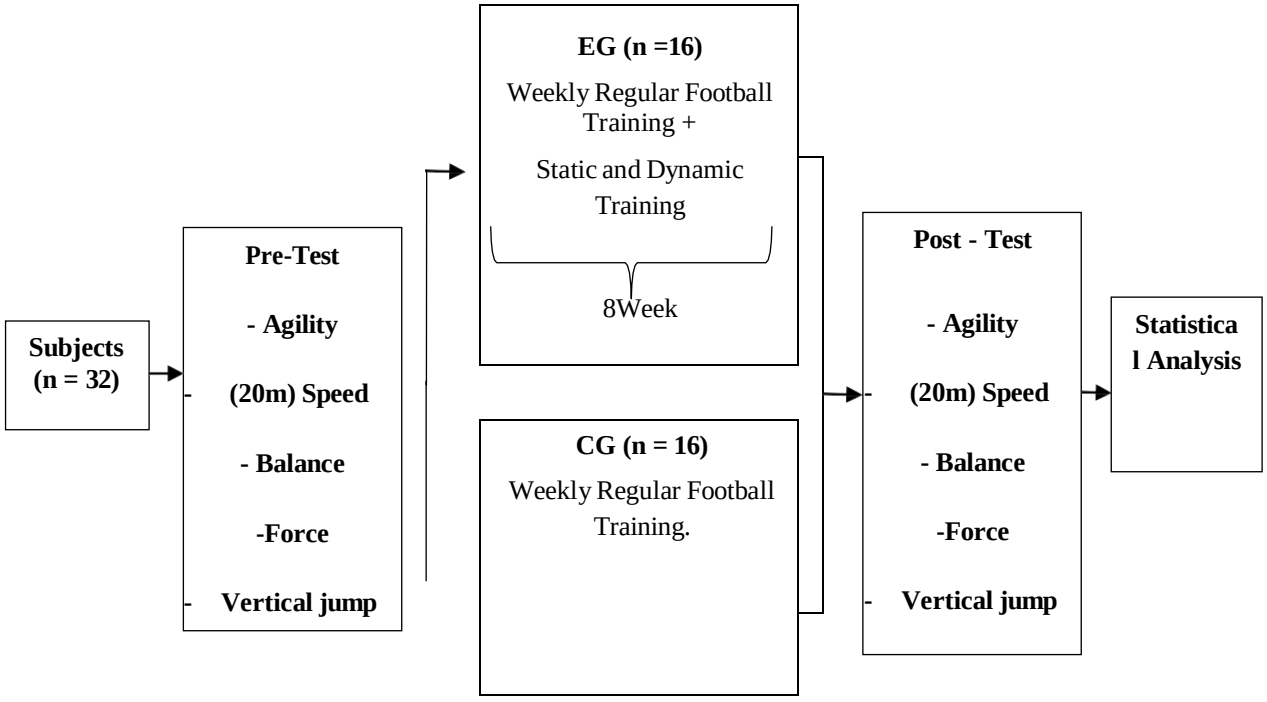
Movement	1-2 Week	3-4 Week	5-6 Week	7-8 Week
Side Ben (sec)	22 (sec) x 2	30 (sec) x 2	30 (sec) x 2	30 (sec) x 2
Shuttle	15 x 1	20 x1	20 x2	22 x2
Superman	22 x1	22 x1	20 x2	22 v 2
Reverse Scissors	22 x1	22 x1	20 x2	22 x 2
Lying Twist Trunk (sec)	17 (sec) x 2	20 (sec) x 2	20 (sec) x 2	20 (sec) x 2
Power Shiver	22 (sec) x 2	22 (sec) x 2	20 (sec) x 2	20 (sec) x 2
Side Bridge (sec)	20 (sec) x 2	22 (sec) x 2	20 (sec) x2	25 (sec) x 2
Side Plank (sec)	15 (sec) x 2	20 (sec) x 2	20 (sec) x 2	22 (sec) x 2
Superman (sec)	15 (sec) x 2	20 (sec) x 2	20 (sec) x 2	22 (sec) x 2
Sit-Up (sec)	15 (sec) x 1	20 (sec) x1	20 (sec) x 1	22 (sec) x 1

2.2. Experimental design

Before the study, all of the athletes were given detailed information about the risks they may encounter and the possible negative aspects of the research, and the volunteering form was read to them. The parents of the athletes were asked to fill in and sign a consent form in the form of a parental consent letter. The first measurements of the study were made during the preparation period of the annual training period, and the last measurements were made at the beginning of the competition period. The athletes participating in the research were randomly divided into two different groups as EG and

CG. Pre-tests (agility, (20m) speed, balance, strength and vertical jump) of 2 groups of 32 athletes before the exercises. At the end of 8 weeks, the last test measurements of the groups were taken. Athletes 20 minutes before the tests. General and special warming was done. The subjects were not given a heavy training program (obligation) within 24 hours before the test.

Table 2. Test protocol



2.3. Body Composition

A measuring instrument with a precision of 0.01m was used to measure the height of the athletes. It was prevented from wearing shoes or clothes that would affect the measurement on the athletes who were to be measured during the height measurement. Tanita BC418 (Japanese) body composition analyzer was used for weight and weight measurements of the athletes

2.4. Agility Test

T test was used for agility measurement. Four cones are arranged in a T-arrangement. The athlete starts the run with the starting signal from point (a). From point (a) to point b, run straight, from part (b) to part c, from point to point C with a rock step and from part c to (d) with a slip step. (Scanlan et al., 2021).

2.5. Static Balance Test

Prokim Tecnobody PK 200 (Italy) balance measuring device was used for the measurements of this test. Measurements were completed with the device and data were collected. The data collected with the device were transferred to the computer via wireless connection.

2.6. Sprint (20m) Test

After the 20 m distance was determined as a running track, 2 wireless Sinar (Turkey) brand photocells were installed. The subjects were asked to complete the limited distance of 20 m by running at maximal speed in the high starting position. The best score was obtained by measuring the run time with a photocell in 'sec' and repeating the test twice (Ayan and Mülazımoğlu, 2009).

2.7. Leg Strength Test

Takei brand dynamometer was used for the leg strength measurement test. Subject athletes were placed on the measuring instrument in a slightly bent knee position, with both feet fully pressing on the instrument. While the arms were in a stretched position, they grasped the bar of the device with both hands and pulled it vertically upwards. When the traction was completed, the value in kg displayed by the device was recorded as the measurement value (Ateş, 2007).

2.8. Vertical Jump Test

For the vertical jump test, a 2m long, 60cm wide board was fixed to the wall at a height of 155cm from the floor. Subjects were asked to first touch the highest point where they could extend their arm and then touch the highest point they could reach by jumping. The distance between the height that the subjects could reach while standing and the distance they could reach with the maximal jump was taken as a score in cm (Kamar, 2008).

2.9. Data Analysis

Repeated ANOVA was used to make separate comparisons for the first and last measurements of the athletes in the 8-week training program for EG and CG. where applicable, training-generated changes within groups (work/set, experiment, and control) were performed using a paired t-test. The results obtained are the mean and standard deviation (SD). The level of significance was determined as p/ 0.05.

3. Results

The mean age of 12,4±0,4 years, average body weight of 43,2±0.31 kg, average height of 153,5±0.32 cm and an average age of 4,32 years for sports, 32 male football players who regularly trained participated voluntarily.

Table 3. Comparison of the changes in 8-weeks EG and CG training between groups according to pre-test and post-test measurements.

Variables	EG (n = 18)		CG (n =11)			
	Pre-test Mean ± SD	Post-Test Mean ± SD	Pre-test Mean ± SD	Post-Test Mean ± SD	F	$\eta_{partial}^2$
T-agility (sec)	14,13. ± 1. 50	13.97 ± 2.10	13.11 ± 2.10	13.03 ± 1.95	1.055	0.328
(20m) Sprint (sec)	3.96 ± 0.42	3.85 ± 0.383	3.88. ± 0.363	3.87 ± 0.359	21.89	0.399
Balance TestL ((sec))	321..36 ± 08	301.14 ± 65.8	327.36 ± 65.85	304.95 ± 54.62	0.04	0.001
Force Test (kg)	48.19 ± 17.02	55.21 ± 0.13	44.75 ± 16.44	47.12 ± 15.83	10.72	0.251
Vertical jump (cm)	25.58 ± 9.01	27.02 ± 9.52	30.14 ± 6.92	29.78 ± 7.93	6.12	0.161

As can be seen in Table 1, there was a statistically significant difference in the equilibrium value in terms of the descriptive values and the comparison of the changes in EG and CG according to the pre-test and post-test measurements between the groups ($P < 0.05$). However, in terms of the intergroup comparison of the changes according to the EG and CG pre-test and post-test measurements and their descriptive values; there was no statistically significant difference in the agility test, (20m) sprint test, strength test and vertical jump test values ($P > 0.05$). The data obtained showed that the movement training program had a positive development on some physical fitness features of the experimental group football players.

4. Discussion and Conclusions

In this study, the effects of static and dynamic core exercises applied to 10-12-year-old football players on some physical fitness characteristics were examined. The results of the study found that static and dynamic core exercises had a significant effect on balance. Sandrey and Mitzel (2013) found that 6-week core stabilization training resulted in significant gains in balance in high school athletes. Gümüşdağ et al., (2021) in their research on the structural and motoric characteristics of young football players according to their position in the game, the age, height, weight, body mass index, body fat percentage, vertical jump, anaerobic power, 10m-30m speed values of a total of 41 football players aged 16-18 were determined. By the end of this work, the defenders were taller and heavier than other position players. The attacking players were faster than the others in the 10m speed test. In other measurements, no relationship was found statistically with respect to the player's positions. The reason for this may be that core exercises generally do not constitute the main part of the training that develops motor features (Egesoy, Alptekin, & Yapıcı. 2018). When we examine the literature; central region body muscles play an important role during exercises (Schiffer et al., 2009). Static and dynamic core exercises are an important prerequisite in many sports applications such as football, basketball and athletics (Raisanen et al., 2018). Although the use of core exercises is very old, it is known that it has been used in the field of rehabilitation in the health sector for a long time before it started to be used effectively in the field of sports (Golpaigany et al., 2010). The increase in sports efficiency was triggered when the 10-12 age group football players in the study were in the pre-adolescent period. These results are similar to some findings in the literature. According to the results of the research, it is necessary to apply more long-term applications to increase the positive effect of 12-Weeks basic game education at the levels of motor development in children aged 4 to 6 years old (Gümüşdağ, 2019).

As a result, it has become a tool for advancing technological possibilities to further the limits of human beings. However, many training tools are being developed to improve the physical fitness characteristics of athletes. In our research, we used dynamic and static core exercises that are used today. We observed that dynamic and static core exercises for 8 weeks can better improve balance performance in football players aged 10-12.

Acknowledgements

This article has been generated from the study which was presented at the *4th International April 23 Scientific Studıes Congress* on 23-24 April 2022 in Gaziantep, Turkey.

I would like to thank the coaches of the teams, their players and those who contributed to the research with their opinions.

Conflict of interest

There are no conflicts of interest.

References

Ateş, M., & Ateşoğlu, U. (2007). The effect of plyometric training on upper and lower extremity strength parameters of 16-18 age group male football players. *Journal of Physical Education and Sport Sciences,* 5(1), 21-28.

Ayan, V., & Mülazimoğlu, O. (2009). Examining the physical characteristics and some performance profiles of 8-10 year old boys in choosing talent and directing them to sports (Ankara Example). *FU Right. know Medical Journal*, 23(3), 113-118.

Balaji E, Murugavel K. (2013)Motor fitnes parameters response to core strength training on Handbal Players. *International Journal for Life Sciences ve Educational Research,*;1(2):76-80.

Bangsbo, J. (1994). *Physiological demands. In: Football (Soccer).* B. Ekblom (Ed.). London: Blackwell Scientific, , pp. 43-59.

Bangsbo, J.; Mohr, M.; Krustrup, P.; Bangsbo, J. Physical and metabolic demands of training and match play in the elite soccer player. *J. Sports Sci.* **2006**, *24*, 665–674.

Egesoy, H., Alptekin, A., & Yapıcı, A. (2018). Core exercises in sports. *International Journal of Contemporary Educational Research,* 4(1), 10-21.

Gümüşdağ, H., Yıldıran, İ., Yamaner, F., & Kartal, A. (2011). Aggression and fouls in professional football. Biomedical Human Kinetics, 3(1) 67-71. doi: 10.2478/v10101-011-0015-4

Gümüşdağ, H. (2019). Effects of Pre-school Play on Motor Development in Children. Universal Journal of Educational Research, 7(2), 580 - 587. DOI: 10.13189/ujer.2019.070231

Gümüşdağ H. , Egesoy H., Kırkaya İ. , İlhan A., Işık A. S. (2021). The Comparison Of The Structural And Motoric Properties Of Junior Players According To Their Positions In Soccer. International Refereed Academic Journal Of Sports, Health And Medical Sciences, sa.38, ss.11-22, 10.17363/sstb.2020/abc89/.38.1

Hammami, R.; Granacher, U.; Makhlouf, I.; Behm, D.G.; Chaouachi, A. Sequencing Effects of Balance and Plyometric Training on Physical Performance in Youth Soccer Athletes. *J. Strength Cond. Res.* **2016**, *30*, 3278–3289.

Hibbs, A. E., Thompson, K. G., French, D. N., Hodgson, D., & Spears, I. R. (2011). Peak and average rectified EMG measures: which method of data reduction should be used for assessing core training exercises?. *Journal of Electromyography and Kinesiology,* 21(1), 102-111.

Kamar, A. (2008). *Ability, Skill and Performance Tests in Sports*. Ankara: Nobel Publications. Kizilet, A., Atalan, O., & Erdemir, I. (2010). The effect of different strength training on the quickness and jumping abilities of 12-14 age group basketball players. Atatürk University *Journal of Physical Education and Sport Sciences,* 12(2), 44-57.

Psotta, R., Bunc, V., Hendl, J., Tenney, D., & Heller, J. (2011). Is repeated sprint ability of soccer players predictable from field-based or laboratory physiological tests? *J Sports Med Phys Fitness,* 51.18–25.

Räisänen, A. M., Pasanen, K., Krosshaug, T., Vasankari, T., Kannus, P., Heinonen, A., & Parkkari, J. (2018). Association between frontal plane knee control and lower extremity injuries: a prospective study on young team sport athletes. *BMJ open sport & exercise medicine,* 4(1), e000311.

Sander, A.; Keiner, M.; Wirth, K.; Schmidtbleicher, D. European Journal of Sport Science Influence of a 2-year strength training programme on power performance in elite youth soccer players. *Eur. J. Sport Sci.* **2013**, *13*, 445–451.

Sandrey, M. A., & Mitzel, J. G. (2013). Improvement in dynamic balance and core endurance after a 6-week core-stability-training program in high school track and field athletes. *Journal of sport rehabilitation*, *22*(4), 264-271.

Sannicandro, I., & Cofano, G. (2017). Core stability training and jump performance in young basketball players. *International Journal of Science and Research (IJSR),* 6, 479-482.

Scanlan, A. T., Wen, N., Pyne, D. B., Stojanovic, E., Milanovic, Z., Conte, D., ... & Dalbo, V. J. (2021). Power-related determinants of Modified Agility T-test Performance in male adolescent basketball players. *The Journal of Strength & Conditioning Research,* 35(8), 2248-2254.

Schiffer, J., Bora, P., Panoutsakopoulos, V., Kollias, I., Arcelli, E., Bianchi, A., ... & Hopkins, W. (2009). *The high jump. New Studies in Athletics*, 34(3), 9-22.

Stølen, T., Chamari, K., Castagna, C., & Wisløff, U. (2005). Physiology of soccer. *Sports medicine*, *35*(6), 501-536.