

# The relationship between core stability and some performance parameters between fourteen and sixteen year old group male long distance runners and football players

Hilal Kiliñç Boz<sup>1\*</sup> and H. Bayram Temur<sup>2</sup>

<sup>1</sup>School of Physical Education and Sports, Van Yüzüncü Yıl University, Van, Turkey.

<sup>2</sup>School of Physical Education and Sports, Bayburt, Turkey.

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## ABSTRACT

The purpose of this study is to examine the relationship between core stability and some performance parameters in 14-16 age group male long distance runners and football players. 15 male long distance runners and 15 male football players with an average whose height measured ranged from  $172.400 \pm 7.3513$  cm participated in the study. Core stability was determined by plank test and performance values were measured by using tests such as; 30 m speed running, pro-agility, long jump and 60 s shuttle pull. Descriptive and paired-sample t tests were used to compare core stability and performance values. When it is analysed according to football and athletics branches, it is seen that there is no significant difference between the branches in terms of height, body weight, BMI (Body Mass Index), plank and shuttle numbers they can pull in 60 seconds ( $p < 0.05$ ). However, it was found that 30 m speed running time, standing long jump distance and pro-agility test values showed a significant difference in favour of athletics ( $p < 0.01$ ).

**Keywords:** Core stability, performance, athleticism, football, long distance runners.

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\*Corresponding author. E-mail: hilalkilinc@msn.com.

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## INTRODUCTION

The word "core" is used to mean the centre in English (Gür, 2015). There is no word equivalent to describe that anatomical region to use in Turkish expression, although the term trunk (trunk stabilization) is used instead of "core", the word trunk expresses a larger anatomical structure. In most of the books published in English, the core exercise concept refers to trunk exercises that train the centre point tissues of the body, which are shown anatomically. In some parts of some physiology and training science books, the word "core" is expressed as basic exercises; it is used to indicate the exercises required for that training unit, which are generally applied at the beginning of training (Beachle et al., 2008). However, when examined in the title of sports sciences, core exercises, core stabilization, core strength, core endurance terms refer to the features of the core muscles of the trunk and the exercises using these muscle groups. This region, which is defined as the central

region of the body, is the point where the stabilization of the abdominal, par-spinal and gluteal muscles, consisting of the muscles, nerves, skeletal and other connective tissues that form the spine, abdominal cavity and superstructures, is important for optimal performance (Nadler et al., 2002). Previous researches on core training and athletic performance has failed to show a positive relationship between the two concepts (Nesser et al., 2008; Tse et al., 2005).

The problems seen in these studies are the tests of the endurance components of the core instead of testing the strength components of it, and they try to associate the endurance components with muscle and strength (Wagner, 2010). Over the past decade, the core training method has taken its place in many training programs in the United States. Materials such as pilates balls, bosu ball and abdominal exercise wheels have provided easy and feasible solutions for training. There is a belief that

core training strengthens the stability of athletes, which creates the idea that it will have a positive effect on athletes' performance on the field or on the track. Although these thoughts are accepted in sports sciences, the relationship between core stability and athletic performance in science remains uncertain (Sharrock et al., 2011).

Core stabilization and the reputation of core strength have become an important fitness trend in recent years, out of sports and health care field. Pilates, yoga, tai chi and many popular fitness programs work mainly on core stability principles. The researches examine and reveal the effect of core stability on many different purposes for athletic performance, disability prevention, and treatment of lower back pain (Akuthota et al., 2008). Athletics is a sport branch, preferred by families around the world in the education of their children for the purpose of gaining the spirit of struggle, developing the social spirit, being disciplined individuals, respecting others and developing a sense of self-confidence (Pekel and Aydos, 2014).

Core athletics are significantly needed in athletics. An athlete with unconditioned core muscles will have low efficiency, strength, and performance. The core muscle system connects the lower and upper extremities to each other and acts as a link between these extremities throughout the movement. Regardless of what the branch is, strong core muscles contribute to the formation of mobility, a proper posture and technique by creating resistance against fatigue. In addition, increasing core muscle strength can help athletes control or resist external forces, as well as exerting force against materials (such as shot put and disc). Moreover, increased core muscle strength contributes to overall body balance and stability (Willardson, 2014).

Football is a highly coordinated and complex sports branch in which aerobics and anaerobic performance are used together, where factors such as basic motoric features, general endurance and coordination affect the performance together (Müniroğlu and Deliceoğlu, 2008). It consisted of low, high and moderate exercises and movement. This complex structure also increases the difficulty level of football training for both athletes and coaches. Coaches should support the development of athletes with appropriate training programs and try to establish the correct load-rest relationship. Many activities in the football game show strength and explosive properties. In a neck and neck struggle, the player will try to provide an advantage by overcoming the opponent's resistance with the maximum isometric contraction he applies. This; is related to the athlete's maximum isometric force. Each of the features such as jumping, shooting, turning and sprinting, is related to power ability. Power is defined as the work done per unit time. It is obtained by dividing the product of power and distance (work) by time (Zorba et al., 2013).

Hibbs et al. (2008) propose that elite level athletes require much higher levels of core stability for sport

performance than during activities of daily living, therefore they must have appropriate rehabilitation to enhance return to function. These definitions suggest that core stability in athletics involves dynamically controlling and transferring large forces from the upper and lower extremities through the core in order to maximize performance and promote efficient biomechanics.

## **MATERIALS AND METHODS**

This study was conducted to examine the relationship between core performance and some performance parameters in 14-16 age group male long distance runners and football players in Van province in Turkey.

### **Height, weight, body mass index (BMI) and body fat percentage measurements**

The heights of the athletes participating in the research were measured with Seca brand height measurement device. The lengths of the athletes were measured in an anatomical stance with their shoes removed, the heel united, the athlete held his breath, the head in the frontal plane, after the position of the overhead table touched vertex point and the measurement was recorded in centimetres (Miller, 2012).

### **Plank test**

It is one of the basic static tests used to measure body strength. The subjects were asked to lie on their stomachs, their forearms and elbows bilateral shoulder widths and on their toes, the pelvis lifted and the neck, shoulders, back, hips and legs were wormed to form a straight-line parallel to the ground and the subject would maintain this posture (Plank position). The time elapsed in seconds until the subject got tired and/or his posture deteriorated with the start of the period (Reiman and Manske, 2009).

### **Standing long jump test**

Subjects were asked to jump forward from a fixed point as much as they could jump double legs in a position parallel to each other. The measurement was made with a steel tape measure (Stanley, USA) over the last trail left by the subjects after the jump. Participants were given two jumps and were best (meter) in calculations.

### **30 m speed running test**

The subjects were asked to start with a wedge 1 meter

behind the starting line and run at the highest speed they could run. Each participant was given two attempts and was recorded as best they could. The photocell device (Sport Expert, Tümer Engineering / Turkey) determined the time of the running speed of 30 meters.

### 60 seconds shuttle pull test

This test is applied on the exercise mat of the athletes by lying on their backs, knees bent 90 degrees, fingers are clamped behind the neck and feet are fixed by the assistant. In order to count repeats, athletes' elbows must touch the strings and their shoulders touch the cushion while lying back. No additional load other than body weight is required to perform the 60 seconds shuttle pull test.

Athletes should move fast within 60 seconds to reach the maximum number of repetitions (Augustsson et al., 2009).

### Pro agility test

Pro agility is a kind of agility test. It is also used in the literature with the name "5-10-5 agility test" and "10-yard shuttle run". A chronometer and an area of 10 yards are needed to perform this test. On a parallel line of 10 yards, (9.2 m) divided into 2 parts equal to 5 yards (4.6 meter), the athlete moves to the left or right at maximum speed, and finally the time it passes from the starting point is recorded (Baechle and Earle, 2008).

## FINDINGS

When the variables in Table 1 were analysed according to football and athletics branches, it was seen that there was no significant difference ( $p < 0.05$ ) between the lengths, body weight, BMI, plank and shuttle numbers that they could pull in 60 seconds. However, it was found that 30 meters of speed running time, long jump distance and pro agility test values differ significantly ( $p < 0.01$ ) in favour of athletics.

## DISCUSSION

In a study by Zingaro (2008), the relationship between core force and tennis service was examined. Seventeen tennis players, 11 women and 6 men, participated in the study. Core force measurement was determined by double leg lowering test (DLLT) and service rate was determined by radar. Measurements were made in one day and as a result, only strong positive correlation ( $r = 0.665$ ;  $p = 0.013$ ) was found in women. No correlation was obtained in the evaluation of men and both genders

together.

In another similar study, Söğüt (2016) examined the relationship between core stability and athletic performance in tennis players. 29 tennis players, consisting of 14 young men and 15 young women tennis players, participated in the study, and each of them was tested for core stability, dynamic balance, maximum service speed, agility, upper and lower body strength tests.

In consequence of his study, there was no statistically significant relationship between core stability and other variables for both genders.

It was revealed that the dynamic and static core exercises applied in the study conducted by Sever (2016) did not affect the anaerobic features and body composition of the players, but increased the core stabilization test scores. It is stated that the exercises that increase the core stabilization in the development of power and force-related performance features do not create sufficient stimulation and develop motor features such as speed and quickness. Mendes (2016) performed 15 basic exercises for 31 players between the ages of 18-30 for 6 weeks in order to investigate the effects of basic strength training physiological parameters applied to footballers and revealed that they could contribute to the speed performance of the core strength training. In their work with elite athletes, Hibbs et al. (2008) suggested that more core is needed during the daily vital activities in sports performances, so they should be included in the appropriate rehabilitation program to return to function. According to this definition, it is suggested that force transfer and maximum performance will increase in direct proportion with core stabilization for athletes from lower extremities to upper ones. According to the research result of Reaburn and Humphries' 6-week study on 18 young athletes (2004), Stanton suggested that a specific core training performed twice a week without improvements in physical performance in young athletes would positively affect the core stabilization stability. In the study conducted by Parkhouse and Ball (2011), the relationship between core stability and athletic performance was examined. The study compared the effects of 6-week static and dynamic core training programs on fitness tests. Static ( $N=6$ ) and dynamic ( $N=6$ ) training groups performed 45 minutes of training 2 days a week during 6 weeks. Seven performance tests consisted of three cores (plank, double leg lowering, and back extensions), one static (standing stork) and three dynamic (overhead health ball throw, vertical jump, 20 m sprint) were performed before and after the training. They found a very strong negative relationship between plank (core stability) and 20 m sprint tests ( $r = -0.927$ ) and double leg lowering (core stability) and 20 m sprint tests ( $r = -0.822$ ). However, no relationship was detected in the dynamic training group.

Sato and Mokha (2009) studied the relationship between core training and running performance. In

**Table 1.** Average and standard deviation values of athletes' height, body weight, body mass index, plank, 30 meters speed, long jump by standing, 60 seconds shuttle, pro agility tests.

Variance	Branch	Mean	T	p
Height (cm)	Football	171.20	891	.381
	Athletics	173.60		
Body weight (kg)	Football	62.07	-1.184	.246
	Athletics	65.07		
BMI (kg/cm) <sup>2</sup>	Football	21.11	-.490	.628
	Athletics	21.48		
Plank (second)	Football	104.27	-1.632	.114
	Athletics	138.33		
30 m speed test (second)	Football	5.02	4.218	.000
	Athletics	4.49		
Pro agility test (second)	Football	5.60	2.692	.012
	Athletics	5.07		

consequence of their research, they found that core exercises had a statistically significant effect on 5000 m running performance, while they determined that these exercises did not have a significant effect on lower body stability and ground reaction strength. According to the results of this study, it can be said that core stability training can play an important role in the performance improvement of long distance runners. Gordon et al. (2013) examined the relationship between core force, hip external rotator, and lower limb sign on Lacrosse players. In consequence of their studies, they stated that there was no statistically significant relationship between core force and hip external rotator and lower extremity balance. In another study, Takatani (2012) investigated the relationship between core strength, core stability and athletic performance.

The study was conducted on 20 male athletes from the university football team playing in the NCAA 2nd league. Rotary stability for core stability, 60 seconds maximum core for core strength, double leg lowering for core strength and maximum shooting speed for evaluating athletic performance were used in the core measurements of the athletes.

According to the result of his study, no relation was found between rotary stability, double leg lowering (DLLT), 60 seconds maximum shuttle tests and shooting speed, core stability, core force and maximum shooting speed. Since core stability tests include muscle movements below maximal, these tests primarily, activate the slow contracting muscle fibrils. In addition, strength and power tests stimulate both slow and fast contracting muscle fibrils, since they contain maximal muscle movements (Prieske et al., 2015). For this reason, since

the sport-specific core stability test involves muscle movements below the maximal, slow contraction muscle fibrils are active. However, when looking at the tests performed in performance measurements, the fast contracting muscle fibrils are active since they include movement-specific to strength, power, agility, explosive power and speed. In other words, it can be said that the primary reason for the lack of a significant relationship between core stability and athletic performance tests may be due to the study of different muscle types.

The result of the study, which Cissik et al. investigated the effects of core training on performance, can be summarized as the role of core training in athletic performance is very ineffective. According to Cissik (2011), if the purpose of the strength and fitness trainer is the development of athletic performance parameters, there is no need to focus much on core training. In his study, Dendas (2010) investigated the relationship between athletic performance and core stability. In the study, while core strength was determined by medicine ball throwing, 30 and 60 seconds shuttle pull tests, he used McGill (2007) protocol in core endurance measurements. Athletic performance values were evaluated along with 3TM breakout, 3TM back squat, 3TM bench press, vertical bounce and 40 m and 20 m sprint times. Findings showed significant correlation between athletic performance and the maximum number of shuttle pulls in 30 ( $r = 0.758$ ;  $p < 0.01$ ) and 60 ( $r = 0.862$ ;  $p < 0.01$ ) seconds and McGill trunk flexion test ( $r = 0.828$ ;  $p < 0.01$ ). In the study of determining the relationship between core stability and athletic performance conducted by Kamaş et al. (2018) no statistically significant relation was found in core stability

and athletic performance measures in short distance runners ( $p > 0.05$ ).

In conclusion, when the literature research is carried out, it is possible to see that insufficient studies on core stability, performance and different results can be obtained. In this context, core training with its contribution to performance and technical development, it allows athletes to perform their technical movements using less energy. As a result, athletes will be less exposed to the effects of fatigue in long-term competitions. A good core zone will both give the athlete more loading and provide better technical movements. When core performance tests are considered to play an important role in the performance development of athletes, it is thought that they will support the researches to be conducted.

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