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Análisis pedagógico del rendimiento de los jugadores de fútbol en la adolescencia temprana

Pedagogical analysis of the performance of soccer players in early adolescence

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Resumen
Este estudio tiene como objetivo examinar los efectos de los juegos reducidos específicos del fútbol sobre las características motoras de los niños en la adolescencia temprana. Quince jugadores de fútbol masculino (edad: 11,4 ± 0,5 años, altura: 148,7 ± 8,2 cm, peso: 39,7 ± 8,7 kg) que jugaban activamente al fútbol en la escuela de fútbol Yeşil Beyaz en la provincia de Konya participaron en el estudio de forma voluntaria. En el estudio V se aplicaron pruebas de flexibilidad de sentarse y alcanzar, salto horizontal y vertical, prueba de equilibrio Y y pruebas de agilidad de cambio de dirección antes y después de los juegos en espacios reducidos. Los datos de las pruebas de antes y después de los atletas que participaron en el estudio se probaron con Kolmogorov Smirnov. Como resultado del análisis estadístico realizado, se ha determinado que todos los datos presentan distribución normal (p> 0.05). En nuestro estudio, se encontró una mejora estadísticamente significativa en los valores de la prueba final para el salto vertical y horizontal, la prueba de flexibilidad sit-and-reach y la prueba de agilidad de los atletas en juegos reducidos, mientras que se encontró un desarrollo estadísticamente significativo en las últimas pruebas de equilibrio. realizado en los ejes posterolateral, posteromedial anterior derecho e izquierdo en comparación con los valores de la primera prueba. Como resultado, se ha observado que los juegos reducidos específicos del fútbol aumentan el rendimiento motor de los niños en la adolescencia temprana.

Palabras clave: fútbol, adolescencia temprana, juegos reducidos, rendimiento motor, deporte

Abstract
This study aims to examine the effects of small-sided games specific to football on motor characteristics of children in early adolescence. Fifteen male football players (age: 11.4±0.5 years, height: 148.7±8.2 cm, weight: 39.7±8.7 kg) actively playing football in the Yeşil Beyaz Football School in Konya province participated in the study voluntarily. In the study V sit-and-reach flexibility, horizontal and vertical jump, Y balance test and change of direction agility tests were applied before and after small-sided games. Data of before and after tests of athletes participating in the study were tested with Kolmogorov Smirnov. As a result of the statistical analysis conducted, it has been determined that all of the data presented normal distribution

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(p>0.05). In our study, a statistically significant improvement was found in the final test values for vertical and horizontal jump, sit-and-reach flexibility test and agility test of athletes in small-sided games while a statistically significant development was found in the last balance tests conducted on right and left anterior, posterolateral, posteromedial axes compared to first test values. As a result, it has been observed that small-sided games specific to football increase motor performance of children in early adolescence.

Keywords: Football, Early Adolescence, Small-Sided Games, Motor Performance, sports

Introduction

Changes in anatomical and anthropometric (height increase, body mass increase, etc.) characteristics that occur in early adolescence cause the motor performance to be negatively affected. In sports, during the transition periods from childhood to adolescence, it is emphasized to improve physical and physiological characteristics and especially motor characteristics such as agility, balance and flexibility with branch-specific games (Deprez et al, 2015; Figueiredo et al., 2009; Höner & Votteler, 2016). During these periods, the effect of successive age increase in individuals on basic and combined motor characteristics causes a greater effect on certain age increases. Motor characteristics such as strength, endurance, speed, flexibility and coordination affect adolescents at different levels, especially in adolescence periods when rapid physical development is observed with the increase of age. This situation is important in terms of examining the increase in age of athletes in early, middle and late adolescence periods in a more detailed manner in terms of condition and technique, and determining the effects on the individual's future sports success and periodic development (Erkek et al, 2021).

In football, effective physical and physiological characteristics should be improved in required proportions and football-specific adaptation should be achieved taking into account effective energy metabolism and motor characteristics (Eniseler, 1994). Although determining the performance limits of athletes is very important (Özkara, 2002), it is also important to evaluate the performance from various aspects. Because the biomotor components that constitute physical structure, physiological capacity and performance in football (Sevim, 1995) will prevent achieving the expected level of values. Football is a team sport characterized by performance under varying conditions during games and training, where performance varies according to situational conditions in terms of high coordination and motoric development (Davids et al., 2013; Tessitore et al., 2006).

Although different methods were used for performance improvement in previous studies in terms of football (Ateş, Demir & Ateşoğlu, 2007) small-sided games in modern football

games are preferred for development of different general movement patterns with certain parameters (e. g. running intensity, sprint distance, agility, etc.) reported to be lower compared to actual football games (Barnes et al., 2014; Casamichana, Castellano & Castagna, 2012; Küçük & Tarakçı, 2018). Small-sided games are an important part of exercise and training strategies that contain game features designed for physical, technical and tactical development of young and adult players in football or other team sports, but rarely played (Hill-Haas et al., 2011; Clemente, Martins & Mendes, 2014, Owen et al., 2014; Serra-Olivares et al., 2015). Since small-sided games have recovery effects on this system where football players increase their cardiovascular capacity, they also include situations such as short sprints, changing direction, passing, quick decision making and shooting, etc. thus increasing the technical-tactical and physical development and motivation and providing versatile development of performance (Köklü, 2013; Owen et al., 2012; Dellal et al, 2008; Impellizzeri et al. 2006).

It has been reported in size studies regarding small-sided games that changes in the number and format of players are effective in terms of physical, technical and tactical development of athletes and are generally the focus of studies examining the effect of small, medium or large sizes. (Aguiar et al., 2012; Hill-Haas et al., 2009; Kelly & Drust, 2009; Rampinini et al, 2007). Studies have reported that larger sizes can improve the physiological, motor, and technical characteristics of players (Rampinini et al, 2007; Evangelos et al, 2012; Giménez, Coso & Gómez-Ruano, 2017; Casamichana, Castellano & Castagna, 2012) and therefore it is important in terms of investigating the effects of small-sided games on the match performance of players and developing new systems (Clemente, Martins & Mendes, 2014). In small-sided games, the combination of number of players and different field sizes, limitations during the game and development of match-specific adaptation by coaches are very important for formation of a training style which ensures high performance (Katis & Kallis, 2009; Bangsbo, 1994).

Since the results of trainings performed for arrangement of small-sided games with different field sizes directly affect the football player, efficiency factors of these training should be well known in the planning process within the training unit (Aguiar et al., 2012; Hill-Haas et al., 2009). In terms of the effects of small-sided games, which are preferred in terms of short loads, on the performance, the expected effects on physiological and motor levels, especially in terms of perceived effort, can be better determined according to the duration of the game and size of the field (Casamichana & Castellano, 2010; Hill-Haas et al., 2009; Kelly & Drust, 2009; Tessitore et al., 2006). This study aims to examine the effects of small-sided games on motor performance of children in early adolescence, since the development of physical and

physiological characteristics in football is important and therefore the early adolescence period between the ages 11-13 is the age of branching in football (Küçük, 2009).

Methodology

Sample group

Fifteen male football players (age: 11.4±0.5 years, height: 148.7±8.2 cm, weight: 39.7±8.7 kg) actively playing football in the Yeşil Beyaz Football School in Konya province participated in the study voluntarily. The study was conducted with players with at least 2 years of football history who trained 3 days a week and had no injuries recently. Before and after the small-sided games, vertical and horizontal jump, V sit-and-reach, Y-balance tests and V changing directions agility tests were applied to players with warm-up and cooldown phases especially included. The exercise was applied on the synthetic turf ground where the players play continuously, and a size 4 ball suitable for the age group was used to prevent injuries (Özbar, 2009). During the study, players were verbally supported during the motor tests in order to increase their motivation. Data of the study were obtained as an experimental research model including uncontrolled pre-test and post-test. Children participating in the study as well as their trainers and families were informed about the purpose and possible risks of the study, and voluntary participation consent form was signed by them.

Anthropometric measurements

Height, weight measurements

Height was measured in cm in anatomical posture, with bare feet and deep inspiration with Seca 23 brand digital scale with height measurement feature with 1 mm accuracy level. Weight Measurements Weight measurements were made on the subjects with bare feet and on an empty stomach, while wearing only shirt and shorts. Weight measurements were made with Seca brand digital height measurement device with an accuracy level of 100 grams.

Tests applied

Vertical Jump Test

The difference between the height where players could touch on the wall marked with a tape measure with full arm span and the height they could reach by jumping with both feet was determined in cm.

Horizontal Jump Test

Subjects were asked to jump to the furthest point where they can jump with both feet, behind the line marked on the ground. The distance between the start line and the point reached by the player is determined in cm (Ballreich, 1970**;** Fetz & Konoxl, 1965).

Changing Directions Agility Test

In this test, where the athlete's agility and coordination ability are evaluated, 3 cones were placed on a straight line with 5-meter intervals. At the beginning of the test, athletes stand ready in the middle cone and go to the right or left side upon the command of the test director, touch the cone in that direction, then go to the farthest cone and finally the test is terminated when they return to the middle cone. All back and forth movements are made with side sliding steps at maximum speed. The test is performed in two repetitions and the highest score is recorded in seconds (Kamar, 2008).

V Sit-and-Reach Flexibility Test

A 30-cm long straight line was marked as the start line, and the measurement line with an accuracy of 0.1 mm and a length of 60-80 cm was placed at a right angle to the start line with 30-40 cm on both sides. The point where the start and the measurement line intersect was accepted as the "zero" point, the legs were adjusted in the shape of a V with 30 cm intervals from the heels, 3 attempts were made and the highest distance the athlete reaches was recorded in cm (Hui & Yuen, 2000).

Y-Balance Test

In the Y-Balance test, athletes took position with bare feet at the "zero" point where the tape measure placed on the floor in anterior, posterolateral and posteromedial directions intersected. The measurement was taken bilaterally, with the right and left feet apart. Leg length of the athletes was recorded in cm by measuring bilaterally from the anterior superior iliac point to the distal part of the medial malleolus in the supine position. During the measurement, they were told to touch with toe tips to the farthest point possible with the heel not leaving the ground and hands on the iliac crest. Before the measurement, athletes were given practical and verbal information about the test. Lifting the hands from the iliac crest and lifting the heel off the

ground was considered a mistake. Two measurements were taken for the right and left legs in all directions and the highest score was recorded in cm.

Y-Balance *Test Scoring:* Y-Balance test is a test in which strength, flexibility, neuromuscular control, stability, range of motion, proprioception and balance parameters can be measured (Gonell, Romero & Soler, 2015). Measurements are made bilaterally for the right and left leg. Total length of the three directions is divided by the multiplication of the leg length by three, multiplied by one hundred, and the combined Y-balance test score is found (Shaffer et al, 2013). Before the test, during anatomical posture, leg lengths are measured with a tape measure between the iliac crest and malleolus to calculate the accurate leg length. Y-Balance test can be calculated with 3 different formulas. In our study, the second formula was used.

1. Absolute reach distance (cm) = (Reach 1 + Reach 2 + Reach 3) / 3

2. Combined reach distance (%) = Total of 3 reach directions / 3 times of extremity length * 100

3. Relative (normalized) reach distance (%) = Absolute reach distance / limb length * 100 (Walker, 2016; Plisky *et al*, 2009; de la Motte *et al*, 2016).

Small-side game

The exercise was carried out in a 20x20 meter area, in 3 sets of 5 minutes as 5x5 with the number of players for each team being 5, giving 90 seconds of water and rest breaks between each set. Application area dimensions were determined within the field with tapes and standard size miniature goalposts were used. However, in order not to waste time and stop the game during the training, assistant coaches were kept around the playing field with spare balls (Eniseler, 2010).

Results

15 young male athletes (n:15, Age: 11.4±0.5 years; Height: 148.7±8.2 cm; Weight: 39.7±8.7 kg) participated in our study. Data of before and after tests of athletes participating in the study were tested with Kolmogorov Smirnov. As a result of the statistical analysis conducted, it has been determined that all of the data presented normal distribution ($p>0.05$). As a result of our study, it has been found that there was a statistically significant improvement in the vertical and horizontal jump, sit-and-reach flexibility test and agility tests of the athletes ($p <0.05$) (Table 1).

Table 1
Evaluation of athletes' vertical, horizontal jump, V sit-and-reach and agility tests

Variable	Pre-Test	Post-Test	P
Vertical Jump (cm)	21.7 ± 7.01	28.7 ± 5*	0.00
Horizontal Jump (cm)	115.3 ± 21	123.1 ± 18.4*	0.01
V Sit-and-Reach (cm)	47.7 ± 8.6	51.8 ± 9.1*	0.00
Agility (sec)	7.9 ± 1.1	7.3 ± 1.1*	0.00

* p<0.05 means statistical significance

On the other hand, data on balance performance of athletes in pre- and post-tests are presented in Table 2. Accordingly, it has been observed that post-test data of athletes regarding the balance tests conducted in the right and left anterior, posterolateral, and posteromedial axes statistically significantly improved compared to pre-test data (p<0.05).

Table 2
Evaluation of balance tests in the right and left anterior, posterolateral and posteromedial axes of athletes

Variable	Pre-Test	Post-Test	P
Right Anterior	60.7 ± 6.1	65.8 ± 5.9*	0.00
Right Posterolateral	69.3 ± 6.2	76.3 ± 5.3*	0.00
Right Posteromedial	67 ± 6.9	73.3 ± 6.1*	0.00
Left Anterior	62.1 ± 6.5	66.5 ± 6.8*	0.00
Left Posterolateral	69.2 ± 5.7	74.7 ± 5.5*	0.00
Left Posteromedial	69.2 ± 6.5	76.8 ± 6.9*	0.00

* p<0.05 means statistical significance

Discussion

In our study, which aimed to determine the effects of small-sided games on motor performance of children in early adolescence, examined parameters of vertical and horizontal jump, sit-and-reach flexibility test and agility parameters and the final test data regarding balance of right and left anterior, posterolateral, posteromedial axes of athletes were found to be statistically significantly improved compared to first test data, as can be seen in Koşar & Demirel (2014).

In terms of preventing negative physical and psychological consequences during adolescence, it is important to choose the games and applications to be applied according to the

age groups and characteristics of the athletes (Lloyd et al, 2014). Selection of games that support development by following the growth and development characteristics of children, especially during adolescence period, is very important in football, as in many team sports, in terms of systematic and versatile development of basic motor characteristics and high performance in children (Bompa, 1983; Kurban & Kaya, 2017). It is known that small-sided games, which are training exercises where sizes of the field and numbers of players are changed for motor performance level and tactical-technical development of players, ensure functional development during training (Impellizzeri et al. 2006). In small-sided games, motor parameters, physical and physiological loads, intensities can be affected by time, field dimensions, number of players, break durations, coach encouragement, and running distance with and without the ball (Rampinini et al, 2007; Hill-Haas et al., 2009).

Similar to the changes in field dimensions, changes in the number of players also affect physical and physiological loading, technical and tactical values. On the other hand, physiological values increase by decreasing the number of players while performance values decrease and tactical behaviors increases with the increase in number of players (Morgans et al., 2014),. For this reason, in order to use the motor characteristics more intensively, number of players was preferred as 5x5 and field dimensions were 20x20 meters in our study. González-Víllora et al (2017) reported that the field of play and the number of players have different effects on the physical and physiological characteristics of young football players during small-sided games. Küçük and Tarakçı (2018) reported that high intensity small-sided games have effects on physiological and motor performances of football players and can be used for the development of more than one characteristic. Hadi (2015) reported that football training with and without ball and small-sided games have effects on selected motor parameters. As a result of the study examining the effects on physical and physiological performances of football players in middle adolescence period, Kocatepe (2019) reported that small-sided games have effects on motor performance level in addition to physical characteristics such as body composition, etc.

When the literature is examined, it has been found that generally the studies examining the effects of small-sided games on physical and physiological characteristics, motor performance, cardiovascular system and technical parameters in adolescent and adult football players are more common compared to the studies on early adolescence (Halouani et al, 2017; Say et al, 2020; Kayantaş & Söyler, 2020; Casamichana & Castellano, 2010; González-Víllora, et al., 2017). As a result of the study conducted by Giménez et al. (2017) examining the effects of large and small-sided football-specific games on performance, they stated that small-sided

game-based training models do not exactly copy the movement patterns of a competitive match, but can ensure positive improvement in performance by ensuring short-term and high-intensity movements for special training of football players.

Limitations of the study

The results of this study are limited to male football adolescents and care should be taken in extending the results to other sports, sex and ages. On the other hand, it has been determined that studies examining the effects of small-sided games on motor performance focus more on agility and the results we obtained in our study were similar to the studies in the literature (Arslan, Orer & Clemente, 2020; Chaouachi et al, 2014; Dilber et al, 2016; Kayantaş & Söyler, 2020). In addition, it has been observed that the number of studies examining the changes on balance, agility, flexibility and anaerobic strength motor parameters of loads during small-sided games applied as a single set is limited in number (Randers et al., 2014; Küçük & Tarakcı, 2018).

Conclusion

The results of this study indicate that football-specific small-sided games can be preferred as an appropriate training method for the development of motor performance of children in early adolescence. In addition, it is thought that narrow field games can be continuously included in training programs in order to determine the effects of different features on the development of adolescence children in football by changing the area sizes and the number of players.

In sum, this study shows a statistically significant improvement was found in the final test values for vertical and horizontal jump, sit-and-reach flexibility test and agility test of athletes in small-sided games while a statistically significant development was found in the last balance tests conducted on right and left anterior, posterolateral, posteromedial axes compared to first test values. As a result, it has been observed that small-sided games specific to football increase motor performance of children in early adolescence.

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