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Investigation Of Agility Performance In Some Anthropometric Variables For Young Male Soccer Players

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Abstract

The purpose of this study was to investigate the agility performance of young male soccer players in anthropometric variables. One hundred sixty-nine healthy young male soccer players (10, 11, 12, 13 and 14 age) were examined. The mean (SD) age was 12.31 ± 1.29 years, height was 153.28 ± 9.79 cm, body weight was 44.18 ± 10.30 kg, and Body Mass Index (BMI) was 18.57 ± 2.82 kg/m2 for the 169 young soccer players. Height, body mass index, body weight, 5-0-5 agility test, the pro-agility test, T test and Illinois agility test score were collected in 169 young soccer players. Body weight was significant predictor of pro-agility, 5-0-5 agility test, T test, and Illinois agility test while age was significant predictor of pro-agility, T test, and Illinois agility test. Also, height was significant predictor of 5-0-5 agility test, T test, and Illinois agility test. On the other hand, body mass index was significant predictor of T test and Illinois agility test. Players who higher body weight has performed better in all agility tests in this study. In conclusion, after 12 years of age, a small difference in maturation may imply a substantial difference in body height and weight, associated with a huge difference in agility performance.

Keywords: Agility; agility test; body mass index; body weight; height.

Genç Erkek Futbolcularda Çeviklik Performansının Bazı Antropometrik Değişkenler Açısından İncelenmesi

Özet

Bu çalışmanın amacı, genç erkek futbolcularda çeviklik performansının antropometrik değişkenler açısından incelenmesidir. Yüz altmış dokuz sağlıklı genç erkek futbolcu (10, 11, 12, 13 ve 14 yaş) araştırmaya katılmıştır. 169 genç erkek futbolcunun yaş ortalamaları 12.31±1.29 yıl, boy uzunluğu ortalamaları 153.28±9.79 cm, vücut ağırlığı ortalamaları 44.18±10.30 kg ve vücut kütle indeksi (VKİ) 18.57± 2.82 kg/m2 dir. Boy, vücut kütle indeksi, vücut ağırlığı, 5-0-5 çeviklik testi, Pro-agility testi, T testi ve Illinois çeviklik testi dereceleri 169 genç futbolcudan toplanmıştır. Vücut ağırlığı; çeviklik, 5-0-5 çeviklik testi, T testi ve Illinois çeviklik testleri için anlamlı bir gösterge iken, yaş parametresi de çeviklik, T testi ve Illinois çeviklik testinin anlamlı bir göstergesidir. Ayrıca boy parametresi 5-0-5 çeviklik testi, T testi ve Illinois çeviklik testi için önemli bir göstergedir. Bunun yanı sıra, vücut kütle indeksi ise T testi ve Illinois çeviklik testinin önemli bir belirleyicisidir. Vücut ağırlığı daha fazla olan futbolcular, bu çalışmada tüm çeviklik testlerinde daha iyi performans göstermiştir. Sonuç olarak, 12 yaşından sonra olgunlaşmadaki küçük bir fark, çeviklik performansında büyük bir gelişime sebep olarak boy ve vücut ağırlığında önemli bir değişime yol açmaktadır.

Anahtar Kelimeler: Boy uzunluğu, çeviklik; çeviklik testi, vücut ağırlığı, vücut kütle indeksi.

INTRODUCTION

Agility does not have a global definition, but it is often recognized as the ability to change direction and start and stop quickly. Agility is the ability to maintain and control correct body positions while quickly changing direction through a series of movement (5). Agility is believed to be an important physical component necessary for successful performance in many sports, particularly in soccer. Agility has a special importance in soccer, because of a great number of a typical game situations that demand multiple rapid change of direction in the relatively small-side of the game. Especially at elite level, playing soccer requires a range of technical and tactical skills as well as physical performance characteristics such as highly developed speed and agility (20). A soccer player who is agile is able to change direction abruptly without losing balance. Agility includes factors such as speed, strength, balance and coordination and is beneficial because it helps a player's ability to get and hold onto the ball (24). Performance in playing soccer requires not only technical, tactical, and psychological skills, but also depends on anthropometry and physical fitness (power of jumping, agility with and without the ball, and speed of cyclic or acyclic movements). Indeed, anthropometric characteristics of an athlete are important predictors of whether the athlete will reach the top level of their chosen sport. In soccer, weight, height and body sizes are significant contributors to better performance. In addition, soccer players with better abilities in speed, strength, and agility have advantages in game situations. Agility performance in soccer has been evaluated with different agility tests. However, the comparison of the athletes with his physical characteristics was made rather than associated. Whereas, the change in soccer players' physical characteristics such as height, body weight and body mass index is very important to explain the agility performance in terms of physical performance. Previous studies have estimated the relative contributions of growth- and maturity-related variables to performance in youth soccer (6). In a study performed with adolescent male Portuguese sub elite players, advanced skeletal maturity and higher body mass positively correlated with physical performance, whereas an increase in adiposity negatively correlated (7). Coaches and scouts can use this information to identify potentially exceptional players. However, rapid changes in anthropometrical and physiological characteristics during childhood and adolescence make it difficult to determine the most important factors involved in the achievement of athletic excellence (12, 15). To the best of our knowledge, no scientific literature was found significant predictor of agility tests used in soccer in terms of anthropometric characteristics. Therefore, the purpose of this research was to evaluate the significant predictor of agility tests used in soccer in term of age, height, weight, and body mass index.

MATERIAL &METHOD

Subject

One hundred sixty-nine healthy young male soccer players (10, 11, 12, 13 and 14 age) were examined. The mean (SD) age was 12.31±1.29 years, height was 153.28±9.79 cm, body weight was 44.18±10.30 kg, and BMI was 18.57±2.82 kg/m2 for the 169 young soccer players. Before conducting the experiment, all subjects were informed of the risks of the study and gave informed consent. The study was approved by a local ethics board and met the conditions of the Helsinki Declaration. For this study, approval was obtained from the non-invasive ethics committee of the Selçuk University Faculty of Sport Sciences.

Table 1. Descriptive statistics of the physical features and agility tests for young male soccer players

Variables	Mean±SD (N = 169)	Agility tests	Mean±SD (N = 169)
Age (y)	12.31±1.29	Pro_Agility (s)	5.77±0.39
Height (cm)	153.28±9.79	T Test (s)	13.13±1.34
Body weight (kg)	44.18±10.30	5-0-5 Agility test (s)	2.98±0.26
BMI (kg/m2)	18.57±2.82	Illinois test (s)	17.20±2.52

Procedures

In this study, Pro-agility test, 5-0-5 agility test, Illinois agility, and T test was used. The aims of all tests were explained to the players before the tests were conducted. The tests were started with a 20-minute warm-up session. While the tests were conducted, the same weather conditions were taken into consideration. This was followed by the administration of 5-0-5 agility test, pro-agility test, T test, and Illinois agility tests. Each test was applied twice, with a 3-minute interval, and the best result was recorded. There was a 5-minute rest session between each test. Cone, stopwatch, and tape measure for distance were used. The methodology employed during the tests is summarized in the following paragraphs.

5-0-5 agility test

This test evaluated the capacity of the subjects to quickly change direction. Cones were set up at 5 and 15 m from a line marked on the ground. The players assumed a starting position 10 m from the timing gates (i.e. 15 m from the turning point). The subjects ran from the 15-m marker (cone) toward the line (running at distance to build up speed) and through the 5 m markers, turned on the line, and ran back through the 5-m markers. The time was recorded from when the participants first ran through the 5-m marker and stopped when they returned through these markers (i.e., the time taken to cover the 5 m up and back distance – 10 m total). The participants were instructed not to overstep the line by too much, as this would increase their test duration (3).

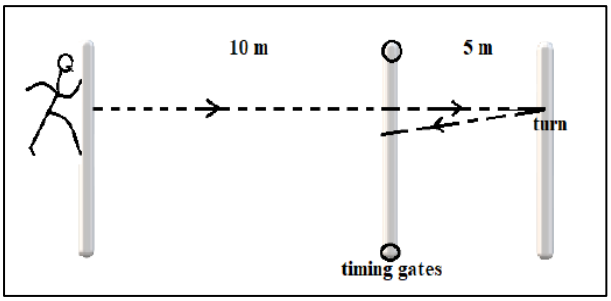

Figure1. Schematic representation of the 5-0-5 Agility test

The Pro-Agility test

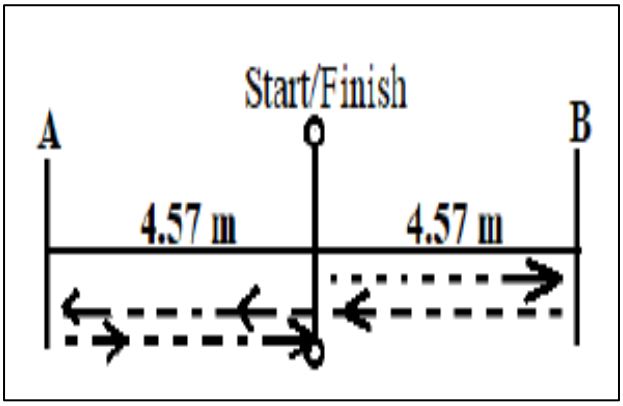

Figure 2. Schematic representation of the Pro agility test

The Pro-Agility test was set up and administered using the protocol outlined by Harman et al. (8). The subjects started in a neutral stance, straddling the start line. On the "Go" command, the subjects were instructed to turn and sprint to the right 4.57 m (5 yd), touching the cone with their right hand. They then turned to the left and ran 9.14 m (10 yd) to the far cone. The subjects touched this cone with their left hand and then sprinted 4.57 m (5 yd) to the finish.

T-Test

The T-Test was administered using a version standardized from previous literature (16, 23). The directions adopted for this study were based on (16). On the "go" command, the participant 1; ran or moved as quickly as possible forward to the center cone, 2; sidestepped to the left 4.57 m to the left cone, 3; sidestepped to the right 10 m to the far-right cone, and then 1; sidestepped back to the left to the center cone. The participant then ran or moved backward as quickly as possible to cross the finish line. The raters began the stop watch on "go" and stopped when the participant broke the plane of the finish line. The time to complete each trial was recorded in seconds. Disqualification was determined if the participant failed to run the course as instructed, failed to reach the finish line or complete the course, moved any cones, did not keep his trunk and feet pointed forward at all times, or crossed his legs more than once when sidestepping

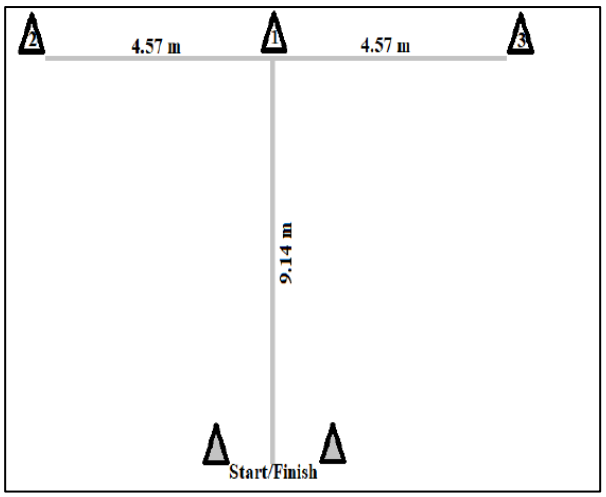

Figure 3. Schematic representation of the T test

Illinois Agility Test

The length of the Illinois agility test was originally set at 9.20 m. The IAT course was marked by cones, with four center cones spaced 3.07 m apart and four corner cones positioned 3.6 m from the center cones (27).

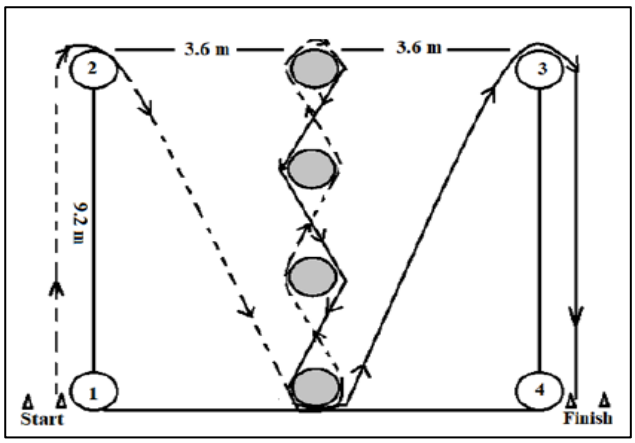

Figure 4. Schematic representation of the Illinois agility test

The participant began the test lying prone on the floor behind the starting line with his arms at his side and his head turned to the side or facing forward. On the "go" command, athlete begins and time starts when they cross the photocells. Get up and run the course in the set path (left to right to left). On the turn spots 2 and 3, be sure to touch the cones with your hand. Trial is complete when you cross the finish line and when no cones are knocked over. The time to complete each trial was recorded in seconds. Disqualification was determined if the participant failed to run the course as instructed, failed to reach the end lines, failed to complete the course, or moved any cones.

Statistical analysis

All statistical analyses were completed using the Statistical Package for the Social Sciences, version 22 IBM. Descriptive analyses were performed for physical characteristics and agility measurements. Data were presented as mean+SD. Relationship between variables was tested via Pearson correlation coefficient, with 95% confidence intervals (95% CI) being calculated for each agility variables and physical characteristic together. Normality was confirmed via the Kolmogorov-Smirnov test. Multiple regression analysis was performed to identify significant predictors of criterion measures of age, height, weight and BMI for Agility performance tests.

RESULTS

Table 2. Multiple Regression Analysis of Independent Variable Effects on Dependent Variables

Dependent Variables	Independent Variable	Coefficient	SE	t-value	P-value
Pro–Agility Test	Intercept	7.883	0.629	12.540	0.000*
	Age	-0.104	0.037	-2.850	0.005*
	Height	-0.011	0.006	-1.750	0.082
	Body weight	0.011	0.005	2.176	0.031*
	BMI	0.016	0.010	1.570	0.118
T test	Intercept	22.926	1.938	11.830	0.000*
	Age	-0.617	0.113	-5.464	0.000*
	Height	-0.040	0.019	-2.159	0.032*
	Body weight	0.058	0.015	3.816	0.000*
	BMI	0.073	0.032	2.267	0.025*
5-0-5 Agility test	Intercept	4.720	0.424	11.125	0.000*
	Age	-0.017	0.025	-0.673	0.502
	Height	-0.015	0.004	-3.781	0.000*
	Body weight	0.014	0.003	4.112	0.001*
	BMI	0.011	0.007	1.584	0.115
Illinois Agility test	Intercept	31.618	3.974	7.956	0.000*
	Age	-0.809	0.232	-3.493	0.001*
	Height	-0.078	0.038	-2.041	0.043*
	Body weight	0.102	0.031	3.276	0.001*
	BMI	0.157	0.066	2.369	0.019*

It is observed that the change in agility performance improved after 12 years of age.

Body weight was significant predictor of Pro-Agility, 5-0-5 agility test, T test, and Illinois Agility test while Age was significant predictor of Pro-agility, T test, and Illinois agility test. Also, height was significant predictor of 5-0-5 agility test, T test, and Illinois agility test. On the other hand, BMI was significant predictor of T test and Illinois agility test.

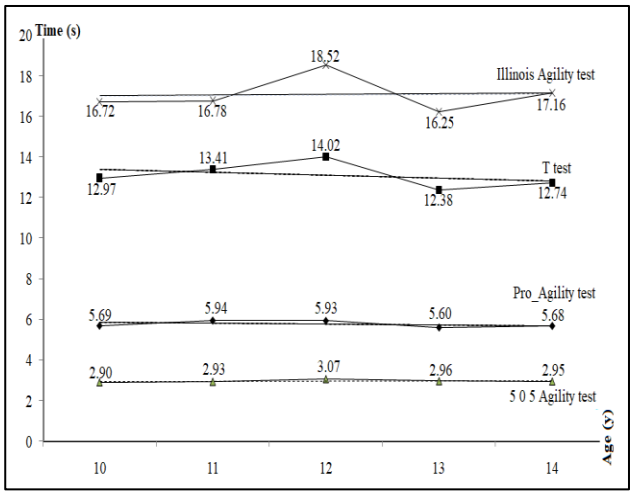

Figure 5. Change graph of agility performances according to age groups.

DISCUSSION

In this study conducted to investigate the agility performance of young male soccer players in anthropometric variables. Body weight was significant predictor of Pro-agility, 5-0-5 agility test, T test, and Illinois agility test. Age was significant predictor of pro-agility, T test, and Illinois agility test. Height was significant predictor of 5-0-5 agility test, T test, and Illinois agility test. BMI was significant predictor of T test and Illinois agility test.

A previous study examined if anthropometry and performance were different amongst older and younger soccer players born in the same year. Older boys performed better in agility ($P<0.05$). Also, the study revealed that chronological age was the most important variable in the agility test (6). Vescovi et al (26) described the physical performance characteristics of female soccer players ranging in age from 12 to 21 years. The 12-13 years-old players had slower scores on both agility tests (pro-agility = 5.40 ± 0.28 s and Illinois = 11.22 ± 0.60 s) compared with all other ages and there was the tendency for younger athletes (e.g., 13-15 years old) to have slower times on the agility tests compared with the older athletes (e.g., 17-20 years old). Performance on

both agility tests showed the largest change between 12 and 13 years, and then modest improvements were observed until 15-16 years when a plateau occurred. Between the three age groups pro-agility scores were stable after 12-13 years; however, there was a continued improvement across each group for the Illinois test. In a previous study of the contribution of chronological age, age at peak height velocity, body size, and body composition to physical performance among young elite soccer players of different age groups, chronological age was the primary predictor of physical performance within both age-groups (under 12 and under 13). Specifically, chronological age was a significant performance predictor for modified Barrow's agility test in the U-12 group and the U-13 group (2). Similarly, in our study revealed that the change in agility performance improved after 12 years of age in all agility tests. The study of Forsman et al. (4) in which they found an average height increase of 7.1 cm in a 12-month period. In the ages between 12 and 15 years is characterized as the second phase of running speed development, and strength increases with stride length, height and muscle development, and sprint because of this performance improves (21). In a study, when we look at the relationship between the mean height of the subjects according to their age groups and the means of T test and The Illinois Agility tests, there were significant differences as statistically. A study which conducted with 12- year-old boys, significant relationship was found between 50 m speed and height (1). Similarly, in this study observed that the change in agility performance improved after 12 years of age. In young athletes, strength and lower extremity power, anthropometric variables, perceptual and decision-making processes and running speed on a straight line will significantly contribute to agility performance (11). Furthermore, a number of rapid age-related biological and social changes occur that can affect the motivational and performance characteristics of young players throughout puberty (9,10). Some researchers revealed that sprint performance development is link to neural system maturation and improved muscle/ neuralization as well as increase in muscle mass (13,15). In this study, when we look at the relationship between the mean height of the subjects according to their age groups and the means of 5-0-5 agility, T test and The Illinois Agility tests, there was significant differences as statistically. Almuzaini (1) was found significant relationship between 50 m speed and height12- year-old boys. In the ages between 13 and 15 years the largest difference in sprint is related to variation in body height and also sprint performance has shown the largest improvement around the peak height velocity (12,22). In a study among young soccer players, shown that taller players performed better in 10 m and 30 m sprint among 14-year-old males (28). In another study, with 12-year-old boys, found a significant correlation between the 50 m sprint and height (1). The peak rate of development of agility performance occurs at approximately the age of 13-14 years in male youths, which is at the time of PHV (25). In the growth spurt, the variations in maturation for the same chronological age have been shown be as much as 2 or 3 years, or even more, and (13), suggest that body mass and maturity account for 50% of variance in short sprint in 13- to 15-year-old soccer players. In this age period, a small difference in maturation may imply a substantial difference in body height and weight, associated with a huge difference in sprint performance (6). It has been observed that the ability of repeated sprint test in the 11-18 age range didn't change with age in a well-trained soccer player (18). Also, with previous studies shown that there are positive relation between anthropometric characteristics (e.g. body mass and stature) sprint performance (14). BMI did not correlate significantly to any performance variables in this study; however, BMI measurements have shown to be related to body fat among adolescent soccer players (19). Body fat to be significantly lower in 9- to 14-year-old soccer players than in a control group and, as a consequence, BMI should be connected to body fat measurement (17). And also, soccer players who has higher BMI values performed better in 30-m sprint (27). In the present study, if the players have higher BMI they showed significant test score in Illinois agility test and T test. Peak height (5%) and weight (14.1%) values were observed in young European soccer players when they reached the age of 14 (25), this finding also supported previous studies (22). In addition, Malina et al (12) considering the findings in the general population, the muscle mass in proportion to the total body weight increased from 47.8% at the age of 11 to 51.9% by the age of 17. Furthermore, with peak height and weight attacks occuring between the ages of 13-14, improvement was observed in speed (5.2%) and agility (3.8%) performances (25). Similarly, in this study, players who higher body weight has performed better in all agility tests.

In conclusion, in this age period, a small difference in maturation may imply a substantial difference in body height and weight, associated with a huge difference in agility performance.

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