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Comparison of Different Agility Tests by Positions in Young Football Players

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ABSTRACT

The aim of this study was to compare the results of the Illinois Agility Test (IAT) and the Zigzag Agility Test (ZAT) in order to evaluate the agility characteristics of young players according to their positions. 80 male amateur football players (Age: 17.82±0.88 years; Height: 175.33±7.23 cm; Weight: 66.46±9.36 kg) who participated in the study were divided into 3 groups according to their positions: Defenders (n= 26; Age: 17.9±0.93; Height: 175.2±5.16 cm; Weight: 66.9±8.45 kg), Midfielders (n= 27; Age: 17.7±0.86 years; Height: 172.8±5.62 cm; Weight: 63.7±8.10 kg) and Forwards (n= 27; Age: 17.8±0.86 years; Height: 177.9±9.39 cm; Weight: 68.7±10.89 kg). Within the scope of the study, Illinois and Zigzag agility tests were applied to all athletes. In order to determine the effect of three different positions (Defenders, Midfielders and Forwards) on agility (Illinois and Zigzag test), one-way multivariate analysis of variance (MANOVA) was used. The measurements showed that playing positions had a significant effect on agility performance ($F(4,152)=2.99$, $p<0.021$, $\eta p^2=0.73$). In the Illinois test, forward players (16.05±0.38 s) performed significantly better compared to other positions (Midfielders= 16.37±0.49 s, Defenders= 16.74±0.75 s); in the Zigzag test, forward players (6.13±0.20 s) performed significantly better compared to other positions (Midfielders= 6.33±0.28 s, Defenders= 6.37±0.35 s). As a result, it was determined that forward players are more agile than midfielders and defenders, and midfielders have more agility characteristics than defenders.

1. INTRODUCTION

Sports include physical, social and cognitive activities at an optimal level that include risks in order to achieve certain goals within a certain plan and program. Football is also a branch of sports [1]. Football is considered a complex sport for sports scientists and coaches, where technical, tactical, physical, and psychological components come to the forefront. Among the factors that determine success in football, players' agility and speed characteristics play an important role [2]. Agility is defined as the capacity of football players to respond quickly to sudden changes of direction, acceleration, and deceleration [3, 4]. Particularly for young football players, the development of these physical abilities holds a critical place in training processes, as it can impact their future performance levels [2, 5]. Agility is not solely dependent on speed; it also encompasses reaction time, balance, and decision-making skills [6].

In football, not all athletes possess similar characteristics. Positions have their own specific requirements. Different positions necessitate players to have varying agility characteristics. For example, it is expected that the agility of defenders develops differently compared to that of offensive players. This is due to the differing movement demands of each position [7]. Additionally, studies on agility development based on the requirements of positions highlight the importance of specially designed agility training programs to help young football players reach their optimal performance levels [8].

Although agility holds a significant place in football performance, there is a limited number of studies in the current literature examining the relationship between agility characteristics and different positions in young football players [9]. Some research has shown that agility performance varies with factors such as age, experience, and training level [10]. However, particularly in

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younger age groups, studies investigating the impact of different agility tests on positional performance remain limited. In this context, which specific agility attributes are more effective in certain positions and which tests best evaluate these characteristics have not yet been comprehensively examined [11]. There are numerous tests available for evaluating agility performance. However, there is no consensus on which test is most suitable for the football discipline.

The Illinois Agility Test (IAT) is widely used to assess agility performance in young athletes. The IAT was developed to measure change of direction ability, acceleration, and short-distance sprint capability. In this test, athletes perform sprints in different directions and make rapid turns at designated points [12]. Especially in sports such as football, which require high agility and sudden changes of direction, the IAT is considered a simulation of on-field performance [13]. Studies conducted on young football players have indicated that the IAT is a valid and reliable test and can be used to compare agility levels among players in different positions [14]. Research demonstrating the relationship between the IAT and agility levels in young football players shows that this test is effectively used in football training programs. For instance, in the study by Hachana et al. [12] the IAT was identified as a reliable measure of agility for athletes of different age groups, with performance varying based on the players' age, gender, and training level. Similarly, the study by Miller et al. [5] emphasized that the IAT is directly related to on-field performance and serves as an important tool for evaluating change of direction abilities, especially in young football players.

The Zigzag Agility Test (ZAT) is another popular test used to assess athletes' agility characteristics, and unlike the IAT, it focuses on shorter and more sudden changes of direction. In the ZAT, athletes run in Zigzag movements around predetermined cones, showcasing their agility and acceleration abilities [15]. Since this test involves shorter, rapid changes of direction compared to the IAT, it is often preferred for positions such as offensive players that require sudden acceleration and deceleration [16]. Studies in the literature examining the effects of the ZAT on young football players indicate that the test is suitable for measuring change of direction speed, balance, and quick reactions. Brughelli et al. [16] emphasized that the ZAT is an appropriate assessment tool for football positions that require sudden acceleration. Additionally, another study conducted on young football players found that ZAT performance is related to players' age, training history, and position [17]. The direct relationship between ZAT performance and on-field performance in young football players suggests that this test can be utilized for specific agility training in football training programs. The study by Sekulic et al. [17] demonstrated that the Zigzag Agility Test is an effective tool for enhancing the performance of young athletes in sports where agility and speed are crucial, such as football.

The aim of this study is to reveal how different agility tests vary according to football positions in young players. Within this scope, the agility characteristics of primary positions such as forwards, midfielders, and defenders will be compared using the IAT and ZAT. The unique value of this study lies in analyzing how different agility tests (IAT and ZAT) vary according to football positions in young players, thus providing a scientific basis for position-specific agility development in football. Given the limited number of studies in the current literature, such an approach contributes both to making training programs more specific and to supporting the development processes of young football players in a more effective and position-appropriate manner. By examining the agility characteristics of different positions, the study offers concrete data for developing position-specific training applications and improving player performance, providing an important innovation in terms of on-field strategies and individual development plans.

2. MATERIALS AND METHODS

2.1. Participants

The sample group of this study consists of 80 male soccer players from two different Football Clubs. The athletes were aged between 17 and 19, with an average age of 17.82±0.88 years. The athletes were aged between 17 and 19, with an average age of 17.82±0.88 years. The athletes participating in our study were included based on criteria such as voluntarily agreeing to participate in the research, obtaining parental consent for those under 18 years old, and having no health problems. Criteria such as experiencing health problems during the research process and irregular participation in exercise programs were used as exclusion criteria. Also goalkeepers were not included in the study because their physical outputs are different from football players in other positions.

2.2. Research Model and Procedures

In our study, the causal-comparative research method was used. Prior to the start of the study, athletes were provided with necessary

information about the study, and approval was obtained from the Ethics Committee for Non-Interventional Clinical Studies of Iğdır University. This study was conducted following the approval of the Iğdır University Ethics Committee for Non-Interventional Clinical Studies. On the first day of the study, body composition measurements of the athletes were taken. Height measurements were taken using a wall-mounted Seca stadiometer (Hamburg, Germany) and body weight was measured using a Tanita BC418 bioelectrical impedance analyzer (Tokyo, Japan). After the body composition measurements, a warm-up session was conducted, followed by the Illinois Agility Test (IAT). On the second day, the athletes were warmed up and then performed the Zigzag Agility Test (ZAT). Each athlete was given two attempts for the tests, with a three-minute rest between attempts. Agility tests were measured using Sinar brand photocells. All procedures performed in studies involving human participants were conducted in accordance with institutional and/or national research committee ethical standards and the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

2.3. Statistical Analysis

For statistical processing of data, we first used descriptive statistics. Measurements and measures of variability were expressed as arithmetic means and standard deviations, respectively. Parametric procedures were chosen after data distribution verification of normality using the Shapiro-Wilk test. The assumptions for using a parametric test were satisfied and differences in the observed dependent variables among the groups were assessed using multivariate analysis of variance (MANOVA). MANOVA was used to evaluate significant differences between all position groups (Defenders, Midfielders and Forwards) for all the test scores. MANOVA was performed using the test scores as dependent variables (Illionis, Zigzag) and the three positions as independent variables (Defenders, Midfielders and Forwards). Tamhane's T2 post hoc test was used to assess mean differences where a significant F value was observed. The P value for statistical significance was set at 0.05. The effect size of the analysis was also calculated as partial eta squared (η^2p). For all the statistical analyses, the SPSS statistical package software was used (IBM, v.26.0, Chicago, IL, USA).

3. RESULTS

When the physical measurements of football players (n= 80) were evaluated according to their positions, it was found that the forwards had higher average values for height, weight, and body mass index (BMI) compared to midfield and defensive players. Examining the Illinois and Zigzag agility test values revealed that offensive players had the best results, while midfield players performed better than defensive players (Table 1). Also Table 1 contains the means and standard deviations of the descriptive values for the three groups.

Table 1. Descriptive values of in soccer players by playing positions.

Positions	Age (years)	Height (cm)	Weight (kg)	BMI (kg/m^2)	Illinois(s)	Zigzag(s)
Defenders (n = 26)	17,9±0,93	175,2±5,16	66,9±8,45	20,3±3,46	16,74±0,75	6,37±0,35
Midfielders (n = 27)	17,7±0,86	172,8±5,62	63,7±8,10	20,3±3,58	16,37±0,49	6,33±0,28
Forwards (n = 27)	17,8±0,86	177,9±9,39	68,7±10,89	21,1±2,98	16,05±0,38	6,13±0,20
Total (n = 80)	17,82±0,88	175,33±7,23	66,46±9,36	20,61±3,33	16,29±0,58	6,28±0,30

MANOVA was conducted to determine the effect of three different positions (defense, midfield and forward) on two dependent variables (Illinois and Zigzag Tests). Significant differences were found among the positions on the dependent variables, Wilks' $\Lambda = 0.85$; $F_{4,152} = 2.99$; $p < .021$; $\eta^2p = 0.07$ (Table 2).

Table 2. MANOVA test results of agility performances in soccer players by playing positions.

Source	Effect	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Position	**Wilks' Lambda**	,85	2,99	4,00	152,0	,021	,073

Following the MANOVA, univariate analysis of variance (ANOVA) were conducted on the dependent variables. Using the Bonferroni method, each ANOVA was tested at the .025 level. The ANOVA on the Illinois test values was significant, $F_{2,77} = 4.04$; $p < 0.021$; $\eta^2p = 0.095$ and the ANOVA on the Zigzag test values was also significant, $F_{2,77} = 5.35$; $p < 0.007$; $\eta^2p = 0.122$ (Table 3).

Table 3. Univariate ANOVA test results of agility performances in soccer players by playing positions.

Source	Dependent Variable	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Position	**Illinois**	2,55	2	1,277	4,04	,021	,095
	Zigzag	,88	2	,442	5,35	,007	,122

For the Illinois Test, the mean difference between the Defense and Midfield positions is 0.10; p = 0.921. This value is not statistically significant (p > 0.05) indicating that there is no significant difference between the two groups.

The mean difference between the Defense and Forward positions is 0.42; p = 0.046 and this difference is statistically significant (p < 0.05). This indicates that players in the Forward position perform better on the Illinois Test compared to Defenders.

The mean difference between the Midfield and Forward positions is 0.32; p = .032 which is also statistically significant (p < 0.05). Forwards exhibit higher performance compared to Midfield players (Table 4).

For the Zigzag Test, the mean difference between the Defense and Midfield positions is 0.04; p = 0.948. This result indicates that there is no significant difference between the groups (p > 0.05).

The mean difference between the Defense and Forward positions is 0.24; p = 0.013 and this difference is statistically significant (p < 0.05). This indicates that players in the Forward position perform better on the Zigzag Test compared to Defenders.

The mean difference between the Midfield and Forward positions is 0.20; p = 0.016 and this is also statistically significant (p < 0.05). Forwards exhibit higher performance compared to Midfield players (Table 4).

Table 4. Tamhane's T2 post hoc test results of agility performances among various positions (Defenders, Midfielders, Forwards).

Dependent Variable	(I) Position	(J) Position	Mean Difference (I-J)	Std. Error	Sig.	95 % Confidence Interval	
						Lower Bound	Upper Bound
Illinois	Defenders	Midfielders	,1004	,17558	,921	-,3358	,5367
		Forwards	,4189*	,16517	,046	,0058	,8321
	Midfielders	Defenders	-,1004	,17558	,921	-,5367	,3358
		Forwards	,3185*	,11990	,032	,0221	,6149
	Forwards	Defenders	-,4189*	,16517	,046	-,8321	-,0058

		Midfielders	-,3185*	,11990	,032	-,6149	-,0221
Zigzag	Defenders	Midfielders	,0436	,08884	,948	-,1762	,2634
		Forwards	,2414*	,07995	,013	,0420	,4407
	Midfielders	Defenders	-,0436	,08884	,948	-,2634	,1762
		Forwards	,1978*	,06749	,016	,0307	,3649
	Forwards	Defenders	-,2414*	,07995	,013	-,4407	-,0420
		Midfielders	-,1978*	,06749	,016	-,3649	-,0307

4. DISCUSSION

This study was conducted to compare different agility tests of young football players according to their playing positions. According to the findings of our study, the participants' different agility test averages were determined as follows: Defenders Illinois Test 16.74±0.75 s; Zigzag Test 6.37±0.35 s; Midfielders Illinois Test 16.37±0.49 s; Zigzag Test 6.33±0.28 s; and Forwards Illinois Test 16.05±0.38 s; Zigzag Test 6.13±0.20 s, respectively. According to these results, the values of the forwards in both the Illinois and Zigzag agility tests were found to be statistically different from the values of the defenders. In this context, it is concluded that the Illinois and Zigzag test values of the forwards are better than those of the football players playing in other positions.

By affecting neuromuscular adaptation, some exercises such as sudden stops, starts and changes of direction, which control muscle spindles, Golgi tendon organ (GTO), tendons, joints, balance and body position and are performed in the majority of sports activities, help to improve agility [18].

Supporting our study, Bloomfield et al. [19] reported that offensive players made movements that involved greater agility. In a similar study in the literature; Little and Williams [14] measured the average agility values of 106 elite football players with the Zigzag test we used in our study and found 5.34±0.20 seconds. The degrees they obtained were found to be lower than the results in our study. This is thought to be because the participants in the study by Little and Williams [14] were elite football players and therefore gave better results.

Yapıcı [20] found the Zigzag test average of professional football players to be 5.87±0.27 seconds and the Zigzag test average of amateur football players to be 6.17±0.34 seconds. The values obtained in these studies found as a result of literature searches differ from the values obtained in our study. However, when we look at the data in the studies, it is seen that the characteristic features that football players have gained according to their positions come to the fore. It is thought that the fact that the midfielders are making a contribution to the attack by dropping men, running without the ball, changing direction suddenly, making feint runs and being active to get the ball from the defense have affected this result. The fact that forward players perform almost the same functions supports the accuracy of the data we obtained. In addition, this difference can be explained by the athletes' own abilities and training quality.

In the study conducted by Köklü et al. [21] which examined the speed, agility and vertical jump performances of football players, it was determined that there was a statistically significant difference between the speed, agility without the ball and vertical jump parameters in terms of physiological and biomechanical aspects.

In the study conducted by Mathisen and Pettersen [22] examining the effect of the anthropometric structure of young football players on their speed and agility characteristics, they stated that the height and body weight of football players between the ages of 13-16 had an effect on the speed and agility abilities of football players and that there was no statistically significant difference between the body weight and speed and agility abilities of football players between the ages of 10-12.

In a study conducted by Yanci et al. [23] examining the relationship between agility, speed, and single and double-footed vertical and lateral jumps in football players, they stated that there was a statistically significant difference between the dominant and non-dominant legs in terms of the height they jumped and the power they produced during the jump.

In their study on football players, Little and Williams [14] reported that the 10 m test for acceleration, the 20 m test for maximum speed, and the Zigzag test for agility were all highly

correlated with each other with statistical significance.

Football is a specific branch where the physical and physiological needs of football players in different positions are different from each other. For example, it is stated that defenders cover less distance, have less high-intensity running distance, and have better strength levels. However, attackers sprint more and engage in high-intensity activities more than defenders [24]. This information supports our study and it is thought that the results of our research will contribute to future studies.

Some of the values obtained in the studies found as a result of literature reviews are parallel to the values obtained in our study, while some values differ. However, when the data is examined, it is seen that the characteristic features acquired by the football players according to their positions come to the fore. During the match, defenders and midfielders need longer sprints due to the width of the playing fields, while attackers need shorter sprints to go directly to the goal. Therefore, as the sprint distance decreases, attackers can exhibit better agility performance. The data obtained in our study also support these views.

5. CONCLUSION

As a result, football is a specific branch where all positions have different physical and physiological requirements. In addition to this specificity, when the difference in the league level in which the players play is added, the difference inevitably becomes very large. In this direction; it has been revealed that some physical and physiological characteristics of players playing in different positions also differ. It is thought that these differences reflect the physical and performance-oriented characteristics of football and will help coaches evaluate their players and players evaluate themselves in this regard.

Conflict of Interest

No conflict of interest is declared by the authors. In addition, no financial support was received.

Ethics Committee

The study protocol was approved by the Chairmanship of the Scientific Research and Publication Ethics Board of Iğdır University (Ethics Committee Approval: 2024/29).

Author Contributions

Study Design, AA, YEA; Data Collection, OT, YEA; Statistical Analysis, AA, YEA; Data Interpretation, OT, YEA; Manuscript Preparation, AA, OT, YEA; Literature Search, AA, OT, YEA. All authors have read and agreed to the published version of the manuscript.

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