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**ORIGINAL ARTICLES. SPORT**

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**Comparative characteristics of the young football players of different game roles technical and physical fitness at the specialized basic training stage**

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**How to site**

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**Abstract**

<b>Rationale and purpose</b>	to reveal the peculiarities of the technical and physical fitness of young football players of 15 years of age in various playing roles.
<b>Material and Methods</b>	51 young football players were examined according to the level of physical and technical preparation, including 9 goalkeepers, 12 defenders, 15 midfielders and 15 attackers. The following indicators were measured: body length, body weight, running time for 15 m, 30 m, 60 m, shuttle running time 5X20 m, heart rate at rest, heart rate after shuttle running, ball juggling (number of kicks with the ball before losing it), time of the ball in a certain area of the goal. For the comparative analysis of the indicators of football players of different playing roles, the dispersion analysis of the comparison of several unrelated samples according to Duncan's multiple comparisons criterion was used.
<b>Results</b>	Based on the results of variance analysis using Duncan's multiple comparisons criterion, it was established that goalkeepers have the smallest body length ( $p < 0.05$ ) and the highest indicator of technical readiness "Ball hit per range, m" ( $p < 0.05$ ). Defenders and midfielders showed the best indicators of speed endurance according to the indicators of the test "Time of execution of the shuttle run 5X20 m, s" ( $p < 0.05$ ). At the same time, their heart rate after performing this test is significantly lower than that of attackers ( $p < 0.001$ ). Also, attackers and defenders have significantly higher indicators of speed abilities compared to representatives of other playing roles according to the results of the "30 m, s" test ( $p < 0.001$ ). In addition, defenders and midfielders and forwards have significantly higher speed abilities according to the results of the "Run 15 m, s" and "Run 60 m, s" tests compared to goalkeepers ( $p < 0.001$ ). Defenders can keep the ball on their feet the longest ( $p < 0.001$ ) and forwards can perform the most kicks (juggling the ball) ( $p < 0.01$ ). Attackers and midfielders have the highest quality of shots on goal compared to goalkeepers and defenders ( $p < 0.05$ ).
<b>Conclusions</b>	As a result of the cluster analysis, the functions of volleyball players were clarified and the players most similar to each other in terms of their preparation structure were identified, which sometimes causes some difficulties for coaches when working with athletes with implicitly expressed game functions. Individual profiles of players were compiled and individual recommendations for training volleyball players were developed based on the individual values of readiness factors and the results of cluster analysis.
<b>Keywords</b>	football, playing role, physical fitness, technical fitness, young football players

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## Анотація

**Жаннета Козіна, Михайло Протас, Олександр Сірий, Олексій Гресько, Владислав Завада, Павло Овдієнко, Олександр Семенров. Порівняльна характеристика технічної та фізичної підготовленості юних футболістів різних ігрових функцій на етапі спеціалізованої базової підготовки**

<b>Обґрунтування і мета</b>	виявити особливості технічної та фізичної підготовленості юних футболістів 15 років різних ігрових амплуа.
<b>Матеріал і методи</b>	51 юних футболістів було обстежено за рівнем фізичної та технічної підготовленості, з них 9 воротарів, 12 захисників, 15 півзахисників та 15 нападників. Вимірювалися наступні показники: довжина тіла, маса тіла, час бігу на 15 м, 30 м, 60 м, час човникового бігу 5X20 м, ЧСС в стані спокою, ЧСС після човникового бігу, жонгливання м'яча (кількість набивань ногою м'яча до втрати), час м'яча у певну ділянку воріт. Для порівняльного аналізу показників футболістів різного ігрового амплуа використовувався дисперсійний аналіз порівняння кількох незв'язаних вибірок за критерієм множинних порівнянь Дункан.
<b>Результати</b>	За результатами дисперсійного аналізу за критерієм множинних порівнянь Дункана встановлено, що у воротарів достовірно найменша довжина тіла ( $p < 0,05$ ) і достовірно найвищий показник технічної підготовленості «Удар м'яча на дальність, м» ( $p < 0,05$ ). У захисників і напівзахисників виявлено найкращі показники швидкісної витривалості за показниками тесту «Час виконання човникового бігу 5X20 м, с» ( $p < 0,05$ ). При цьому їхні показники ЧСС після виконання даного тесту достовірно нижчі, ніж у нападників ( $p < 0,001$ ). Також у нападників і захисників достовірно вищі показники швидкісних здібностей у порівнянні з представниками інших ігрових амплуа за результатами тесту «Біг на 30 м, с» ( $p < 0,001$ ). Крім того, у захисників і напівзахисників та у нападників достовірно вищі показники швидкісних здібностей за результатами тестів «Біг на 15 м, с» і «Біг на 60 м, с» у порівнянні з воротарями ( $p < 0,001$ ). Захисники найдовше можуть утримувати м'яч на стопі ( $p < 0,001$ ), а нападники можуть виконувати найбільшу кількість набивань м'яча ногою (жонгливання м'яча) ( $p < 0,01$ ). У нападників і напівзахисників найбільша якість ударів м'ячом по воротах у порівнянні з воротарями і захисниками ( $p < 0,05$ ).
<b>Висновки</b>	На етапі спеціалізованої базової підготовки у футболістів 15 років вже спостерігаються достовірні розходження за результатами тестування за показниками спеціальної фізичної і технічної підготовленості. Це свідчить про необхідність диференційованого підходу до тренувального процесу юних футболістів 15 років різних ігрових амплуа.
<b>Ключові слова</b>	футбол, ігрове амплуа, фізична підготовленість, технічна підготовленість, юні футболісти

## Introduction

Team game sports involve the combination of players in one team who perform different functions (have different game roles) [1, 2]. Athletes of different playing roles often differ not only in the development of different physical qualities and technical skills, but also have different anthropometric data [2, 3]. Football is no exception [3, 4, 5]. In football, players are divided into the following main playing roles: goalkeepers, defenders, midfielders, attackers [6]. Strikers or forwards are attacking players. They are located in the attack closest to the opponent's goal. Their main task is to score goals. Midfielders perform an intermediate function between attackers and defenders depending on the game situation. A defender is a player who acts between the goalkeeper and the midfielders. He is located, as a rule, in his half of the football field. Its main function is to prevent the opponent's players from hitting the goal. Goalkeepers are players who play exclusively near the goal [7–11]. His main task is to deflect balls that are sent to the goal. According to the playing roles, football players have developed certain physical qualities (speed of running segments of different lengths, general and speed endurance, strength, jumping, etc.) and technical skill (ability to pick up the ball, accuracy of shots on goal, accuracy of ball passes, etc.). Also, players of different game roles may also differ in anthropometric data. This is especially characteristic of basketball, volleyball, and handball [1, 2].

At the current stage, the solution to the question of when exactly to start a differentiated approach to the training of players of different game roles is relevant. In this regard, there is an opinion that it is necessary to train children as long as possible according to the principle of universality, that is, the ability to perform any function on the field [12, 13]. There is also another opinion that, on the contrary, the division of young football players by game functions should be started as early as possible [14–16]. And for this you need to know exactly what physical qualities and technical skills prevail in players of certain game roles. After all, it is known that when a child does something to which he is more inclined according to his genetic predisposition, the probability of success is much greater than in the case when a child does something to which he is inclined to a lesser degree [17, 18]. And players of different game roles often have very large differences, in particular, in basketball and volleyball, the team combines players with such different anthropometric data that they

represent people with different biomechanical and physiological characteristics [1, 2]. And that's why they need a differentiated, individualized approach. Information is also needed regarding at what age the playing roles of football players have already been formed, and at what age they are just beginning to be formed. To what extent does it depend on genetic predispositions, and to what extent does it depend on the coach's vision and appropriate intervention? Can game roles be formed spontaneously, if there is no intervention of the coach in this process? All these questions are relevant both for the practice and for the theory of football and other team sports.

But, first of all, it is necessary to find out whether the features of the development of physical qualities and technical skills have already been formed at the stage of specialized basic training, which corresponds to approximately the age of 15 years in football.

Purpose: to reveal the peculiarities of technical and physical fitness of young football players of 15 years of age in various playing roles.

## Material and methods

### Participants

51 15-year-old players of the "Areal" Junior High School in Kharkiv took part in the study. Of them - 15 attackers, 15 midfielders, 12 defenders and 9 goalkeepers.

### Procedure

The testing of young football players was carried out during May 12-14, 2023 at the school stadium, which was not hit by enemy rockets and artillery, as the stadium of the State University of Youth and Sports was closed due to the conditions of the war. Testing was conducted in the morning at 9:00 a.m. after a light warm-up of the players. The tasks were explained to the young football players, then they were given 3 to 5 attempts to master the tests. After that, testing began.

Determination of indicators of physical development: body length was measured using a height meter, following standard methods. Body weight was measured on electronic scales (measurement accuracy  $\pm 100$  g).

Resting heart rate and heart rate after shuttle running were measured using a Polar fitness watch, and the obtained results were analyzed using the Polar flow mobile application.

The level of physical fitness was determined by the following tests [3]:

#### Speed abilities

Running time for 15 m, 30 m and 60 m. Testing was carried out as follows. The test participant ran up to 10 meters, crossed the starting line at maximum speed and covered the corresponding distance.

#### Speed Endurance

Shuttle running time 5 times for 20 m in combination with heart rate after completing this test.

The level of technical readiness was determined using the following tests.

1. Time of keeping the soccer ball on the foot. The participant of the test fixed the ball on the foot and kept it straight on longer. The time of the test until the loss of the ball was recorded. Each participant was given 3 attempts. The time of the best attempt was recorded.

2. Juggling the ball. In this test, the number of kicks with the foot was recorded without a loss.

3. Time of execution of dribbling a soccer ball with intersections. The test was performed as follows. The ball was on the line. There were three pins at a distance of 3 m, 6 m, 9.5 m from the line. At the signal, the test participant circled the pins with a "snake" from the right side.

4. Hit the ball on the goal with the accuracy of hitting the designated area of the goal. The test was performed as follows. The goal was divided into 6 equal squares with the help of special strips, the ball was placed at a distance of 11 m. The football player had to hit the squares with the ball one by one. The football player had to hit each square three times. Thus, the total number of hits was 18. For one hit in the square, 1 point was awarded.

5. Hit the ball on the flight range. The test was performed as follows. The ball was placed on the line. The young football player needed to hit the ball as far as possible. The result was determined by the first contact of the ball with the ground.

### Statistical analysis

To select the methods of processing the obtained results, all samples were first checked for normality of distribution using the Kolmogorov-Smirnov method. Since all the samples corresponded to a normal distribution ( $p > 0.05$ ), the Student's method was used to compare the test scores of players of different game roles with each other. One-way analysis of variance for several independent samples (ANOVA) using Duncan's test for multiple comparisons was also used. The test indicators were

the dependent variables. Conventional designations of players of different game roles acted as an independent variable: 1 – goalkeepers, 2 – defenders, 3 – midfielders, 4 – attackers.

## Results

Variance analysis using the Duncan method showed the presence of significant differences between the following indicators of testing young football players: body length, heart rate after a shuttle run, time to complete a 5x20 m shuttle run, 30 m run time, 15 m run time, 60 m run time, ball retention time, ball juggling, quality of goal kicks and long distance kicks (Table 1- 10). No significant differences were found between body weight and resting heart rate of football players of different playing roles.

In terms of body length, only goalkeepers differ significantly ( $p < 0.05$ ) from representatives of other playing roles of young football players. Their body length is 166 cm, while representatives of other playing roles have a body length of 168-172 cm, and these groups of football players do not reliably differ from each other ( $p > 0.05$ ) (Table 1).

According to the heart rate indicator after shuttle running according to the Duncan test, football players of different playing roles were divided into 3 groups, which differ significantly ( $p < 0.001$ ) from each other (Table 2). The first group included goalkeepers, they had the lowest heart rate after the shuttle run (132 bpm), the second group included defenders and midfielders, their heart rate was 142.5 and 151.2 bpm, respectively, and the highest heart rate after the shuttle run was found in forwards (163.2 bpm). Based on the obtained data, it could be noted that those players have the best level of special endurance. Who has the lowest heart rate after the shuttle run. However, if we analyze the time of the 5X20 shuttle run by 15-year-old football players of various playing roles, it can be noted that goalkeepers have the longest shuttle run time of all 3 formed groups (Table 3). This explains the lowest heart rate indicators after the shuttle run of goalkeepers compared to representatives of other playing roles, because they have the longest time ( $p < 0.01$ ) to perform this test, that is, the lowest speed. The greatest speed in the shuttle run (the shortest execution time) is in defenders and midfielders. They differ significantly ( $p < 0.001$ ) from other formed groups in the Duncan test. Attackers occupy an intermediate place according to this test. Thus, it can be concluded that defenders and midfielders have the best level of speed endurance: they have the shortest time to perform the "Shuttle Run 5X20 m, s" test, and the heart rate indicators after performing this test occupy an intermediate place between goalkeepers and attackers (Table 2).

Table 1

Comparative characteristics of the body length of 15-year-old football players of various playing roles

Duncan a, b		Subset for alpha = 0.05			Significance of intergroup differences	
Game role	N	Groups with reliable intergroup differences Body length, cm ( $\bar{x}$ )			F	p
		1	2			
Goalkeepers	9	166,3333			3,602	0,043
Midfielders	15		168,2			
Forwards	15		170,8			
Defenders	12		172,75			
Significance of intragroup differences		0,079	0,074			

Notes. Means for groups in homogeneous subsets are output.

a Uses harmonic mean sample size = 12.203.

b Unequal group sizes. The harmonic mean of the group sizes is used. Type I error rates are not guaranteed.

Table 2

Comparative characteristics of heart rate after shuttle running of 15-year-old football players of various playing roles

Duncan a, b		Subset for alpha = 0.05			Significance of intergroup differences	
Game role	N	Groups with reliable intergroup differences heart rate after shuttle running, bits/ min ( $\bar{x}$ )			F	p
		1	2	3		
Goalkeepers	9	132			13,16	0,000
Defenders	12		142,5			
Midfielders	15		151,2			
Forwards	15			163,2		
Significance of intragroup differences		1	0,093	1		

Notes. Means for groups in homogeneous subsets are output.

a Uses harmonic mean sample size = 12.203.

b Unequal group sizes. The harmonic mean of the group sizes is used. Type I error rates are not guaranteed.

Table 3

Comparative characteristics of the 5X20 m shuttle running time of 15-year-old football players of various playing roles

Duncan a, b		Subset for alpha = 0.05			Significance of intergroup differences	
Game role	N	Groups with reliable intergroup differences 5X20 m shuttle running time, s ( $\bar{x}$ )			F	p
		1	2	3		
Defenders	12	23,1875			33,738	0,000
Midfielders	15	23,29				
Forwards	15		23,456			
Goalkeepers	9			24,2367		
Significance of intragroup differences		0,331	0,118	1		

Notes. Means for groups in homogeneous subsets are output.

a Uses harmonic mean sample size = 12.203.

b Unequal group sizes. The harmonic mean of the group sizes is used. Type I error rates are not guaranteed.

According to the indicators of speed abilities according to the “30 m Run, s” test, all experimental athletes of various playing roles were divided into 2 groups according to the results of the variance analysis according to the Duncan test (Table 4). The first group included midfielders and defenders, the

second group included attackers and goalkeepers. In the first group, the time to perform this test is significantly ( $p < 0.001$ ) less than in the second group. Therefore, it can be concluded that defenders and midfielders have significantly more developed speed qualities compared to attackers and goalkeepers

Table 4

Comparative characteristics of the 30 m running time of 15-year-old football players of various playing roles

Duncan a, b		Subset for alpha = 0.05		Significance of intergroup differences	
Game role	N	Groups with reliable intergroup differences 30 m running time, s ( $\bar{x}$ )		F	p
		1	2		
Midfielders	15	5,408		14,693	0,000
Defenders	12	5,485			
Forwards	15		5,784		
Goalkeepers	9		5,9333		
Significance of intragroup differences		0,396	0,103		

Notes. Means for groups in homogeneous subsets are output.

a Uses harmonic mean sample size = 12.203.

b Unequal group sizes. The harmonic mean of the group sizes is used. Type I error rates are not guaranteed.

According to the results of the “15 m running time” test, defenders, midfielders, and forwards had higher speed indicators compared to goalkeepers ( $p < 0.001$ ) (Table 5).

Similar results were obtained for the “60 m running time” test (Table 12): significantly higher speed

indicators were found in defenders, midfielders and attackers compared to goalkeepers ( $p < 0.001$ ). It should be noted that within the groups, that is, between defenders, midfielders and attackers, no significant differences were found (Table 6).

Table 5

Comparative characteristics of 15 m running time of 15-year-old football players of various playing roles

Duncan a, b		Subset for alpha = 0.05		Significance of intergroup differences	
Game role	N	Groups with reliable intergroup differences 15 m running time, s ( $\bar{x}$ )		F	p
		1	2		
Defenders	12	3,4075		4,005	0,013
Midfielders	15	3,536			
Forwards	15	3,572			
Goalkeepers	9		3,97		
Significance of intragroup differences		0,322	1		

Notes. Means for groups in homogeneous subsets are output.

a Uses harmonic mean sample size = 12.203.

b Unequal group sizes. The harmonic mean of the group sizes is used. Type I error rates are not guaranteed.

Table 6

Comparative characteristics of the 60 m running time of 15-year-old football players of various playing roles

Duncan a, b		Subset for alpha = 0.05		Significance of intergroup differences	
Game role	N	Groups with reliable intergroup differences 60 m running time, s ( $\bar{x}$ )		F	p
		1	2		
Forwards	15	8,1233		10,343	0,000
Defenders	12	8,16			
Midfielders	15	8,2775			
Goalkeepers	9		8,64		
Significance of intragroup differences		0,198	1		

Notes. Means for groups in homogeneous subsets are output.

a Uses harmonic mean sample size = 12.203.

b Unequal group sizes. The harmonic mean of the group sizes is used. Type I error rates are not guaranteed.

According to the results of the test “Time of keeping the ball on the foot, s” by variance analysis using the Duncan method, football players of various game functions were also divided into 2 groups (Table 7). The first group included goalkeepers, midfielders and attackers, the second group included defenders. The defenders have the longest time keeping the ball on their feet in comparison with the players of the playing roles of the first group (Table 7).

According to the results of the test “Juggling the ball, the number of times” by variance analysis using the Duncan method, football players of various game functions were divided into 3 groups (Table 14). The first group included goalkeepers, the second group included defenders and midfielders, the third group included attackers. Football players of the third group (strikers) had the highest number of ball juggling, goalkeepers - the lowest ( $p < 0.01$ ) (Table 8).

Table 7

Comparative characteristics of ball retention time by 15-year-old football players of various playing roles

Duncan a, b		Subset for alpha = 0.05		Significance of intergroup differences	
Game role	N	Groups with reliable intergroup differences		F	p
		Ball retention time, s ( $\bar{x}$ )			
		1	2		
Goalkeepers	9	7,0367		13,77	0,000
Midfielders	15	7,362			
Forwards	15	8,266			
Defenders	12		12,097		
Significance of intragroup differences		0,192	1		

Notes. Means for groups in homogeneous subsets are output.

a Uses harmonic mean sample size = 12.203.

b Unequal group sizes. The harmonic mean of the group sizes is used. Type I error rates are not guaranteed.

Table 8

Comparative characteristics of ball juggling by 15-year-old football players of various playing roles

Duncan a, b		Subset for alpha = 0.05			Significance of intergroup differences	
Game role	N	Groups with reliable intergroup differences. Ball juggling, numbers ( $\bar{x}$ )			F	p
		1	2	3		
Goalkeepers	9	35,3333			4,205	0,010
Defenders	12		38,75			
Midfielders	15		43,4			
Forwards	15			46,4		
Significance of intragroup differences		0,307	0,167	0,369		

Notes. Means for groups in homogeneous subsets are output.

a Uses harmonic mean sample size = 12.203.

b Unequal group sizes. The harmonic mean of the group sizes is used. Type I error rates are not guaranteed.

According to the “Quality of shots on goal, points” test, football players of different playing roles were divided into 2 groups (Table 9). The first group included goalkeepers and defenders, the second group included attackers and defenders. Attackers and midfielders have a significantly higher quality of shots on goal compared to football players of the first group ( $p < 0.05$ ) (Table 9).

According to the results of the test “Ball hit per distance, m) football players of different playing roles were divided into 3 groups: the first group - attackers and midfielders, the second group - defenders, the third group - goalkeepers (Table 16). The highest indicators of long-range shots were found in goalkeepers, the lowest in forwards ( $p < 0.001$ ) (Table 10).



Table 9

Comparative characteristics of the quality of goal kicks by 15-year-old football players of various playing roles

Duncan a, b		Subset for alpha = 0.05			Significance of intergroup differences	
Game role	N	Groups with reliable intergroup differences Quality of goal kicks, points ( $\bar{x}$ )			F	p
		1	2			
Goalkeepers	9	8			3,844	0,015
Defenders	12	9				
Forwards	15		10,3333			
Midfielders	15		10,75			
Significance of intragroup differences		0,29	0,082			

Notes. Means for groups in homogeneous subsets are output.

a Uses harmonic mean sample size = 12.203.

b Unequal group sizes. The harmonic mean of the group sizes is used. Type I error rates are not guaranteed.

Table 10

Comparative characteristics of hitting the ball at a distance by 15-year-old football players of different playing roles

Duncan a, b		Subset for alpha = 0.05			Significance of intergroup differences	
Game role	N	Groups with reliable intergroup differences. Hitting the ball at a distance, m ( $\bar{x}$ )			F	p
		1	2	3		
Forwards	15	35,6			41,004	0,000
Midfielders	15	37				
Defenders	12		41			
Goalkeepers	9					
Significance of intragroup differences		0,243	1	1		

Notes. Means for groups in homogeneous subsets are output.

a Uses harmonic mean sample size = 12.203.

b Unequal group sizes. The harmonic mean of the group sizes is used. Type I error rates are not guaranteed.

Thus, according to the results of variance analysis by the Duncan method for independent samples, goalkeepers have reliably the smallest body length ( $p < 0.05$ ) and reliably the highest indicator of technical readiness "Ball hit per range, m" ( $p < 0.05$ ). Defenders and midfielders showed the best indicators of speed endurance according to the indicators of the test "Time of execution of the shuttle run 5X20 m,

s" ( $p < 0.05$ ). At the same time, their heart rate after performing this test is significantly lower than that of attackers ( $p < 0.001$ ). Also, attackers and defenders have significantly higher indicators of speed abilities compared to representatives of other playing roles according to the results of the "30 m, s" test ( $p < 0.001$ ).

In addition, defenders and midfielders and forwards have significantly higher speed abilities according to the results of the "Run 15 m, s" and "Run 60 m, s" tests compared to goalkeepers ( $p < 0.001$ ). Defenders can keep the ball on their feet the longest ( $p < 0.001$ ) and forwards can perform the most kicks (juggling the ball) ( $p < 0.01$ ). Attackers and midfielders have the highest quality of shots on goal compared to goalkeepers and defenders ( $p < 0.05$ ). Based on the obtained results, it can be concluded that at the stage of specialized basic training among football players of 15 years of age, there are already significant differences according to the results of testing for indicators of special physical and technical readiness. This indicates the need for a differentiated approach to the training process of young football players of 15 years of age in different playing roles.

## Discussion

As a result of the conducted research, its goal was achieved. Features of the physical and technical readiness of young football players of various playing roles at the stage of specialized basic training corresponding to the age of 14-16 years were determined. We found that goalkeepers compared to outfield players have the highest score in the "Distance Shot" test. This is due to the fact that goalkeepers train in long-range shots, as their function is to perform long-range shots from their penalty area. Goalkeepers have worse speed than field players. This is quite logical, since goalkeepers do not perform as much running loads as field players, according to the specifics of their game function. In goalkeepers, in general, the creatine-phosphate mechanism of energy supply of muscle activity predominates, which implies high possibilities in the manifestation of explosive power [1, 20]. By this alone we can explain the best indicators in the test of hitting the ball at the range of the goalkeepers.

In field players, the mechanism of energy supply of muscle activity is mainly aerobic-anaerobic with the predominant inclusion of the glycolytic component [21, 22]. This determines the development of speed endurance, as well as the manifestation of speed capabilities against the background of aerobic and anaerobic loads. It is the speed component that is different in field players of different roles. The best level of speed endurance according to the test "5X20 m shuttle running time" in defenders and midfielders. They also have the best results in the 30m Run and 60m Run tests. This is explained by the fact that these players have to run on the field for a relatively

long time, while constantly changing the direction of movement. The distance that midfielders constantly cover on the football field. The biggest among all other field players. Defenders also perform a similar job on the field. Attackers are located closest to the opponent's goal, and therefore perform mainly short (3-10 m) runs. In them, the glycolytic mechanism of energy supply for muscle activity is combined with the creatine-phosphate mechanism most of all field players.

The obtained results partially coincide with the results obtained by us in previous studies [3], where the predominance of speed abilities and speed endurance in defenders and midfielders was also revealed.

Thus, at the stage of specialized basic training, 15-year-old football players already have significant differences according to the results of testing for indicators of special physical and technical readiness. This indicates the need for a differentiated approach to the training process of young football players of 15 years of age in different playing roles.

## Conclusions

1. According to the data of modern scientific research, it has been established that there is a problem of a differentiated approach to the training process of football players at the stage of specialized basic training and the insufficiency of research on determining the features of the level of special physical and technical preparation of football players of various playing roles.

2. Based on the results of the variance analysis using Duncan's multiple comparisons criterion, it was established that goalkeepers have the smallest body length ( $p < 0.05$ ) and the highest indicator of technical readiness "Ball hit per range, m" ( $p < 0.05$ ). Defenders and midfielders showed the best indicators of speed endurance according to the indicators of the test "Time of execution of the shuttle run 5X20 m, s" ( $p < 0.05$ ). At the same time, their heart rate indicators after performing this test are significantly lower, than attackers ( $p < 0.001$ ). Also, attackers and defenders have significantly higher indicators of speed abilities compared to representatives of other playing roles according to the results of the "30 m, s" test ( $p < 0.001$ ). In addition, defenders and midfielders and forwards have significantly higher speed abilities according to the results of the "Run 15 m, s" and "Run 60 m, s" tests compared to goalkeepers ( $p < 0.001$ ). Defenders

can keep the ball on their feet the longest ( $p < 0.001$ ) and forwards can perform the most kicks (juggling the ball) ( $p < 0.01$ ). Attackers and midfielders have the highest quality of shots on goal compared to goalkeepers and defenders ( $p < 0.05$ ).

3. At the stage of specialized basic training, football players of 15 years of age already have significant differences according to the results of testing for indicators of special physical and technical readiness. This indicates the need for a differentiated approach to the training process of young football players of 15 years of age in different playing roles.

## Conflict of interest

The author declares no conflict of interest.

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## References

1. Kozina Z. Factor models of the physical preparedness of volleyball players of a high class of various game role. *Pedagogy, Psychology and medical and biological problems of physical education and sport*. 2007; 9: 80-85
2. Kozina ZL. Basic scientific and methodological approaches to the process of individualizing the training of athletes (by the example of basketball). *Fizicheskoe vospitanie studentov tvorcheskikh spetsialnostey*, 2005;5: 8-20.
3. Sobko I, Kozina Z, Andruhiv V, Seryi A, Ayaz AM. Model characteristics of physical development, physical and technical preparedness of football players 15 years of different roles. *Health, Sport, Rehabilitation*. 2018;4(2):106-114. <https://doi.org/10.34142/HSR.2018.04.02.10>
4. Chomani SH, Dzai AM, Khoshnaw KK, Joksimovic M, Lilic A, Mahmood A. Effect of Aquatic Plyometric Training on Motor Ability in Youth Football Players. *Health, Sport, Rehabilitation*. 2021;7(1):66-76. <https://doi.org/10.34142/HSR.2021.07.01.06>
5. Kanishchev O, Kozina Z, Grynyova V, Masych V. The technique of using balls of different weights and diameters for the interrelated development of physical qualities, accuracy of strikes and psychophysiological capabilities of young football players. *Health, Sport, Rehabilitation*. 2021;7(1):28-41. <https://doi.org/10.34142/HSR.2020.07.01.03>
6. Atiq A, Yunitaningrum W. Physical activities for moral forming football athletes. *Health, Sport, Rehabilitation*. 2020;6(3):51-59. <https://doi.org/10.34142/HSR.2020.06.03.06>
7. Abdullah KH, Khoshnaw KK, Nabee HM, Moroz Y. Building a measure of sports tolerance for youth football players. *Health, Sport, Rehabilitation*. 2022;8(1):52-60. <https://doi.org/10.34142/HSR.2022.08.01.04>
8. Cieślicka M, Muszkieta R, Bejtka M, Gryn I. Factor structure of the complex preparedness of young football players 12-13 years old. *Health, Sport, Rehabilitation*. 2021;7(2):45-56. <https://doi.org/10.34142/HSR.2021.07.02.04>
9. Pavlović R, Savić V, Radulović N, Skrypchenko I, Detection of female volleyball player body composition using bioelectric impedance analysis: cross-sectional study. *Health, sport, rehabilitation*. 2022;8(1):28-38. <https://doi.org/10.34142/HSR.2022.08.01.02>
10. Pavlović R, Siryi O. Football as a means of integral development of intellectual abilities and physical fitness of middle school students. *Health Technologies*, 1(1), 24–29. <https://doi.org/10.58962/HT.2023.1.1.24-29>
11. Kalinowski P, Andryszak B. Przygotowanie motoryczne w Bundeslidze na przykładzie zawodników Borussia Dortmund. (Motor preparation in the Bundesliga on the example of Borussia Dortmund players). *Asytsent Trenera*. 2020; 37 (2): 54-56 (in Polish).
12. Zandi HG, Zarei S, Besharat MA, Zadeh AB. Iranian Coaches Forgiveness and Relationship Quality to Their Athletes. *International Sport Coaching Journal*. 2021;1(aop):1-8.
13. de Lima Pinto JCB, de Oliveira RSC, Galvão-Coelho NL, de Almeida RN, Moreira A, Mortatti AL. The Effects of Successive Soccer Matches on the Internal Match Load, Stress Tolerance, Salivary Cortisol and Jumping Performance in Youth Soccer Players. *Journal of Human Kinetics*. 2021;80(1):173-84.
14. Jaworska L, Hawrylak A, Burzyński B, Szczepańska-Gieracha J. Effect of progressive muscle relaxation on pain threshold and effectiveness of footballers' training. *Human Movement*. 2018;16(4):225-228. doi:10.1515/humo-2015-0043.
15. Jagim AR, Wright GA, Camic CL, Kisiolek JN, Luedke JL, Oliver JM, Karen MF, Jones MT. Relationship between training load and recovery in collegiate American football players during pre-season training. *Science and Medicine in Football*. 2020. DOI: 10.1080/24733938.2020.1863455
16. da Silva IM, Ramos SP, Galvao PVM, Simao R, Silva GCE, Rodrigues R, et al. Somatotipological analysis in football athletes with age between nine and twenty years: a transversal study. *Revista Brasileira De*

- Futsal E Futebol. 2019;11(42):111-8.
17. Lyzohub V, Nechyporenko L, Pustovalov V, Suprunovych V. Specialized training and bioenergy state of football players with different typological properties of the higher parts of the nervous system. *Science and Education*. 2016;8:107–112; doi: 10.24195/2414-4665-2016-8-21.
  18. Kaur D, Malik A, Govindasamy K, K B, Meethal A, Shukla TD, Kumar S, Pramanik M, Suresh C, Tiwari U, Skrypchenko I. Analysis of platelet count among female athletes of volleyball, judo, and football: a comparative study. *Health, Sport, Rehabilitation*, 8(4), 47-57. <https://doi.org/10.34142/HSR.2022.08.04.04>
  19. Jaafar Z, Kee J, Abdul Hadi H, Ahmad Tajuddin NA. Anthropometrical and fitness level changes following a 12-week walking football program for obese primary school children aged 8-11. *Medicina Dello Sport*. 2018;71(3):451-460. doi:10.23736/s0025-7826.18.03285-4
  20. Chromik K, Burdukiewicz A, Pietraszewska J, Stachoń A, Wolański P, Goliński D. Characteristics of anteroposterior curvatures of the spine in soccer and futsal players. *Human Movement*. 2018;18(4):49-54. doi:10.1515/humo-2017-0039.
  21. Duncan M, Eyre ELJ, Noon M, Morris R, Thake D, Clarke N. Fundamental movement skills and perceived competence, but not fitness, are the key factors associated with technical skill performance in boys who play grassroots soccer. *Science and Medicine in Football*. 2021. DOI: 10.1080/24733938.2021.191033
  22. Kozina ZhL, Cretu M, Safronov DV, Gryn I, Ruban I, Khrapov SB, Pasichna TV. Interrelation of neurodynamic indicators with indicators of physical and technical readiness of young footballers of 12-13 and 15-16 years in the preparatory and competitive periods of the annual cycle of the training process. *Health, sport, rehabilitation*, 2019; 5(1): 36-46. doi:10.34142/HSR.2019.05.01.04

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