

## THE TREND OF SPEED AND AGILITY DEVELOPMENT IN FOOTBALL PLAYERS

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**ABSTRACT:** With the aim of determining the trend of development of speed and agility in soccer players, the results of the research conducted on a sample of 68 soccer players aged 12 to 16 were analyzed. The research is transferal in nature, i.e. the results were obtained by measuring the investigated variables at one time point for soccer players aged 12, 13, 14, 15 and 16 years. Two variables from the space of morphological characteristics were measured on the tested sample, three variables for speed assessment and one variable for agility assessment. Based on the results of the central and dispersion parameters and the comparison of the arithmetic means of the variables for evaluating speed and agility in football players of different ages, we can see that the results of the 5 m sprint variable indicate that the lowest average value was in football players aged 13 (1.27 m/s), while the positive growth trend is 5-meter sprint from 12, 14 to 16 years (1.22>1.24>1.13>1.10 m/s). The 10 m sprint variable has the same values at 12 and 14 years old (2.04 m/s), and the growth trend continues at 15 and 16 years old (1.90>1.86 m/s), and the smallest sprint value at 5 m was with a 13-year-old football player. By analyzing the variable that explains the 20-meter sprint, we can see that the results show a negative trend of sprint development. Soccer players aged 14 had the best average score, followed by soccer players aged 12, then 13, and players 15 and 16 had the lowest values. The variable for the assessment of agility (zig zag without ball) has the lowest average value in thirteen-year-olds (6.39 m/s), while there is a positive growth trend from 12, 14 to 16 years (6.21>6.14>6.10> 5.98 m/s).

**Keywords:** *nogomet, trend, brzina, agilnost*

### INTRODUCTION

Football is one of the complex sports in which achieving good results depends on multiple interconnected factors (Stølen T., Chamari K., Castagna C., 2005; Bangsbo, J. & Krstrup, P., 2009). Football belongs to the group of polystructural acyclic movements and is one of the most complex sports today (Dujmović, 1997). The complexity of football is reflected in the demands placed on the players, both technical and tactical, during which the distance that the players cover during the game should be considered, while applying different forms of movement, from walking, jumping, kicking, duels, handling the ball, to sprints, all performed at different intensities. In an effort to determine the abilities that are most important for success, the fact is that the research must begin by determining the laws that appear by analyzing the movement itself during the game, and then the analysis of the basic physiological indicators that can be monitored during the game is extremely important (Dujčić, 2019). Soccer is the most popular sport in the world, with higher and greater demands on the players' motor skills and ability to provide energy, as well as the use of faster and more efficient techniques and tactics (Sporiš et al., 2012). Since soccer players constantly change their movement speed during the game, it is necessary to break down the total distance traveled during the match into certain categories, in relation to the speed (intensity) of movement (Di Salvo et al., 2006; Barros et al., 2007; Lago et al. et al., 2010). Speed is an almost entirely disposition-type ability. Most of the authors who researched speed for this ability determined the innateness coefficient of .95, which means that about 95% of the variability of this ability is a genetic factor, and only 5% is training. Sensitive periods of speed development are from 7 to 10 years (I phase) and from 14 to 15 years (II phase) (Gužalovski, 1984), while according to Drabik (1996) this period is from 7 to 9 years. For these

reasons, speed needs to be developed at a very early age, similar to explosive power with which it is closely related. The speed of soccer players is a complex trait made up of different anthropological abilities such as: perception speed, prediction speed, decision speed, reaction speed, cyclic and acyclic speed, action speed, action speed (Rađo et al., 2002). The football game can be described as a complex activity of an acyclic interval character. For example, during one soccer match, top soccer players of both sexes perform an average of 1,200 to 1,400 different activity changes (mostly short-term), changing them every 4–6 seconds (Čolakhodžić, E., Rađo, I., Alić, H., 2016). Agility, as a primary motor factor, is defined as the ability to quickly change the direction of movement (Gredelj et al., 1975). Sheppard and Young (2006) based on several years of research gave a definition that fast movement of the whole body with a change in speed or direction of movement in response to a stimulus is considered agility, but the movement should not only contain a change in speed or direction of movement, but must it is also an open skill, in which the reaction to the stimulus is included. Sensitive phases for the development of agility have two periods: immediately before puberty (10–13 years) and after the accelerated phase of growth and development (from 16 years onwards) (Martin, 1982). The methodology of training and development of agility should be guided by the following rules. The extreme neuromuscular demands of agility condition the application of agility exercises at the very beginning of training. Training should consist of short intervals of intense work (3–10 seconds) and appropriate rest intervals. The ideal method for developing agility is the repetitive method, and if you want to improve agile endurance, the interval method is recommended (Plisk, 2000).

## METHOD

This research is a transversal study with the aim of determining the trend of development of speed and agility in football players. Assessment and testing of motor skills (speed and agility) performed at the auxiliary stadium of FK Velež. Before the testing assessment, a ten-minute warm-up was performed, which included activation and mobility exercises, stretching, light running, and acceleration exercises. The break between tests lasted 10-15 minutes. The testing was done by researchers from the Institute of Kinesiology, Faculty of Teaching, University "Džemal Bijedić" in Mostar.

### A sample of respondents

The sample of respondents consisted of 68 young football players of FK Velež from Mostar, aged 12 to 16. The respondents were divided into five groups by age: 12 years (N=11), 13 years (N=11), 14 years (N=22), 15 years (N=13), 16 years (11).

### Sample variables

This research included 7 variables, namely 3 variables to assess speed, 1 variable to assess agility, 2 variables to assess morphological status and one to assess age. The basic variables used in the work are: AGE - age (years), Body height (cm), Body mass (kg),

Sprint 5 meters (m/s), Sprint 10 meters (m/s), Sprint 20 meters (m/s), zig zag without the ball (m/s).

### Data processing methods

The obtained results were processed in the statistical package SPSS (version 26.0; SPSS, Inc., Chicago, IL, USA). Central and dispersion parameters were calculated for each applied variable. The normality of the distribution of the results was examined on the basis of the skewness coefficient and the elongation coefficient (Kurtosis).

## RESULTS AND DISCUSSION

Table 1 shows measures of central tendency, measures of variability, and measures of deviation in 11 soccer players aged 12 years. The research included soccer players with an average height of  $163.18 \pm 5.91$  cm, of which the shortest soccer player was 155 cm and the tallest 174 cm, and the range between the minimum and maximum score was 19 cm, while the average mass was  $49.82 \pm 6.15$  kg. In the variables that determine the speed, the average speed at 5 meters was  $1.22 \pm .09$  m/s., at 10 meters it was  $2.04 \pm .09$  m/s., while at 20 meters the average speed was  $2,99 \pm .19$  m/s. In the variable that explains agility, the average values achieved by soccer players were  $6.21 \pm .20$  m/s.

**Table 1.** – Central and dispersion parameters of football players aged 12 years

Variables	N	Min.	Max.	Mean	Std.Dev.	Skew.	Kurt.
age	11	12,00	12,00	12,0000	12,00		
height (cm)	11	155,00	174,00	163,18	5,91	,33	-,54
weight (kg)	11	43,00	62,60	49,82	6,15	,91	,24
Sprint 5m (m/s)	11	1,11	1,40	1,22	,09	,45	-,48
Sprint 10m (m/s)	11	1,90	2,19	2,04	,09	,14	-1,05
Sprint 20m (m/s)	11	2,74	3,33	2,99	,19	,28	-,87
zigzag without ball (m/s)	11	5,99	6,58	6,21	,20	,60	-1,15

Table 2 shows the results of central and dispersion parameters in 11 soccer players aged 13 years. Soccer players of this age had an average height of  $164.63 \pm 5.04$  cm, of which the shortest soccer player was 158 cm, and the tallest 174 cm, and the range between the minimum and maximum score was 16 cm, while the average mass was  $52.66 \pm 4.21$  kg. In

the variables that determine the speed, the average speed at 5 meters was  $1.27 \pm .09$  m/s., at 10 meters it was  $2.11 \pm .10$  m/s., while at 20 meters the average speed was  $3,10 \pm .19$  m/s. In the variable that explains agility, the average value achieved by soccer players was  $6.39 \pm .14$  m/s.

**Table 2.** - Central and dispersion parameters of soccer players aged 13 years

Variables	N	Min.	Max.	Mean	Std. Dev.	Skew.	Kurt.
age	11	13,00	13,00	13,00	,00		
height (cm)	11	158,00	174,00	164,63	5,04	,40	-,66
weight (kg)	11	47,50	61,30	52,66	4,21	,87	,56
Sprint 5m (m/s)	11	1,11	1,39	1,27	,09	-,37	-1,36
Sprint 10m (m/s)	11	1,90	2,24	2,11	,10	-,77	-,21
Sprint 20m (m/s)	11	2,82	3,45	3,10	,19	,14	-,94
zigzag without ball (m/s)	11	6,08	6,62	6,39	,14	-,51	1,06

Table 3 shows measures of central tendency, measures of variability, and measures of deviation in 22 soccer players aged 14 years. The average height of soccer players was  $170.50 \pm 7.56$  cm, of which the shortest soccer player was 159 cm and the tallest 185 cm, and the range between the minimum and maximum score was 26 cm, while the average mass

was  $54.77 \pm 8.15$  kg. In the variables that determine speed, the average speed at 5 meters was  $1.24 \pm .09$  m/s., at 10 meters it was  $2.04 \pm .11$  m/s., while at 20 meters the average speed was  $2.92 \pm .12$  m/s. In the variable that explains agility, the average value achieved by soccer players was  $6.14 \pm .13$  m/s.

**Table 3.** - Central and dispersion parameters of football players aged 14 years

Variables	N	Min.	Max.	Mean	Std. Dev.	Skew.	Kurt.
age	22	14,00	14,00	14,00	,00		
height (cm)	22	159,00	185,00	170,50	7,56	,15	-1,05
weight (kg)	22	39,90	70,30	54,77	8,15	,39	-,57
Sprint 5m (m/s)	22	1,01	1,40	1,24	,09	-,81	,46
Sprint 10m (m/s)	22	1,75	2,23	2,04	,11	-,44	,33
Sprint 20m (m/s)	22	2,58	3,18	2,92	,12	-,48	1,71
zigzag without ball (m/s)	22	5,79	6,35	6,14	,13	-,75	,99

By analyzing table 4, where the results of the central and dispersion parameters of 13 soccer players aged 15 are shown, we can see that the average height of the soccer players is  $180.53 \pm 9.59$  cm, of which the shortest soccer player was 168 cm, and the tallest 194 cm, and the range between the minimum and maximum results was 26 cm, while the average mass

was  $68.19 \pm 8.16$  kg. In the variables that determine the speed, the average speed at 5 meters was  $1.13 \pm .09$  m/s., at 10 meters it was  $1.90 \pm .11$  m/s., while at 20 meters the average speed was  $3.27 \pm .16$  m/s. In the variable for assessing agility, the average values achieved by soccer players were  $6.10 \pm .29$  m/s.

**Table 4.** - Central and dispersion parameters of football players aged 15 years

Variables	N	Min.	Max.	Mean	Std. Dev.	Skew.	Kurt.
age	13	15,00	15,00	15,00	,00		
height (cm)	13	168,00	194,00	180,53	9,59	-,04	-1,66
weight (kg)	13	51,70	78,70	68,19	8,16	-,61	-,48
Sprint 5m (m/s)	13	,98	1,26	1,13	,09	-,16	-1,10
Sprint 10m (m/s)	13	1,69	2,07	1,90	,11	-,43	-,12
Sprint 20m (m/s)	13	3,00	3,63	3,27	,16	,18	1,00
zigzag without ball (m/s)	13	5,68	6,57	6,10	,29	,22	-1,22

Table 5, which tells about the results of the central and dispersion parameters for 11 soccer players, aged 16, who had an average height of  $178.81 \pm 5.23$  cm, of which the shortest soccer player was 171 cm, and the tallest 186 cm, and the range between the minimum and the maximum result was 15 cm, while the average weight was  $70.87 \pm 6.49$  kg. In the

variables that determine speed, the average speed at 5 meters was  $1.10 \pm .07$  m/s., at 10 meters it was  $1.86 \pm .07$  m/s., while at 20 meters the average speed was  $3.17 \pm .11$  m/s. In the variable that explains agility, the average values achieved by soccer players were  $5.98 \pm .33$  m/s.

**Table 5.** - Central and dispersion parameters of soccer players aged 16 years

Variables	N	Min.	Max.	Mean	Std. Dev.	Skew.	Kurt.
age	11	16,00	16,00	16,00	,00		
height (cm)	11	171,00	186,00	178,81	5,23	-,16	-1,34
weight (kg)	11	62,80	83,20	70,87	6,49	1,00	,35
Sprint 5m (m/s)	11	,98	1,20	1,10	,07	-,55	-,72
Sprint 10m (m/s)	11	1,74	1,97	1,86	,07	-,45	-,98
Sprint 20m (m/s)	11	3,00	3,42	3,17	,11	,96	1,03
zigzag without ball (m/s)	11	5,52	6,53	5,98	,33	,109	-1,28

Table 6 shows a comparison of arithmetic means of variables for assessing speed and agility in soccer players of different ages. Based on the obtained results, we can see that the variable sprint 5 m, the lowest average value was achieved by thirteen-year-olds (1.27 m/s), while the positive growth trend is from 14, 12 to 16 years (1.24>1.22>1, 13>1.10 m/s). The 10 m sprint variable has the same values at 12 and 14 years old (2.04 m/s), and the growth trend continues at 15 and 16 years old (1.90>1.86 m/s), and the smallest sprint value at 5 m was with a 13-year-old football player. By analyzing the variable that explains the 20-meter sprint, we can see that the results show a negative trend of sprint development. Soccer players aged 14 had the best average score, followed by soccer players aged 12, then 13, and players 15 and 16 had the lowest values. The variable for the assessment of agility (zig zag without ball) has the lowest average value in thirteen-year-olds (6.39 m/s), while there is a positive growth trend from 12, 14 to 16 years (6.21>6.14>6.10> 5.98 m/s). All the facts, a large number of studies confirm that

the modern soccer game places great demands on soccer players. For this reason, young players must be continuously exposed to effective training stimuli in order to provide their maximum when it is most expected of them - in the senior category (Reilly, 2005). However, creating top soccer players is a long-term process that includes the identification, selection and development of talent (Reilly et al., 2000). The identification and development of young footballers have therefore become very important for most top teams. (Williams and Reilly, 2000). Numerous variables are taken into account when it comes to selecting the best young soccer players, and all of them are evaluated with the help of numerous laboratory and field test procedures. In addition, the importance of testing is reflected in the evaluation of anthropological characteristics and the assessment of the effectiveness of the training process. Probably the most important task of permanent monitoring is the selection of young players and noting the development of these categories of football players over a long period of time. (Stojanović, 2008).

**Table 6.** - Comparison of the arithmetic means of the tested variables

Variables	12 GOD.		13 GOD.		14 GOD.		15 GOD.		16 GOD.	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
age										
height (cm)	163,18	5,91	164,63	5,04	170,50	7,56	180,53	9,59	178,81	5,23
weight (kg)	49,82	6,15	52,66	4,21	54,77	8,15	68,19	8,16	70,87	6,49
Sprint 5m (m/s)	1,22	,090	1,27	,09	1,24	,09	1,13	,09	1,10	,07
Sprint 10m (m/s)	2,04	,09	2,11	,10	2,04	,11	1,90	,11	1,86	,07
Sprint 20m (m/s)	2,99	,19	3,10	,19	2,92	,12	3,27	,16	3,18	,14
zigzag without ball (m/s)	6,21	,20	6,39	,148	6,14	,13	6,10	,29	5,98	,33

## CONCLUSION

This paper presents the results of the trend of speed and agility in 68 young soccer players. The results of the statistical analysis show that the variables for assessing speed and agility in most of the tested groups have a continuous development. In addition to the fact that football is the most popular sport in the world and regardless of the fact that it is played by everyone, children, women, young and old, the greatest attention of the world's sports until now, science has focused on top teams and soccer players. That is why little is known about the effects of football on the motor skills and morpho-functional characteristics of young people. The obtained results are on a descriptive level and are in accordance with previous research, while the analysis on a comparative level between categories was absent because it concerns young football players, where the period during, before and after puberty differentiates young athletes in many ways. Research in this direction would lead to new and clearer knowledge that would facilitate the selection process of young football players.

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