CHANGES IN SPEED, AGILITY AND ENDURANCE IN FOOTBALL PLAYERS REGARDING DIFFERENT AGE CATEGORIES – TRANSVERSAL MODEL

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ABSTRACT

Agility, speed and endurance are integral aspects of almost every defensive and offensive manoeuvre performed by football players in practices and games. Testing for assessing motoric fitness levels of team players is an essential component in the evaluation of training programs and the assessment of players` progress during the season. The aim of this research is to define model of tendency of changes in speed, agility and endurance in young and perspective football players as a result of football training system in Serbia. 290 young football players (Ages 12 N= 73, ages 13 N= 98, ages 14 N= 65, ages 15 N= 54) performed a standardized specific field tests in order to assess speed (10 m quickness, flying 20m sprint and 30 m sprint), agility (zigzag test with and without ball) and endurance (YO YO intermittent test) performances. All the results were processed applying the descriptive statistics, multivariate analysis and the tendency of changes in the observed contractile characteristics was afterwards defined by applying the method of linear regression using the general equation: $y = ab^x$. Multivariate statistical analysis established that there is a significant difference at all observed performance at the level of Wilks´ Lambda 0.464, F=13.788, p=0.000, among the observed sub-samples. Statistically significant difference was also established at all variables regarding the observed sub-samples. Besides, the results showed the statistically significant (p=0.000) tendency of change in all tested performance tests. Generally, obtained differences between observed age categories and presented model of tendency of changes can serve as criteria for any future sports training technology improvement according to young football players as well as considering long term planning process.

Keywords: fitness level, performance tests, young and perspective football players

INTRODUCTION

Training system represents long-standing process which involves several permanent cycles. Each cycle has it's own general objective and several special objectives as well, which are logically and functionally connected to general objective of training system – achieving the highest results, whether it`s concerning different age-group athletes (3, 7). Testing for assessing motoric fitness levels of team players is an essential component in the evaluation of training programs and the assessment of players` progress during the season (2, 5, 8). Agility and speed are integral aspects of almost every defensive and offensive manoeuvre performed by football players in practices and games (1, 6). The football-specific field tests are popular among coaches due to their simplicity, validity, and minimal use of equipment (2, 8). A number of laboratory and field tests have been developed to evaluate players' physical abilities, determine individual strengths and weaknesses, and assess the effect of various training and other procedures expected to improve football performance. The primary aim of this research is to define model of tendency of changes in speed, agility and endurance in young and perspective football players as a result of football training system in Serbia. The second goal was to define differences of observed characteristics in speed, agility and endurance in young and perspective football players regarding different age categories.

METHODS

A total of 290 young football players devided into 4 age groups – Ages 12 N= 73 (body height =154.46±7.28 cm, body weight =40.23±5.76 kg, training experience=5.50±1.23 yrs), ages 13 N= 98 (body height =163.46±7.12 cm, body weight =48.50±6.78 kg, training experience=6.30±1.17 yrs), ages 14 N= 65 (body height =173.11±5.56 cm, body weight =58.50±7.88 kg, training experience=6.96±1.40 yrs), ages 15 N= 54 (body height =176.04±6.00 cm, body weight =65.19±9.41 kg, training experience=8.06±1.04 yrs) were tested. All examinees were members of the best national player teams in their age categories. All standardized specific field tests were performed on a high-quality football field applying the same procedure and measuring device of The Serbian Institute for Sport and Sports Medicine.

All athletes performed a thorough warm-up as part of their training routine. Speed and agility tests were performed on football field, and time was measured using Infrared timing gates (Physical Ability Test with an accuracy of ± 0.01 sec, Uno Lux Belgrade, Serbia). Each test was demonstrated, and thereafter, 1 practice trial was allowed for habituation. The following 2 trials were recorded as experimental trials. Each subject had 3 or more minutes of rest between 2 consecutive trials.

Speed testing

Timing lights were placed at the start, 10 m and 30 m, in order to collect sprint times over the 3 distances: 10 m sprint (quickness, acceleration) – the ability to rapidly accelerate from a standing position was measured over a 10-m dash initiated from a standing position (2, 6), flying 20m sprint – this test assessed the sprinting ability over a short distance and 30 m sprint – this test allows the assessment of sprinting ability (6). As a consequence, the subjects were instructed to run with maximal speed over 30 m, and all tests were obtained from the same trial. Athletes started in a standing position with the left toe approximately 30 cm back from the starting line and the right toe approximately in line with the heel of the left foot.

Agility testing

Zigzag Test. This test assessed running agility from changes in direction. A zigzag course consisted of four 5-m sections set out at 100° angles (6,8) required for short running time, which represented the result of the test (6). Zigzag With the Ball. The ability to control the ball while changing direction was assessed. Subjects were instructed to run with the ball as fast as possible along the same zigzag path used in the previous test (8).

Endurance testing

YO YO intermittent recovery test was performed according to the guidelines established by Bangsbo (1996). Briefly, the test consists of incremental shuttle running until exhaustion. Every second 20 m, players have 10 seconds of active recovery consisting of 2 *5 m jogging. Running speed is prescribed by bleeps occurring at timed intervals. Players must reach the 20-m line by the time each bleep is heard. The test is terminated when the participant twice fails to reach the front line in time (objective evaluation) or he or she feels unable to cover another shuttle at the dictated speed (subjective evaluation). The test result is the total distance covered. Audio cues of the test were recorded on a compact disc and broadcast using a portable CD player.

Statistical analysis

All the results were processed applaying the descriptive statistics and the tendency of changes in the observed contractile characteristics was afterwards defined by applying the method of linear regression using the general equation: y = abx, as well as the

multivariate statistical method – General Linear Method – multivariate procedure (4). All statistic analysis were done by the application of software package SPSS for Windows, Release 11.5.0 (Copyright © SPSS Inc., 1989–2002).

RESULTS

The following models of the tendecy of changes in the observed variables were defined:
- values of speed performance results model was:
$y = -0.04x + 1.991$, for 10 m acceleration, at 89.9% of probability (R^2 =0.899),
$y = -0.113x + 3.000$, for flying 20m sprint, at 91.9% of probability (R^2 =0.919),
$y = -0.153x + 4.992$, for 30 m sprint, at 92.5% of probability (R^2=0.925),
- values of agility performance results model was:
$y = -0.164x + 7.714$, for zigzag test without ball, at 96.6% of probability (R^2 =0.966),
$y = -0.122x + 5.820$, for zigzag test with ball, at 84.3% of probability (R^2 =0.843),
- values of endurance performance results model was:
$y = 1.544x + 43.59$, for YO YO intermittent test, at 91.9% of probability (R^2 =0.919).

The Figures 1–3 show defined models of the tendency of change in observed characteristics of speed (Figure 1), agility (Figure 2), and endurance performance (Figure 4).

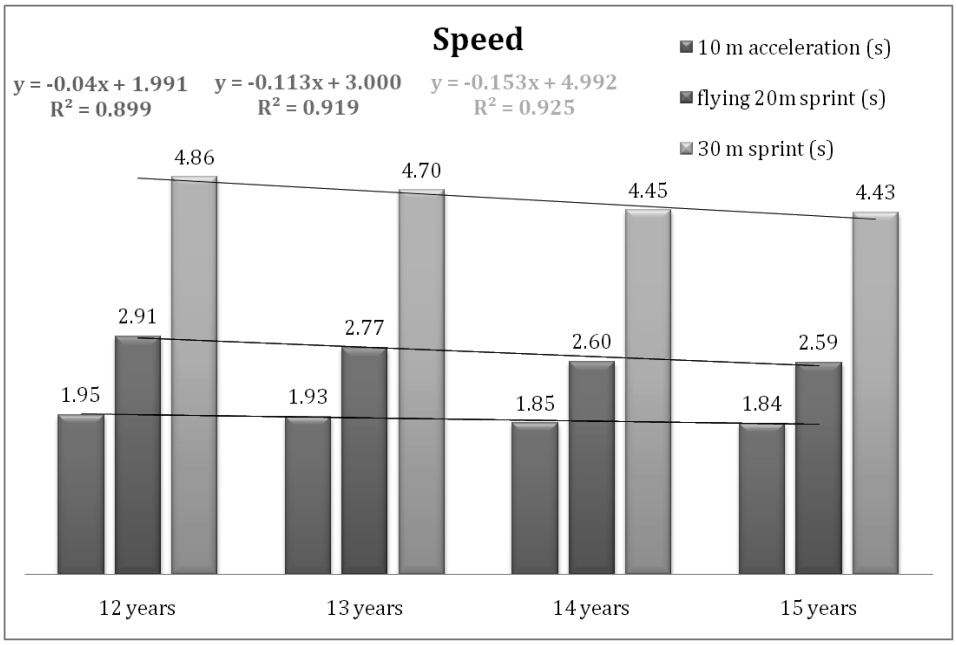

Figure 1
Defined models of the tendency of change in observed characteristics of speed performance

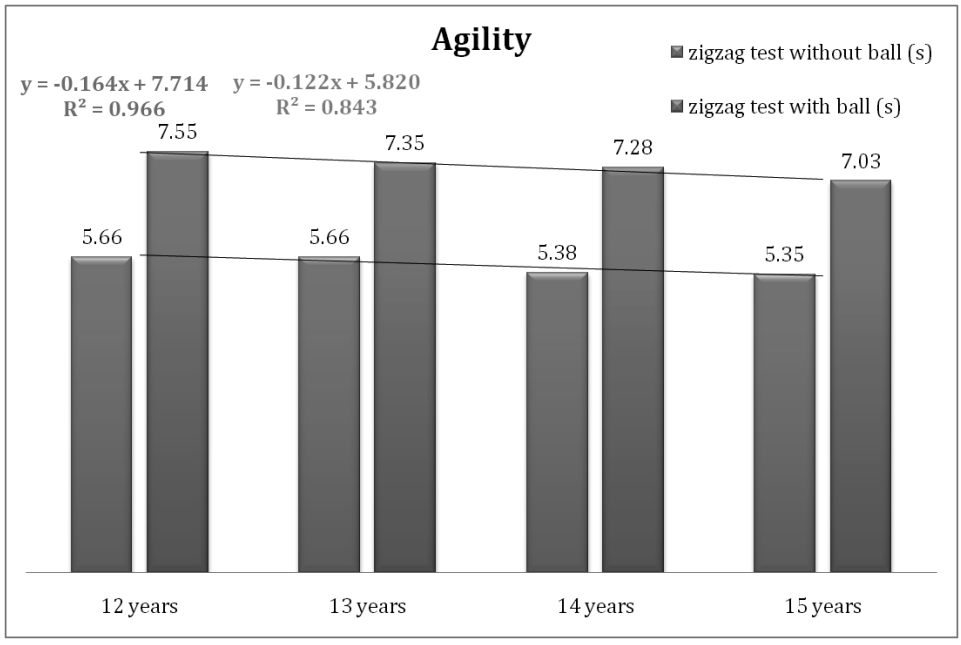

Figure 2
Defined models of the tendency of change in observed characteristics of agility performance

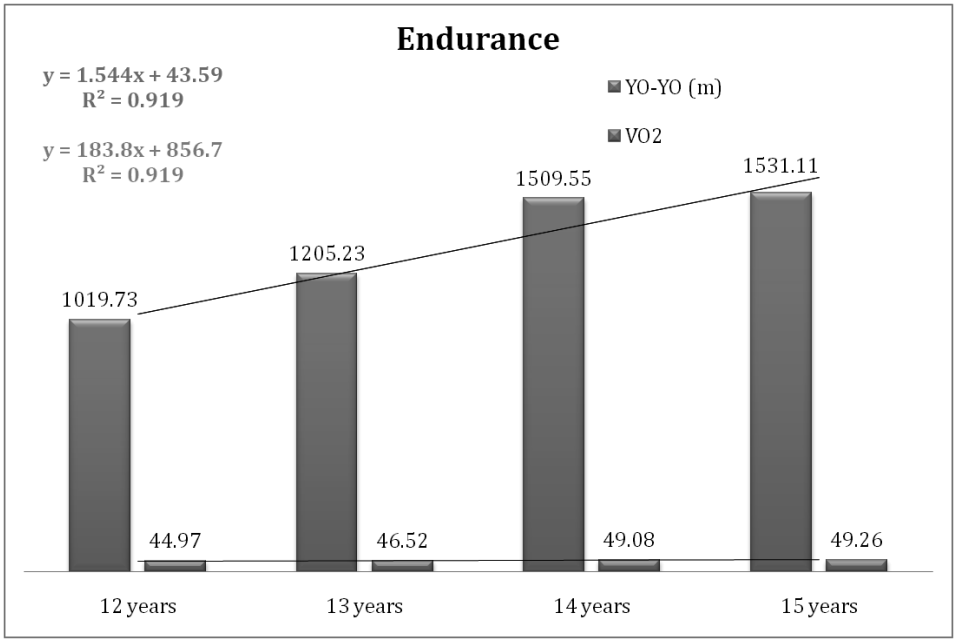

Figure 3
Defined models of the tendency of change in observed characteristics of endurance performance

Multivariate statistical analysis established a significant difference for all observed characteristics at the level of Wilks´ Lambda 0.464, F=13.788, p=0.000, among the observed subsamples in different age categories. Statistically significant difference was also established for all tested subfields regarding the function of the observed subsamples of different ages: 10 m acceleration F=29.216, p=0.000; flying 20m sprint F=85.797, p=0.000; 30 m sprint F=77.587, p=0.003; zigzag test with ball F=9.802, p=0.000; zigzag test without ball F=17.862, p=0.000; YO YO intermittent test F=22.722, p=0.000. The results of partial differences between the observed variables among different ages are shown in Table 1.

Table 1 Partial differences between the observed variables in the tested groups

Dependent Variable	(I) sub-sample	(J) sub-sample	Mean Difference (I-J)	Sig.
10 m acceleration	12 years	14 years	0.0982	0.000
		15 years	0.1172	0.000
	13 years	14 years	0.0800	0.000
		15 years	0.0990	0.000
flying 20m sprint	12 years	13 years	0.1412	0.000
		14 years	0.3083	0.000
		15 years	0.3128	0.000
	13 years	14 years	0.1671	0.000
	13 years	15 years	0.1716	0.000
30 m sprint	12 years	13 years	0.1602	0.000
		14 years	0.4080	0.000
		15 years	0.4303	0.000
	13 years	14 years	0.2478	0.000
		15 years	0.2701	0.000
zigzag test without ball	12 years	14 years	0.2809	0.000
		15 years	0.3144	0.000
	13 years	14 years	0.2789	0.000
		15 years	0.3124	0.000
zigzag test with ball	12 years	14 years	0.2768	0.019
		15 years	0.5223	0.000
	13 years	15 years	0.3218	0.003
YO YO intermitent test	12 years	13 years	-185.5048	0.030
		14 years	-489.8194	0.000
		15 years	-511.3851	0.000
	13 years	14 years	-304.3146	0.000
		15 years	-325.8803	0.000

DISCUSSION

According to primary aim of this research, based on the data of the tested sample of young and talented football players, the results showed the statistically significant (p=0.000) tendency of change in all tested performance characteristics, namely in increase of physical ability in:

- sprinting ability - 0.04, 0.11 and 0.14 s in 10, 20 and 30m sprint, respectively, in regard to 1-year training cycles,
- agility ability - 0.10 and 0.17 s in zigzag without and with ball, respectively, in regard to 1-year training cycle,
- endurance ability - 170.46 m in YO YO intermittent test, in regard to 1-year training cycle.

Considering literature that has examined the differences of observed characteristics in speed, agility and endurance in young and perspective football players regarding different age categories, we can conclude that the results of previous researches (9) strongly support our findings (Table 1). As expected, the 14 and 15-year-old players achieved significantly better results ($p<0.01$) than the 12 and 13-year-old players in all speed, agility and endurance tests (Table 1).

CONCLUSION

The present results confirm earlier findings (3) that different physical ability have different tendency of changes in young and perspective football players during the long period of time as a result of male football training system in Serbia. The most intensive changes were found at endurance ability (average 170.46 (14.96%) per one year period of time) while the least intensive changes were found at 10m sprint (average 0.04s (1.85%) per one year period of time). According to all observed sprint abilities, most intensive changes were found at 30m sprint (average 0.14 s (3.82%) per one year period of time). Generaly, presented model of tendency of changes can serve as critera for any future sports training technology improvement according to male footballers as well as considering long term planning process.

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