

DEVELOPMENT OF SPEED AND STRENGTH IN YOUNG FOOTBALL PLAYERS AGED 10-12 YEARS

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Abstract: The theoretical basis of training continues to grow, along with the expansion of scientific knowledge about how the human body is able to respond to various stimuli. Sports science and methods of training athletes are in constant development. This evolution is mainly based on expanding knowledge on how the human body adapts to different physical or psychological stressors. The present study aims to improve the efficiency of the specialized physical training process, depending on the targeted motor qualities, in our case speed and strength, is an increasingly accessed topic in search of obtaining a higher yield in a more efficient time. The study was conducted on a sample of 16 subjects, members of the U12 group. In the case of the applied program, we seek to achieve the proposed objectives, and by carrying out the planned, measured and interpreted physical training, we want to highlight the essential moments in the formation and development of the proposed program.

Keywords: training, motor skills, physical training, speed, strength, football.

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INTRODUCTION

The purpose of the condition or physical form is resistance to fatigue, an indispensable aspect in any sports discipline. An athlete's recovery speed is directly proportional to their level of fitness. Physical training is considered to be a fundamental notion in the mastery of physical education and sport, regardless of the levels we are talking about (Aubert, 2002a; Papp et al., 2019; Erdely et al., 2020).

Training for peak fitness involves practice to develop all the fitness components required for the sport in question. The topicality of the subject and the importance of the problem addressed is the fact that the activity related to the football player's gear during the game depends to a large extent on the level of special physical training, which is at the foundation of the manifestation of

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his technical-tactical training (Sirghi, 2016; Sandra et al., 2022). In this context, it is important that the athletes to be trained to tolerate both forms of fatigue, physical and mental (Bompa, 2013).

The changes occurring in the current football game refer to its orientation and structure as a whole on player lines (compartments and positions), as well as to the dynamism with which transitions from attack to defense and from defense to attack take place. Today, it is not possible to speak of the achievement of a scientific preparation of the game without a detailed, quantitative and qualitative knowledge of the dynamic constituent elements of its development in competitive conditions as different as possible, interpreting the game according to: the particularities of the players, the tactical concepts approached, the place of the game, the stake and the factors involved in the organization and running of the competition.

Each generation of sports training specialists seems to adhere to a certain slogan that accurately describes the prevailing profile theories of the respective periods. Many coaches argue that form is made through games, although they should embrace the notion that form is made through practice. These coaches must be aware of the fact that in order to improve the technical and tactical procedures of an athlete, not only the game contributes to the increase in performance, but especially training contributes to their improvement (Bompa, 2013; Bulz et al., 2022).

All sports programs must address the physical, technical, tactical, psychological and theoretical aspects of training. These factors are essential to any training program, regardless of the athlete's age, individual potential, level of athletic development or stage of training. However, each factor is emphasized differently depending on the time of year, his biological age and the sport he is training for. Even though training factors are strongly interdependent, each of them develops in a specific manner. Physical training is the basis on which all other forms of training are developed. The stronger the foundation, the greater the potential for developing technical, tactical and psychological qualities (Bompa and Haff, 2009; Dragoş et al., 2022).

The training of athletes involves preparing the body, both from the point of view of increasing the morpho-functional indices, and as a psychological preparation to support continuous efforts and intensity. The training of athletes is preferable to be oriented, planned, systematic and long-term, with the objective of achieving performance (Gamble, 2012).

The physical preparation of football players has a special role in the entire training process, ultimately determining the athletes' performance in training and competitions. Actually, physical training is the basis for all other components of the training, even constituting the starting point for the entire training process. The physical training of football players is the indispensable premise of capitalizing on the technical-tactical expression capacity. High performances are achieved in football only by developed multilateral players, fast, strong and skilled, able to navigate well in the most complicated phases of the game (Balint, 2008).

In the last decades, a period in which continuous improvements were made in physical training, the development of the football game has reached a new conceptual stage of this sport, which refers to the fact that the game is organized and carried out based on well-defined ideas, of specialized and professional mentalities or attitudes. In today's football, a varied content of different sports training compartments (physical, technical-tactical, psychological) can be observed, including unpredictable actions, through which victory can be achieved, even in the last seconds (Bangsbo, 2006).

Just like physical training, speed has become a key factor in modern football, something revealed by the fact that most of the players have managed to achieve performances that in the past seemed impossible to achieve (Marinău, 2016). Compared to strength and endurance, which athletes, without extraordinary talent, can improve spectacularly if they train properly, speed is determined by heredity, requiring more native talent. Consequently, the mobilization of nervous processes, the rapid alternation between excitation and inhibition and the ability to regulate the

neuromuscular coordination system can result in an increased motor frequency (Szabo et al., 2021). In addition, the intensity and frequency of nerve impulses are determining factors in reaching a high speed. But still there is a period when exercises for the development of speed are more productive (Bompa, 2001).

The most favorable period in which it is possible to act in certain directions regarding the development of speed, specific to the period of development that is between 7-12 years (Teodoru, 2011). The pace of development decreases after this stage, and adaptation stimuli no longer cause appropriate answers. This hypothesis, tested experimentally, leads to the idea that the plan for development in this period of evolution must be drawn up with great care (Wilmore and Costill, 2002). Speed develops, being involved in reaction capacity and especially movement frequency, while speed acyclic and speed of action reach the maximum level a few years later. In the current state of scientific knowledge, we can speak of a key stage for the force in the speed regime (FRF, 2018).

When we discuss speed, we cannot ignore strength, motor qualities that directly influence the performance of the activity. Muscular strength is one of the most important qualities available to the human body, being required in most fields of activity, but very frequently in motor activity.

In general, there are two conceptions regarding the starting period of strength development, the first claims that strength can also develop before puberty, taking into account the morphological and physiological possibilities of prepubertals (e.g. the ratio between muscle mass and adipose tissue or body weight, level hormonal, neuromuscular coordination etc). Thus, different dynamic exercises can be used, and starting from the age of 12, intensities that do not exceed 1/3 of the body weight are used (Aubert, 2002b).

The second orientation refers to the situation in which the development of strength can be done (adequately) after overcoming the puberty period. At the beginning, you can gradually apply exercises that do not excessively demand the locomotor system, involving approximately 2/3 of the body weight, and later the level of intensity will reach the body weight and then exceed it (Bota, Cornelia, 2000).

Today, sports performance is determined by a number of factors and no one can say with certainty which of them has the greatest weight, so the study focuses on the idea of highlighting the positive effect it has in the development of the football game, especially in the case of juniors, in order to obtain higher indices of speed development, an optimal demand is needed, and most importantly, the physical demands must correspond to the particularities of age, level of physical training, degree of understanding, etc. Achieving performance, as well as the need to achieve it, is based not only on the phenomenon of emulation, but also on the individual's desire to improve, in the extensive training process (Prodan, 2016). In this idea, we proposed to conceive, we apply and evaluate a program for the development of motor qualities, speed and strength, in a U12 group.

MATERIALS AND METHODS

The purpose of our research is to optimize the structure and content of the sports training of junior football players aged 10-12, based on the differentiated treatment of specific physical training in the pre-competitive period, carried out over three months. More precisely, the activity was structured in the form of three training cycles, each cycle lasting four weeks. Training took place on Mondays, Wednesdays and Fridays, and at the end of each week a friendly game took place. Prior to the start of the activity, the initial testing was carried out, and the whole process was completed with the final testing of the subjects.

In the framework of the research undertaken, the following methods were applied: analysis and generalization of specialized literature data; analysis of training process planning documents; pedagogical observation; testing method; the statistical-mathematical method of data processing and interpretation.

The present study was carried out on a sample of 16 juniors, the average age being 11.5 years. The means used to evaluate the activity carried out are presented in detail in table 1.

Table 1. The tests used in the present study and the objectives pursued.

Nr. crt.	Test	Objective
1.	Speed running 20 meters, starting from the feet (Speed 20m.)	By performing this test, we aim to evaluate the linear speed of starting and acceleration;
2.	Sprint 4x10 meters, starting from the feet (Shuttle 4x10 m.)	Evaluation of speed with changes of direction, combining muscle strength, explosive strength, starting force, acceleration and deceleration;
3.	Illinois Test (T. Illinois)	The Illinois test will help us evaluate agility, the ability to move with rapid changes of direction at different angles, combining muscle strength, starting strength, explosive strength, balance, acceleration and deceleration;
4.	Standing long jump	The long jump capitalizes on the evaluation of the horizontal explosive force of the lower limbs, the lactic acid anaerobic power of the lower limbs;
5.	Throwing the soccer ball with two hands above the head (Soccer ball throwing)	As part of this testing, we will monitor the evaluation of the explosive force of the upper limbs and the trunk;
6.	Trunk flexion from lying on the back (Crunches challenge. 30/sec.)	In the last test, the objective is to evaluate the strength of the abdominal muscles.

Throughout the duration of the study, the subjects carried out their activity based on the proposed program. This includes specific and non-specific means of the football game, means selected according to the objectives and the goal pursued. The means used in each training cycle can be found in table 2, along with aspects related to intensity, volume and breaks between repetitions. This program was created in such a way as to respect the particularities of the players' age, level of preparation and knowledge of the exercise mechanism.

For the Monday of each week, it was decided to plan homework for force and acceleration speed. Based on Verkhoshanski's (2006) assertion that a true sprint session must be preceded by plyometric exercises, the two themes of explosive lower body strength and acceleration speed were used in combination on Monday of each training cycle. For the development of explosive force, the means used are: jumping on two feet, jumping over fences of different sizes, standing long jumps and long jumps with squatting, jumping step.

The Wednesdays during the training included elements regarding the development of strength in resistance regime, the method used was that of the strength circuit, consisting of different workshops. The volume of work but also the intensity increased with the transition from one training cycle to another. It was opted for the gradual increase from 5 to 6 and finally to 8 workshops, with the duration of the load starting from 15 sec, and the rear being 20 sec.

Table 2. Presentation of the content of the training cycles

Cycle	Acceleration speed			Explosive strength			Agility			Explosive strength			
	C I	C II	C III	C I	C II	C III	C I	C II	C III	C I	C II	C III	
Intensity	90-95%	90-100%	95-100%	90-95%	90-100%	95-100%	90-95%	90-100%	95-100%	90-95%	90-100%	95-100%	
Duration	Minutes	5-8 min.	5-8 min.	5-8 min.	10 min.	10 min.	7-8 min.	10-12 min.	10-12 min.	10-12 min.	8-10 min.	8-10 min.	8-10 min.
	Meters	80-90 m.	100-120 m.	110-120 m.	13x	15x	17x	40 metri	40 m.	60 m.	60m.	64 m.	80m.
Load duration	4-5 sec.	3-6 sec.	3-7 sec.	2-7 sec.	2-7 sec.	2-7 sec.	10-12 sec.	10-15 sec.	10-15 sec.	15 sec.	15-17 sec.	15-17 sec.	
Rest duration	45-90 sec.	45-90 sec.	45-90 sec.	45-90 sec.	45-90 sec.	45-90 sec.	30 sec.	30 sec.	30-45 sec.	45 sec.	1 min.	1 min.	
Means	4 x 7m. 3 x 15m.	4 x 12 m. 2 x 15m.	4 x 15 m. 2 x 30 m.	4 x 10 S.J. 3 x 6 J.o.f. 3 x S.L.J.	4 x 8 J.o.f. 2 x Sq.L.J. 4 x S.L.J.	3 x 8 J.o.f. 4 x 12 S.J. 5 x S.L.J.	2x (ladder +10m sla.) 2x (ladder + 10m zig-zag)	20m F. 4m.Left/Right. 4R.	2x(ladder+ 8m sla.) 2x(ladder+ 10m zig-zag) 2 x 20(5F+1left+1right.)	2x10Pushups 2x10R.Elastic Band. 2x10R. throwing the ball	2 x 12pushups. 2x10R.throwing the ball	2 x 10 pushups. 2x10R. throwing the ball. 2kg 2x10R. throwing the ball. 1kg	
Frequency	1 times a week												

S.J. – Step Jump; J.o.f. – Jumping over the fence; S.L.J. – Standing long jump; Sq.L.J.– Long jump with squat; Sla –Slalom; F-Front; B-Back

The last day of a week of training contained aspects regarding the development of agility. The means used were represented by various variants of moving on a ladder, followed by accelerated running over different distances in zig-zag, slalom, running with a change in the direction of travel, forward and backward, left and right (5 front+1 back) and 180° turns with continued movement (both left and right).

For the development of the explosive force of the upper body, the means used were: exercises with the elastic band, push-ups, but also throwing the soccer ball and throwing the medicine ball of different weights.

RESULTS AND DISCUSSIONS

The results obtained from the tests represent a control factor of the entire study and the efficiency of the means used to achieve the proposed objectives. For a more objective picture of the results obtained from the present study, we will compare both the initial results and the results final results obtained by the participants in all six tests considered.

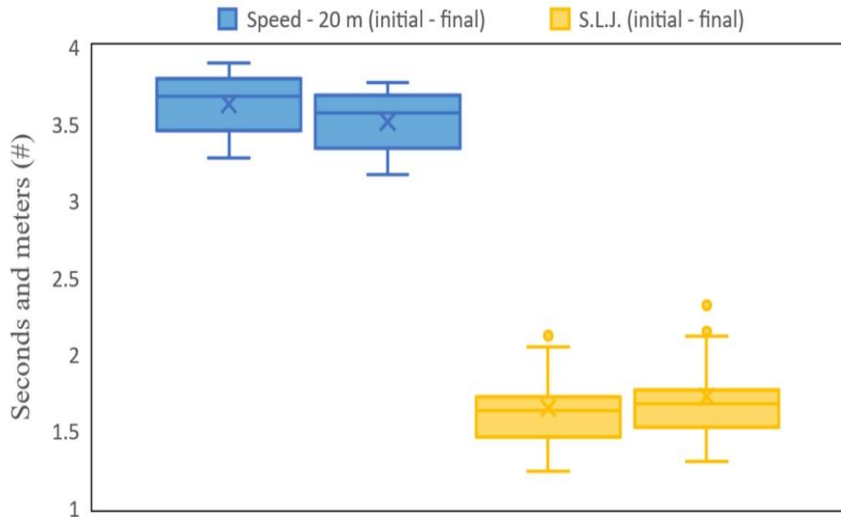


Figure 1. Graphic representation of the results obtained from the initial and final tests (Speed-20m., Standing long jump)

In the 20m sprint the group mean improved from 3.63 sec at initial testing to 3.51 sec at final testing. This materializes through an average progress of 0.12 sec, and in percentages the progress is 3% (Fig.1). Based on the results obtained from the statistical-mathematical calculations, but also from the application of the effect size formula, it can be observed the fact that the most significant difference of the means is in the 20-meter speed run test, being located at the value of 1.03, representing the value of the effect size index.

The study of the coefficient of variability recorded for each sample provides us with data on the measure of relative dispersion. The lower the coefficient, the greater the homogeneity of the group. It is considered that a group is homogeneous when the coefficient is less than 10% (Maroti, 2008), and the best homogeneity of the group can be observed in speed tests, especially in the 20 m sprint, the coefficient being below 6% for both tests.

In the test S.L.J. (Fig.1), the performances of the group of soccer players were better in the second test, 1.73 m compared to 1.65 m in the initial test; the progress being estimated at approximately 0.08 m. A large value of the difference between the means can also be observed after obtaining the value of the effect size, the value index of 0.96 being the second most significant result after the one from the distance speed test of 20 m. In this test, the homogeneity of the group is more dispersed, but still the value obtained at the final test is 15.4%, 1.1 percent higher than the results obtained at the initial test, which indicates an improvement. Relative homogeneity is given in particular by the fact that the level of explosive force of the lower train at this age is influenced by the sudden and differentiated growth of the segments depending on the individual genetic characteristics of the children.

Comparison of averages recorded in the 4x10 m shuttle test shows a decrease in times from initial to final testing. Thus, the average values of the first testing were 11.43 sec, for the final testing to indicate an improvement of 0.7 sec (about 7%), the final values being 10.73 sec. For this sample, the result of the effect size can also be considered significant, having the value index located at 0.91 (Fig. 2). Following the statistical-mathematical calculations, it can be seen that the homogeneity of the group has the best values in the tests of running. The 4x10 m shuttle test has a value below 5% in both tests, which demonstrates a very good homogeneity of the entire group even after the training period.

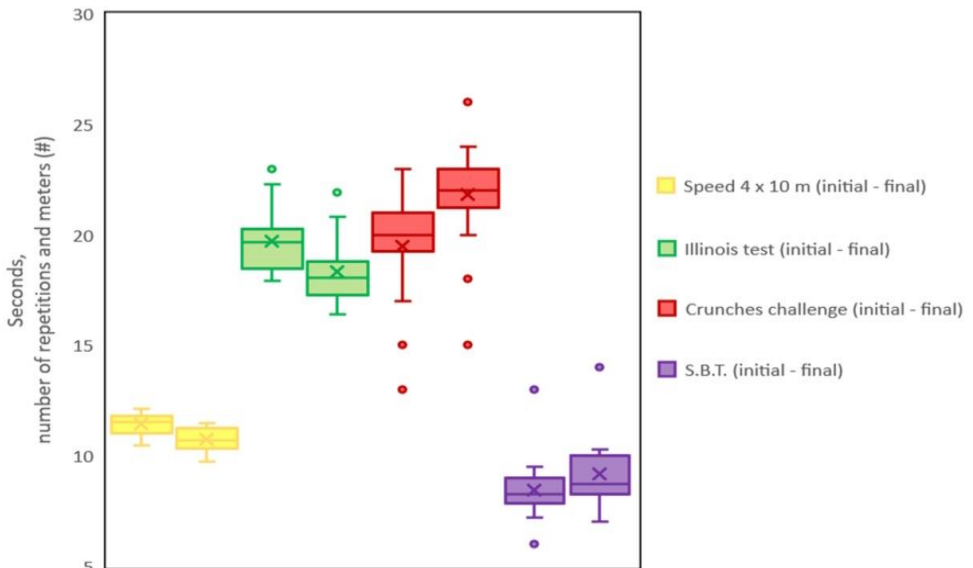


Figure 2. Graphic representation of the results obtained from the initial and final tests (Speed4x10m, Illinois, Crunches challenge, S.B.T.)

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Analyzing the data recorded in the Illinois test, we notice that the evolution of the group still tends towards progress, between the initial and final testing, being a significant increase of 1.38 sec (approximately 8%). Following the statistical-mathematical calculations made, the size of the effect has a large value of from a statistical point of view, which exceeds the threshold of 0.8, having an index of 0.94. This value represents a significant difference in the averages between the two tests.

The crunches challenge test, as in the case of previous tests, indicates an obvious progress of all participants. The group's progress amounts to about 9% between the two tests. Compared to the other samples, the value of the effect size is slightly lower, but remains statistically significant, the index being 0.85. (Fig. 2)

The upper limb strength test S.B.T. (Fig.2), shows a difference of 0.70 m between the average of the initial and final testing, which demonstrates an improvement in the group's performance from one test to another. The effect size value of the present testing was significant, the index reaching the value of 0.81. In this test, the homogeneity of the group is relative, due to the positions played by the players, goalkeepers and defenders being more exposed to this type of throw both in matches and in training. These aspects contributed to the reduction of homogeneity in this initial testing, a fact that is also highlighted by the improvement of homogeneity after the training period, where all players (regardless of positions) were subjected to the same type of training.

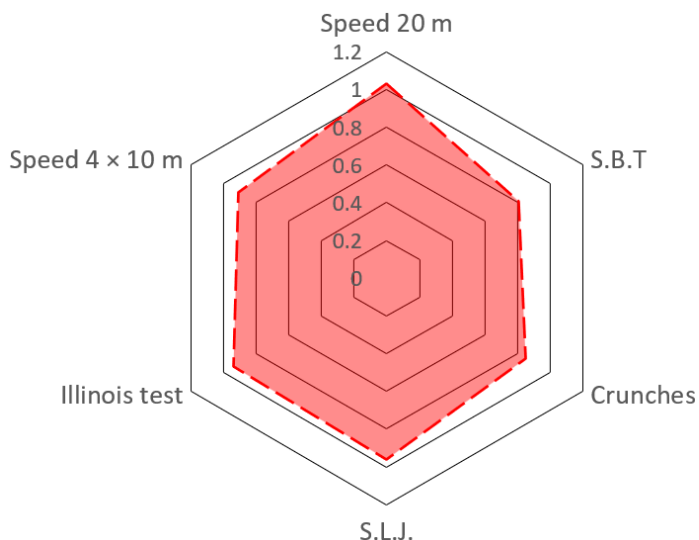


Figure 3. Graphical representation of effect size values for the six tests applied to the target group

The values presented in figure 3 represent the standardized difference between the averages and highlight whether or not this difference is statistically significant. This is a method to find out the degree of efficiency obtained after the training period. For the difference to be considered small, this value must be less than or equal to 0.2, for an average efficiency of the group this value must be between 0.2-0.8, and for a high efficiency from the point of view statistically, this value must be greater than or equal to 0.8(Fig.3).

CONCLUSIONS

The current state of the football game and the directions for its further development, as seen from the analysis of the specialized literature, is characterized by an increasing influence on the level of training of players and teams, in terms of preparation their special physics.

Following the application of the training program in the present study, it was demonstrated that the experimental group registered a statistically significant superiority in the final tests for all motor tests applied, thus following the application of the program the performances during the game/training will be in growth.

The results obtained in this study can favorably influence aspects regarding the choice, the volume of work, the intensity of the effort, the complexity of the means chosen, in the preparation of football players and not only, but also constitute a starting point in the achievement of the proposed short-term objectives over a U12 group.

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