

**NATIONAL SPORTS ACADEMY
"Vasil Levski"**

DEPARTMENT OF FOOTBALL AND TENNIS

Alay Kesler

ABSTRACT

**MODELING EARLY FOOTBALL EDUCATION IN THE
REPUBLIC OF TURKEY**

Sofia ` 2025

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**of a dissertation for the award of the educational and scientific
degree " *Doctor* "
in a professional direction 7.6. *Sports* ,
Doctoral program "*Theory and Methodology of Sports Science*"**

Scientific supervisor:

Assoc. Prof. Ventsislav Gavrilov - doctor

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The dissertation contains 151 standard pages plus 1 appendix . It is illustrated with 25 tables, 55 figures and a list of literature. The bibliography contains 118 literature sources (88 in Cyrillic and 14 in Latin), as well as 16 Internet sites.

The dissertation work was discussed and directed for public defense before a scientific jury at an extended meeting of the Football and Tennis Department at the Vasil Levski National Sports Academy, held on December 18, 2024.

The public defense of the dissertation for the award of the educational and scientific degree " **Doctor** " will take place on **09.04.2025** from **14 .00 hours** in **hall A-3** of **the National Academy of Sciences "Vasil Levski", Studentski Grad , Sofia .**

INTRODUCTION

Achieving high sporting achievements (including in football) is possible only after many years of hard work on the part of both the athletes and coaches, as well as many other specialists (sports physicians, physiotherapists, psychologists, etc.). In this process, a special place is occupied by the preparation of adolescents, who are a reserve of high sportsmanship.

The period of childhood and adolescence should be used most rationally to attract adolescents and young people to systematic physical exercises and sports. This is the most crucial period for general hardening, development of basic motor functions, physical qualities and the entire motor culture, as well as for creating habits for participation in sports activities. This will lead to the achievement of the so-called physical fitness, expressed in the good condition of the motor, physiological and psychological capabilities of young men and women.

One of the main problems in training, which is extremely important for the development of physical fitness and its influence on the skills of football players, is related to the knowledge of the specifics of the age range 11-15 years. This also determines the importance of scientific research conducted at this age.

Practice shows that high sports results can be achieved only on the basis of many years of scientifically based sports training. The establishment of the state, changes and interrelationships between some of the main factors of sports achievement, their analysis and evaluation will allow the construction of a modern scientifically based system for selection and initial football training in the Republic of Turkey, which will increase the effectiveness of coaching work in the preparation of young football players.

Therefore, we are convinced that increasing the level of sportsmanship in the Republic of Turkey goes through periodic monitoring, analysis and evaluation of the existing sports training methodologies in different age periods. In this context, the goal of our research, aimed at increasing the effectiveness of early football training in the Republic of Turkey, by optimizing the existing sports training methodologies in the age range of 12-13 years, is of high scientific and practical value.

I. STATEMENT OF THE PROBLEM

I.1. Organization and specifics of the training of young football players in the Republic of Turkey

The development of young football players is an important task facing the Turkish Football Association. football federation. Its efforts are aimed at organizing and conducting certain activities and events that will help discover talented boys and girls, as well as their training by highly qualified coaches and other sports specialists, with the aim of achieving high sportsmanship.

The main goal of amateur and professional football clubs should yes be the organization on qualified programs for football training for children and youth up to 15 years of age, reaching more children in communication and cooperation with the surrounding schools and the organization on football festivals on various occasions and holidays throughout the year.

The Turkish Football Federation, in cooperation with the Ministry of National Education, carries out activities to support the sports education of children and youth in the process of raising them as worthy people, good citizens and athletes, healthy and educated individuals through organized football activities in schools.

On the basis on this one idea, the Football Federation implements a number of programs for the development of young footballers under the name "Development Leagues". Development Leagues support the game of football and provide opportunities for Turkish footballers competing in the relevant age groups to raise their level and compete for inclusion in the youth national teams.

The aim of the "Young Footballer" program is to conduct systematic studies throughout the country, enabling talented people to be discovered at a high scientific level young football players, who, in the right hands, can be built as important personalities of tomorrow, ambassadors of Turkish sports.

In school football, the Turkish Football Federation, in cooperation with the Ministry of Education and Science and the Ministry of Youth Affairs, carries out activities that will support the sports education of children and youth in the process of their growth as worthy people, good citizens, elite athletes, healthy and educated individuals. One of the goals of the TFF in this attitude is yes activates the school football through engagement on teachers physical upbringing, which will introduce the children with football and will play important role in their transition to "big football".

Thanks to research into the philosophy of school football, the so-called " **Basic Principles of School Football** " have been created, which are underlying the " **Ethical regulation** ", prepared by TFF, jointly with MOE (<https://tff.org/default.aspx?pageID=883>) .

An extremely important role in the development of football in Turkey is played by the so-called **Football Development Directorate** . This is the organization that carries out training for coaches, takes care of the development of elite football, and organizes a number of mass activities that outline the future of football in the country. It is also involved in the development of national teams (women's, beach national team and national futsal team). With its help, various programs are organized for training, as well as certification activities , training seminars and communication meetings

(<https://www.tff.org/Default.aspx?pageId=735>).

The goal on the project " **Football Training Centers** ", realized from Turkish football federation in 2013, it was to provide opportunities for training activities on weekdays and Saturdays for children up to 12 years of age, with coaches selected by it, in regional centers, certain from the federation, where the club structures are not working effectively.

In **football camps** , which are organized every year during the summer vacation after the end of the school year, 12-year-olds participate boys and girls. The participants come from the relevant age groups of football clubs across the country.

Football schools are structures that have existed in Turkey for many years. For various reasons - such as the constant increase in the urban population, the ever-decreasing free land along with the growing population, the difficulty of playing football in the streets and the increasing concerns of parents about the safety of their children - have made football schools a major starting point for children to get into football (<https://tff.org/>) .

Football is one of the areas in which **the Turkish Volunteers in Education Foundation works** , which plans various educational activities for children and carries them out through volunteers. In accordance with the contract between the Foundation and TFF, signed in 2009 and updated in 2012, the volunteers who provide football training to children are usually students and are trained by TFF (<https://tff.org/default.aspx?pageID=1232>). The target audience are children of age 11-12 years .

I.2. Peculiarities of psychophysical development in 12-13-year-old adolescents

The specificity of the game of football "is determined by its great variability , by the rapidly changing situations, by the great variety of movements and actions (with and without

the ball), by the high speed of movement and execution of technical and tactical techniques in extreme conditions of continuous combat " (Petkov, P., 2022: 118-119).

It is quite natural, with a quality selection of children for football activities and effective preparation, to expect high sporting achievements. Therefore, the football training process must be properly directed and effective, and the coach is required to control the physical development of the athletes (Atanasov , E., Ignatov , G., Lovkov , K., 2019).

According to L. Dimitrov et al. (2019: 317), "the study of the anthropometric indicators of competitors, together with the measurement of the signs that make up the individual aspects of training, related to attempts to predict their definitive values, should be part of the selection system at each stage of multi-year sports training, as well as be the subject of monitoring in the annual cycle, as they are informative regarding the influence of training and competition load and its impact on competitors."

The assessment of the health and nutritional status of children often depends on their height and body mass gain. The use of anthropometric observation, combined with assessments of motor abilities, provides additional insight into the process of their development. The assessment of various factors, such as genetics, growth hormones, period of reaching maturity, nutrition and physical activity, which influence the anthropometric development of children is a huge challenge. It is essential to cover all variables in understanding and carefully examining physical changes (Jürimäe , T., Jürimäe , J., 2001:13).

M. Toteva's (1992) research with adolescent Bulgarian football players shows that 12-13 year olds have a height that is above the standard for the Bulgarian population (according to Slanchev, P. et al. , 1981), and the weight meets the requirements of this sport. At the same time, according to the author, "an uneven increase in total body dimensions is noticeable, with a significant increase between 12-13 years and later between 14-15 years. The remaining somatotypological parameters, especially those related to football (circumferences of the lower legs and biepicondylar diameter of the Os Femuris), note the most accelerated development at the age of 12-13 years" (Toteva, M., 1992: 87-88). Based on the above parameters, the overall somatotype of 12-year-old football players can be defined as mesomorph-ectomorph , which subsequently turns into ecto-mesomorph .

According to D. Dasheva and I. Bonova (2020: 9), "in order to develop specific qualities necessary for performance in a certain sport, they must be genotypically embedded in the future athlete and the higher their initial level (of trainability), the higher they can be developed in the process of long-term preparation (adaptation)."

I.3. Specificity of development of physical qualities in 12-13-year-old adolescents

Physical training is an extremely important aspect of a football player's sports preparation and must be built continuously by professionals.

"To achieve high sports results, the level of physical qualities and their combination with other aspects of the athletes' preparation are of paramount importance" (Dimov, I., 2001: 110). The author believes that when selecting children for a specific type of sports specialization, it is necessary to apply a wider range of morphological characteristics, as well as more comprehensive indicators for revealing the level of physical fitness and specific motor skills.

"The goal of physical training in football is to reach such a degree of improvement in the physical condition of the football player that it will ensure the achievement of high sports results and the manifestation of technical and tactical mastery" (Shishkov, A., Dimitrov, L., Madanski, M., Genchev, V., 1985, 1989).

"The systematic sports-pedagogical impact has a significant impact on the development of motor qualities. They manifest themselves more fully and their age dynamics occur more rapidly and at a higher level" (Bazekov, S., 2016: 923). It is precisely the dynamics of development of special motor qualities in football that is the subject of research by A. Gigov et al. (2001).

The targeted work to develop the basic physical qualities of young football players begins during the stage of primary training (Bachvarov, M., 1999). This opinion coincides with the opinion of a number of authors (Bachvarov, M., 1992, 1999; Buschmann, J. et al., 2006; Nikolaenko, V., Shamardin, V., 2015), who believe that in the stage of early specialization, the main place is given to the development and maintenance of the level of physical qualities.

According to S. Ozcan, Y. Polat and K. Karacabey (2005) found that long-term movement training significantly improved physical fitness scores. The authors made this finding based on a 16-week experiment with 80 Turkish children aged 10-12.

"The positive effect after conditioning exercises is becoming more and more established over time. This is due to the changes in football. In order to maintain this form of the game, performers are needed. What is modern in the game today is not only being technical and fast. A football player is required to possess a palette of qualities, including strength, speed, making quick and correct decisions, and endurance. In order for a football

player to meet this challenge, he needs to prepare comprehensively" (Velikov, A., Ismail, D. , 2024: 266).

In this sense, V. Yordanov (2024: 283-284) notes that "the intensive development of the motor apparatus, the high plasticity and the spatio-temporal characteristics of movements create favorable conditions for the targeted development of physical qualities with the means of sports. An optimal relationship between motor qualities and the mastery of sports techniques is necessary."

I.4. Specificity of technical and tactical training for 12-13-year-old football players based on data from the literature

The technical mastery of a football player is determined by the arsenal of technical techniques that he perfectly masters and can use to solve specific game tasks in the extreme conditions of the competition. Technical mastery follows the path of increasing the speed and intensity of the movements and actions performed, of the hard and uncompromising fight for the ball in all parts of the field.

An extremely important condition when working with young football players is that they be prepared bilaterally, i.e. that they be able to perform various motor actions almost equally with both their comfortable and uncomfortable leg. On this occasion G. Ignatov and V. Gavrilov (2012: 73) noted that "the formation and improvement of technical skills in football depends on the leading side in their motor skills – left or right". With the improvement of the level of football technique, the asymmetry of technical actions between the two legs is reduced. "The use and improvement in football activities of targeted training for playing with both legs leads to an increase in football capabilities, as well as to greater efficiency in the game" (Ignatov , G. , 2022: 92).

In the initial training stage, "25% of the time is allocated to learning the basic techniques isolated from the game. It is mandatory to work with the strong leg to master the technical movements and actions (Dimitrov, L., 2019: 38). And further - the mastery of the technique is carried out mainly through special preparatory and competitive exercises and in unison with individual and group tactical actions in defense and attack". Work on handling the ball with the weak leg begins a little later - at the age of 12-13.

"The improvement of technical and tactical techniques during the initial training stage should proceed with a simultaneous emphasis on the requirements for correct technical execution, speed and accuracy in martial arts conditions, an approach that gives a great effect in the technical and tactical preparation of young football players" (L. Dimitrov (2019: 44).

Tactical training of football players, in turn, is an important and difficult task, the implementation of which requires special knowledge, sufficient time and great perseverance on the part of players and coaches. Sports tactics can be defined as the art of conducting sports combat or a set of certain elements, techniques aimed at achieving a maximum or favorable result in a sports competition. Tactics can be considered as a function of technical, physical and other types of training. Tactics unites, as in focus, almost all the requirements that a well-prepared football player must meet.

The main task of tactical training is the mastery and improvement of individual and collective tactical actions in attack and defense and the development of the creative abilities of the football player. Tactical mastery is based on the ability of football players to quickly and correctly perceive, "feel" and evaluate the constantly changing game situation and, in accordance with it, to act correctly and usefully.

I.5. Psychophysiological aspects of training in 12-13-year-old football players

In the field of psychological preparation, moral and volitional efforts, intellect and mental resilience increasingly strengthen the trend for complexity in this direction, which is characterized by motivated combat readiness of the players for maximum performance in the performance of the set private and general tasks. It is necessary to cultivate firmness, aggressiveness, steadfastness, perseverance (all this within the rules), which are extremely necessary in the fight for every ball and space.

In team sports, including football, there is an objectively complicated situation, which is the result of the need to coordinate the actions of each competitor with his teammates, to coordinate joint efforts, and to adapt individual behavior to the requirements arising from the common goal and the collective final result (Yancheva, T., 2004).

Studying the features of the psychomotor functions of young football players, according to the age characteristics of adolescents, is of great importance in the selection and preparation of future masters of the field, who will play quickly and accurately. For example, it should be known that when determining the time and components of the motor reaction, the values for the latent and motor component decrease with increasing age. The greatest changes occur in 8-13-year-olds. The time of the motor component and the time of the motor reaction decrease significantly. In addition, studies show that the frequency of movements increases most significantly between the ages of 8 and 14. After 15-18 years, this indicator changes insignificantly. When preparing young football players to improve the

maximum frequency of movements, it is necessary to work systematically and purposefully between the ages of 8 and 14.

Good concentration of attention, allowing the athlete to "turn off" external stimuli and successfully perform the upcoming action, is extremely important for the development of players in football, especially when performing static situations (penalties, corner kicks, etc.). "Building a stress-resistant psyche is one of the main goals of the training process. Work in this direction begins during the initial preparation and continues until the end of the sports career of each athlete" (Lefterov, E., Dimitrov, V., 2010: 417).

The work on the precise execution of movements in time and space is extremely important in football. The analysis of game actions shows that the football player reacts repeatedly to a moving object – accurately controlling the ball, accurately playing the ball, directing the ball into an unprotected area of the goal and a number of other actions in time and space. In other words, game actions in football represent an accurate and correct reaction to the moving object (RDO).

I.6. Specific features of the education and training of adolescent football players

It is known that high achievements in any sports discipline can only be achieved on the basis of a properly organized and conducted multi-year process of sports training.

According to Ts. Zhelyazkov and D. Dasheva (2017: 426), "multi-year sports training is defined as a unified pedagogical system that ensures continuity of goals, tasks, means, methods and forms of training in different age groups in the process of sports improvement. Its main focus is the achievement of high sports results by ensuring an optimal ratio of the different aspects of the athletes' sports training during the different stages."

The entire childhood period can be viewed as a critical phase for acquiring basic motor skills and exposure to a diverse range of athletic talents. Of particular importance is the developmental stage of early childhood, which typically spans from about three to eight years of age. The acquisition and refinement of basic motor skills are essential prerequisites for the acquisition and mastery of specific sports-related skills (Gallahue, D., Donnelly, F., 2007: 45).

According to K. Simeonov (2006: 191-192) "one of the main tasks of training with adolescent football players is to influence their body in a complex and differentiated way, taking into account the individual pace of development. The development of motor skills must be carried out in inseparable unity with their technical and tactical training, with the use of a large number of exercises, close in nature and structure to the game actions,

because football is, above all, the ability to correctly perform technical techniques, when combined with precise, optimal movement throughout the field". The author develops a program for developing the speed of adolescent (14-15-year-old) football players, based on targeted game exercises (with and without the ball), identical in structure to the game actions in football.

The interests of Kılıç and Nuri (2008) are aimed at establishing the influence of a 10-week plyometric training program on the development of physical qualities of young football players aged 13-15 years. The results give the authors reason to note that under the influence of the applied training effects, a significant increase in the level of development of sprint capabilities, special strength and flexibility of football players from the experimental group occurred.

A large number of specialists (Dimitrov, L., 1985; Vine , H., 2004; Kuznetsov , A., 2007) point out as a feature of the stage of initial training in football the need for targeted work to develop basic technical and tactical skills. According to them, training in complex football techniques should begin with mastering dribbling the ball, which is a natural action and is accessible to children at this age.

As priorities in the initial training of 10-12-year-old football players, L. Dimitrov (2019: 3) defines:

- leading the ball in a straight line with the top of the foot (with the tips of the toes), followed by executing a straight or inside shot at goal;
- driving the ball in a straight line with the inside of the foot, followed by executing an inside shot at goal;
- combined dribbling in a straight line against a semi-active or active defender, followed (optionally) by a straight or inside shot at goal;
- performing various other types of ball handling (zigzag, changing direction, using feints in single combat situations, taking the ball away, etc.), alone or in various combinations between them.

It is important to note that "at the beginning of the football training process, when technical techniques and tactical actions are first learned, the elements of training predominate, and later, when the competitive stage is entered, the elements of improvement gain the advantage" (Bachvarov, M., 2003: 234).

According to S. Denev (2018: 21-22), the game approach is particularly important in the process of training football players. It allows for the preservation of "the idea and structure of football, and adaptation to the age of the students to be achieved mainly through changes in the rules. The main goal is to gradually move from the most simplified

form of the game to football 7 and 9, and finally to big football. The sequence of trying - learning - practicing is followed through small competitions, small games, aimed at the specified goal, while seeking orientation towards the technical and tactical features of the target game.

Implemented by I. Özdemir (2014) leads to a significant improvement in the values of the measured signs characterizing the level of development of physical qualities and motor skills of the football players participating in the experiment he conducted. The author especially emphasizes the need to individualize the training according to the specific needs and capabilities of the athletes. The training program implemented by M. Kurban and Y. Kaya (2017) is of the same duration, which aims to improve some motor skills specific to football in 10-13-year-old youth.

I.7. Control over the process of education and training of young football players

Permanent control over the signs of physical development and specific performance is extremely important for achieving success in the development of adolescent football players.

"In principle, control is a cognitive process in which information is collected and the actual state of a given object (system) is assessed, with a view to its purposeful (pre-planned) development and improvement" (Broglie, Ya., 2012: 29). According to the same author, "information processing is an extremely important problem for sports practice. It is especially relevant in the so-called extreme conditions of sports competition, when in a very complex situation, in an extremely short time, with the opponent's active counteraction, a huge amount and significance of information must be processed and the most correct decision made" (Broglie, Ya., 2012: 28).

"If control is considered as a process, then it is a process of measuring and determining the current state of a given object or system and comparing the obtained result with the planning at the beginning of management. The essence of control is expressed in measurement, comparison and evaluation" (Borukova, M., 2023: 31).

"Of particular importance for conducting rational sports training with young football players are the various types of control and assessment of the sports and technical capabilities of individuals and the team and, on this basis, the ability to make correct management decisions" (Dimitrov, L., 2019: 55).

An integral part of control in sports is related to the ability of researchers to determine the goals of control, to select adequate means and methods both for collecting information about the state of the studied object, and for mathematical and statistical

processing of the information obtained. The correctness in the preparation of each study is also related to the correct development of the test battery. The tests and indicators included in it must meet the requirements of sports statistics for validity, reliability, credibility, objectivity and standardization .

The study of the physical capabilities of football players allows K. Lovkov and E. Atanasov (2018: 34) to conclude that "the strongly deviating values in terms of achievements in some of the tests raise the question of the application of appropriate and logically valid selection tests and their implementation as a whole in the practice of clubs".

To assess the physical capabilities of 17-year-old Bulgarian football players, K. Lovkov (2018: 55) developed normative tables for various football-specific tests that "allow coaches, managers and players to control and manage the training process more effectively".

According to A. Aliyev, A. Gigov, P. Nagin and V. Gigova (2010: 58-59), speed is one of the most important qualities for the football game. It manifests itself in a specific way and this should be taken into account by sports specialists. The authors develop a normative basis for controlling the speed capabilities of young Azerbaijani football players, which allows for the differentiation and separate assessment of both starting acceleration and maximum speed.

"For effective control and assessment of the physical and technical-tactical preparedness of students from sports schools in Bulgaria", a scientific team from the National Sports Academy "V. Levski", with the participation of E. Atanasov, is developing a System for assessing the results of sports training (Tsorova , R., Miladinov, O. et al., 2012: 572-583). Based on a large number of studies on 8 sports-pedagogical tests, the System presents normative tables for assessing young football players from 12 to 19 years of age. This makes it possible to track the sports development of Bulgarian football players trained in sports schools in the long term.

Particularly valuable for practice are the model characteristics developed by L. Dimitrov (2019: 103-105) for each age group (from 8 to 18 years), each of which can successfully serve as a "functional model of the individual countries and qualities of preparedness for different levels of sports and technical improvement". The normative base (by years) developed by the same author for control and assessment of the physical and technical-tactical preparedness of young 8-18-year-old football players also deserves special attention.

I.8. General conclusions from the literature review and working hypothesis

The early inclusion of children in the sports training system and the opportunities for significant achievements at younger ages have led to the need for a longer and properly organized training process, as well as an increase in the intensity of training programs for child athletes.

However, children's reaction to training loads differs from that of adults, due to some specific features related to their growth and development. In-depth knowledge of the nature of age-related changes and the specifics of the development of the child's organism is a prerequisite for a successful sports specialist.

Under the influence of the ongoing training process and the normal morphofunctional development of adolescent football players, adaptation processes to the applied training loads occur, which lead to a reduction in their effect. This fact, as well as the intensive development and improvement of the football game, requires adequate changes in the work with the young hopes of Turkish football.

Therefore, at the current stage of the development of the game of football, there is a growing need to optimize the existing training program, as well as to create a unified methodology for working with young football players in the Republic of Turkey.

The theoretical study conducted and our professional experience provide grounds for formulating the following **working hypothesis** :

The development and implementation in practice of an optimized methodology for early football training, in the age period of 12-13 years, will increase the effectiveness of the sports training of adolescent football players and will have a positive impact on the level of development of the football game in the Republic of Turkey.

II. PURPOSE, OBJECTIVES AND METHODOLOGY OF THE RESEARCH

II.1. Purpose and objectives of the study

The aim of this study is to improve early football training in the Republic of Turkey and to implement a methodology to optimize the sports preparation of 12-13-year-old boys practicing the game of football.

Research objectives :

1. Study of the problem of early football training in the Republic of Turkey based on data from specialized literary sources.
2. Development of a methodology for application in the training process for 12-13-year-old adolescent football players.
3. Research on the effect of the developed methodology for training 12-13-year-old football players in the Republic of Turkey.
4. Revealing the factor structure and deriving the main factors of physical development and specific performance of 12-13-year-old football players from the Republic of Turkey.
5. Development of a regulatory framework for ongoing control over the level of physical development and specific performance of 12-13-year-old Turkish football players.

II.2. Research methodology

II 2.1. Organization of the study

This study was conducted in the period June 2021 - March 2024.

The subject of research is the process of training and improving the sports preparation of adolescent football players in the age group of 12-13 years.

Object The research focuses on the main signs of physical development, special physical fitness, specific technical and tactical skills and some psychological characteristics of football players from the indicated age group, as well as the changes occurring in them as a result of the application of an optimized methodology for early training.

population consists of 42 12-13-year-old boys from the Republic of Turkey, included in organized football activities at the Football Club "Aslan Güçükçe " (translated as " Lion Power") – Istanbul , of which 22 (randomly) were included in the so-called experimental group. The participants in the experimental group were exposed to the optimized training methodology for early training and improvement in football developed by us. The control group, consisting of 20 boys, conducted their activities according to the established

traditional, currently operating methodology for training adolescent 12-13-year-old football players from the Republic of Turkey.

II.2. 2. Research methods and indicators

To address the goal and objectives of the study, the following *research methods were used* :

1. *Theoretical study* of specialized literature .
2. *Anthropometry* - to reveal the morphofunctional status of football players, using 5 basic anthropometric characteristics (*table 1* - indicators from 1 to 5).

Table 1. List of morphofunctional features

No.	Indicators	Measure units	Measurement accuracy	Direction of increase
1.	<i>Height</i>	cm	0.5	+
2.	<i>Weight</i>	kg	0.100	+/-
3.	<i>Chest circumference - respiratory difference</i>	cm	0.5	+
4.	<i>Body Mass Index (BMI)</i>	kg /m ²	0.01	+/-
5.	<i>Quetelet Index</i>	g/cm	0.01	+/-

The measurements were performed with standard equipment and according to standard sports medicine methodologies. Under No. 4 and No. 5 are included, additionally calculated, body mass index (Body Mass Index - BMI) and Quetelet index , which give an idea of the degree of security of the studied football players and allow a comprehensive assessment of their physical development. Due to the young age of the studied football players, we have assumed 290 g/ cm as normal security.

3. *Sports and educational testing – to establish the level of development of the* signs that provide information about the special motor qualities and specific technical and tactical skills of young football players. The test battery includes a total of 15 tests, of which:

- for special physical fitness – 8 indicators (from No. 6 to No. 13) – *table 2* ;

Table 2. List of signs of *special physical fitness*

No.	Indicators	Measure units	Measurement accuracy	Direction of increase
6.	<i>Sprint 15 m</i>	s	0.01	-
7.	<i>Sprint 30 m</i>	s	0.01	-
8.	<i>Vertical jump from a place</i>	cm	0.5	+
9.	<i>Vertical rebound with boost</i>	cm	0.5	+

10.	Long jump	cm	1.0	+
11.	Shuttle Run	s	0.01	-
12.	20 rebounds	s	0.01	-
13.	Running 6 min.	m	0.5	+

■ for specific motor skills – 7 indicators (from No. 14 to No. 20) – **table 3**.

Table 3. List of signs characterizing *specific motor skills*

No.	Indicators	Measure units	Measurement accuracy	Direction of increase
14.	<i>Dribbling the ball (40 m)</i>	s	0.01	-
15.	<i>Illinois test - no ball</i>	s	0.01	-
16.	<i>Illinois test - stack</i>	s	0.01	-
17.	<i>Illinois test - index</i>	s	0.01	-
18.	<i>Juggling a ball</i>	number	1.0	+
19.	<i>Kicks at the goal - with a comfortable foot</i>	number	1.0	+
20.	<i>Kicks in the door - with an awkward foot</i>	number	1.0	+

5. Sports and educational experiment – To test the effectiveness of the optimized training program we developed for early football training of 12-13-year-old Turkish boys.

The sports-pedagogical experiment was conducted in the period February 2023 - July 2023 and lasted 5 months (20 weeks) with three classes per week.

A total of 42 boys participated in the experiment, included in organized football activities at FC "Aslan" "Gujo" (translated as "Lion Power") - Istanbul (Turkey), divided into two groups, as follows:

- experimental – 22 boys;
- control group - 20 boys.

The distribution of participants in the sports-pedagogical experiment into groups was carried out randomly.

During the working period, the experimental group was subjected to the training effects provided in our optimized training program for early training of adolescent football players, and the control group was subjected to the effects provided in the standard program used in the long-standing practice of football sports clubs in the Republic of Turkey.

The main differences in the content of the training process in the two groups are related to the number of specialized training sessions, as well as the methods used to develop special motor qualities and specific technical-tactical skills.

Characteristic of the activities of the experimental group is the application of specialized complexes, in the form of the circular-interval method, which include various

types of exercises for developing special physical qualities, for increasing the level of specific technical-tactical skills , or an appropriate combination of the two groups.

One of the main requirements when working with the experimental group is that each session ends with covering at least 2 practical standards, which the young football players must perform in a state of fatigue after the training game.

To verify the effectiveness of the experimental methodology we applied, both at the beginning and at the end of the observed period (twice), a sports-pedagogical testing was conducted. The test battery used includes 23 indicators that meet the requirements of sports statistics for validity, credibility, reliability, objectivity and standardization .

II.2.3. Mathematical and statistical methods for processing the results of the study

The results of the sports and pedagogical tests were processed using the standard programs SPSS 10 and Microsoft Excel. The following ***mathematical and statistical methods were applied :***

- ***alternative analysis;***
- ***variational analysis;***
- ***hypothesis testing;***
- ***factor analysis;***
- ***with a needle method for assessment ;***
- ***index method.***

III . ANALYSIS OF THE RESULTS

III.1 . Average values and variability of the studied characteristics at the beginning of the sports and pedagogical experiment

III.1. 1. Average values and variability of the signs of physical development at the beginning of the sports and pedagogical experiment

The physical development of boys is one of the important factors in football selection, which is largely related to their chances of reaching a high level of sportsmanship.

The results of the variational processing of the traits characterizing the physical development of the 12-13-year-old Turkish children we observed football players at the beginning of the experimental period are presented in **Table 2**.

Table 5. Average values and variability of the studied signs of physical development of 12-13-year-old football players from the experimental group at the beginning of the observed period

No.	Indicators \ Parameters	Mean	S	V	minutes	max
1.	<i>Height</i>	151.55	7.07	4.67	141.00	173.00
2.	<i>Weight</i>	41.09	6.37	15.50	31.00	59.00
3.	<i>Chest circumference - respiratory difference</i>	5.64	1.36	24.13	4.00	8.00
4.	<i>Body Mass Index (BMI)</i>	17.81	1.70	9.55	15.11	21.60
5.	<i>Quetelet Index</i>	270.22	32.02	11.85	218.31	341.04

The analysis of the table shows that at the start of the experiment the average height of the boys in the experimental group was 151.55 cm , and the average level - 41.09 kg . The body mass index (BMI) calculated on this basis is 17.81 kg / m ² , which allows us to consider that in general, according to the norms of the World Health Organization (WHO) for the studied age, the experimental group can be attributed to the zone of normal body weight.

However, a more in-depth study of the individual results shows that, alongside 72.73% of boys with normal body mass, there are also 27.27% of underweight children in this group (**Figure 3**).

The additionally calculated Quetelet index , which provides information about the amount of body mass that falls on 1 cm of the height of each of the boys, is here 270.22 g .

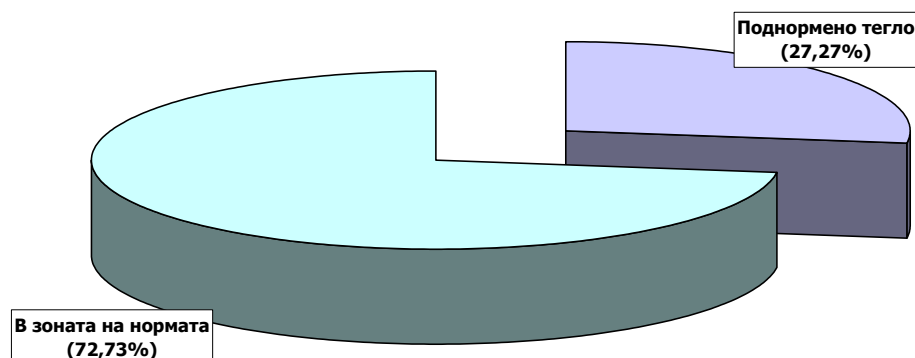


Figure 3. Relative shares of the *security levels of football players from the experimental group at the beginning of the observed period*

Important indirect information about the functional capacity of the chest is provided by indicator 3 (chest circumference – respiratory difference). As can be seen from **Table 5**, the average value of this indicator in the experimental group is 5.64 cm.

In a similar manner, the dissertation analyzed the results, providing information about the state of the studied morphofunctional features in the control group.

The comparative analysis of the levels of security of the football players at the beginning of the period shows that in both groups the relative shares of children with underweight are lower than those with normal body weight.

The positive fact is that in both groups there were no overweight boys, which is a good attestation for the selection of children for organized football activities carried out in our sports club.

As can be seen from the variation tables, however, the individual results are quite diverse, which, quite naturally, affects the homogeneity of the two groups and is expressed in the values of the coefficient of variation V. (**Figure 5**).

The analysis of the figure shows that both groups are homogeneous (uniform) in terms of height and BMI of the young football players included in them. Proof of this are the values of V, which for the 1st and 4th indicators are lower than 10%.

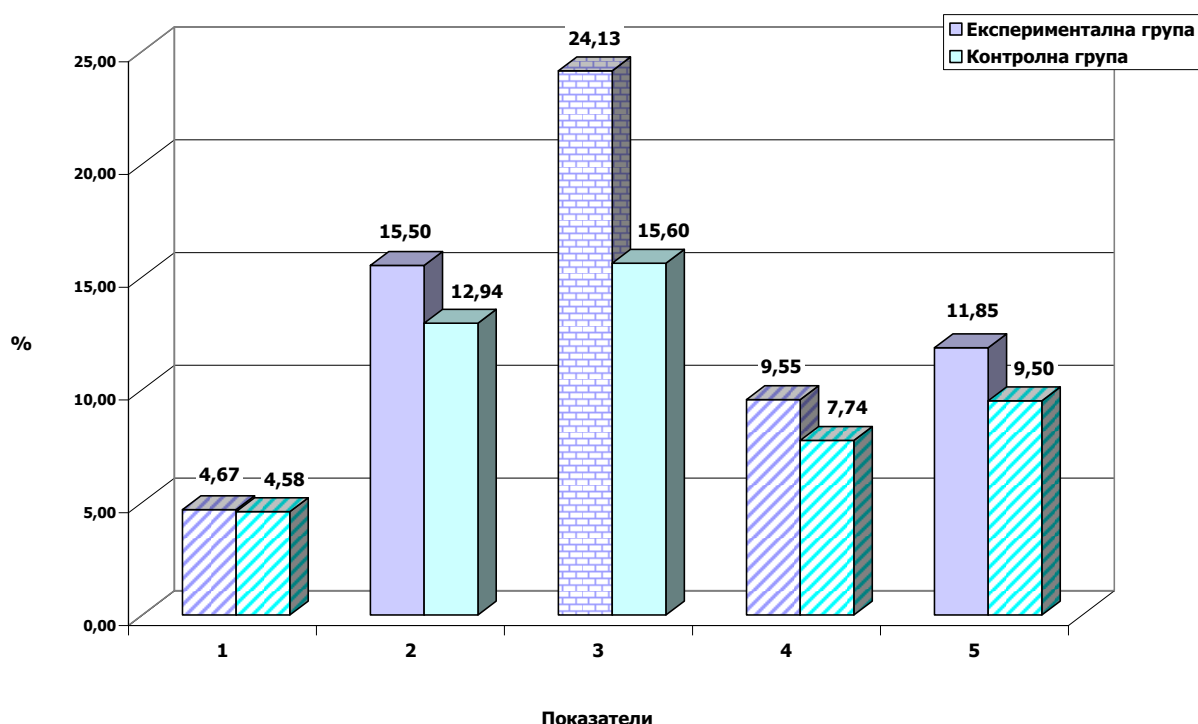


Figure 5. Dispersion of signs of physical development at the beginning of the observed period

A similar conclusion is valid for the Quetelet index in the boys from the control group (index 5 – $V_{5\text{ KG}} = 9.50\%$).

For the remaining indicators, the dispersion of individual results around the average levels for the respective group is between 10 and 30%. This, according to the norms of sports statistics, gives reason to consider that the respective indicators are relatively stable, and the groups - relatively homogeneous in terms of the characteristics for which these indicators provide information.

The above-mentioned differences between the average levels of the experimental and control groups in the signs characterizing the physical development of the boys included in them do not give grounds to draw serious conclusions before the reliability of the observed differences is verified. The verification of the null hypothesis, using the comparative Student's t-test, shows that at the beginning of the observed period, the control group had higher average values in all studied signs (**Figure 6**).

However, the analysis of the figure gives reason to conclude that, overall, the observed differences between the average levels of physical development indicators in the two groups are insignificant, which is evidence of correctness at the start of the experiment.

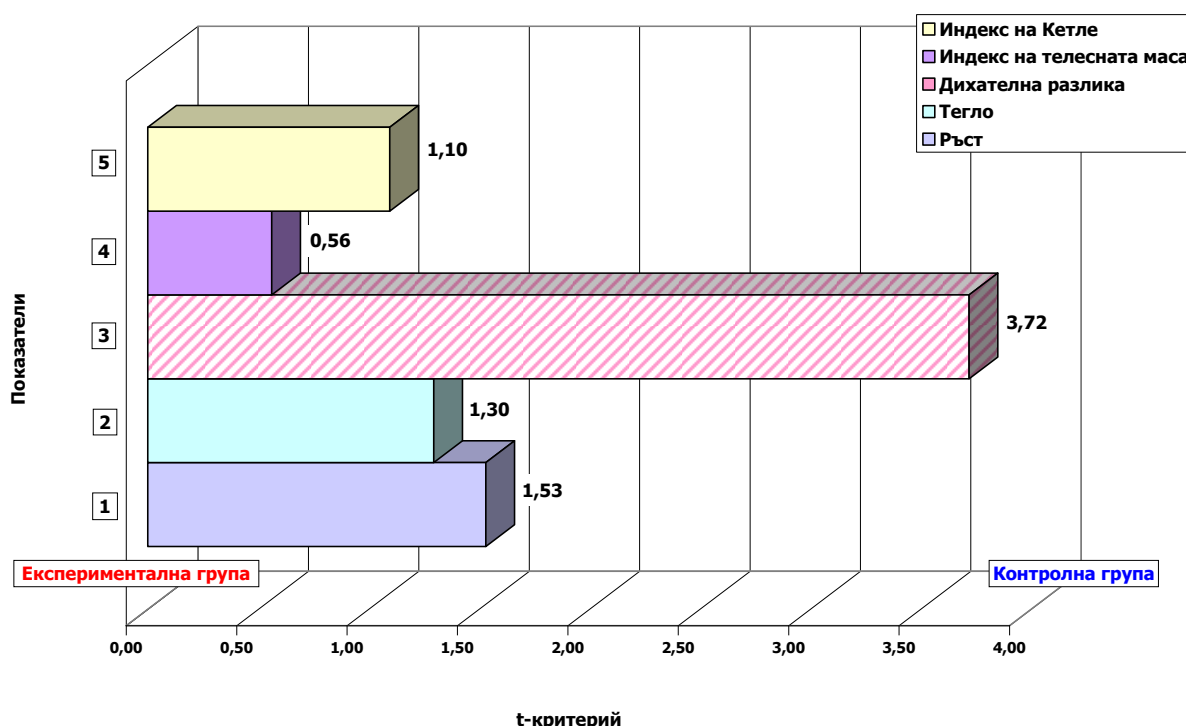


Figure 6. Significance of differences between the average levels of signs of physical development at the beginning of the observed period

This fact is supported by the values of the calculated t -criterion, which for 4 of the 5 indicators are lower than the critical one ($t_{cr} = 2.02$ - according to V. Gigova, 1999) and range between 0.56 and 1.53. The only exception is observed for indicator 3 (respiratory difference), where the t -criterion is higher than its critical value ($t_3 = 3.72$). This gives grounds, with a high guarantee probability ($P_t \geq 95\%$), with regard to this indicator, the null hypothesis should be rejected and the alternative hypothesis accepted as true, according to which at the beginning of the working period the control group, as a whole, significantly outperforms the experimental one in terms of the functional capacity of the chest of the adolescent football players included in it.

III.1.2 . Average values and variability of the signs of physical fitness at the beginning of the sports and pedagogical experiment

Physical training is one of the most important aspects of sports training. Purposeful work on the development of special motor qualities should be carried out at all stages of multi-year sports training. Of course, the applied training effects should be consistent with the so-called formative (sensitive) periods in the development of young football players.

As stated in the Research Methodology, in order to control the level of development of special motor qualities both at the beginning and at the end of the sports-pedagogical

experiment, testing was carried out with both groups (experimental and control) participating in it.

The results of the variational processing of the initial data of the boys from the experimental group are presented in **Table 8**.

Table 8 . Average values and variability of the studied signs of physical fitness of football players from the experimental group at the beginning of the sports and pedagogical experiment

No.	Indicators / Parameters	Mean	S	V	minutes	max
6.	<i>Sprint 15 m</i>	2.77	0.14	5.06	3.05	2.50
7.	<i>Sprint 30 m</i>	5.00	0.41	8.19	5.80	3.70
8.	<i>Vertical jump from a place</i>	29.63	5.64	19.04	18.50	39.05
9.	<i>Vertical rebound with boost</i>	31.03	6.83	22.01	18.30	44.50
10.	<i>Long jump</i>	163.91	22.97	24.64	130.00	210.00
11.	<i>Shuttle Run</i>	20.25	1.20	5.93	22.15	18.10
12.	<i>20 rebounds</i>	12.97	3.44	26.52	21.50	10.13
13.	<i>Running 6 min.</i>	1317.73	203.40	15.44	950.00	1620.00

The table shows that for 3 of the 8 physical fitness indicators included in the test battery, the V values are lower than 10%, which means that the corresponding indicators are stable, and the experimental group is homogeneous in terms of the indicators for which they carry information.

Therefore, with a high guarantee probability ($P_t \geq 95\%$), which satisfies the needs of sports practice, it can be stated that our experimental group at the beginning of the observed period is homogeneous in terms of sprint capabilities, linear speed and speed endurance of the young football players included in it. In terms of the other indicators, the group is relatively homogeneous.

The analysis gives reason to believe that the average values of the control group in all studied signs of physical fitness at the beginning of the observed period are lower than those of the experimental group.

A test of the null hypothesis (**Figure 10**) regarding the significance of the differences between the average levels of the physical fitness indicators of the two groups at the beginning of the observed period gives grounds, with a high guarantee probability, to accept the null hypothesis as true with respect to the majority of the indicators from this group. However, the same conclusion cannot be made regarding indicators 6 and 7. As can be seen from **Figure 10**, for them The t -test is higher than the critical value ($t_6 = 2.48$ and $t_7 = 3.79$).

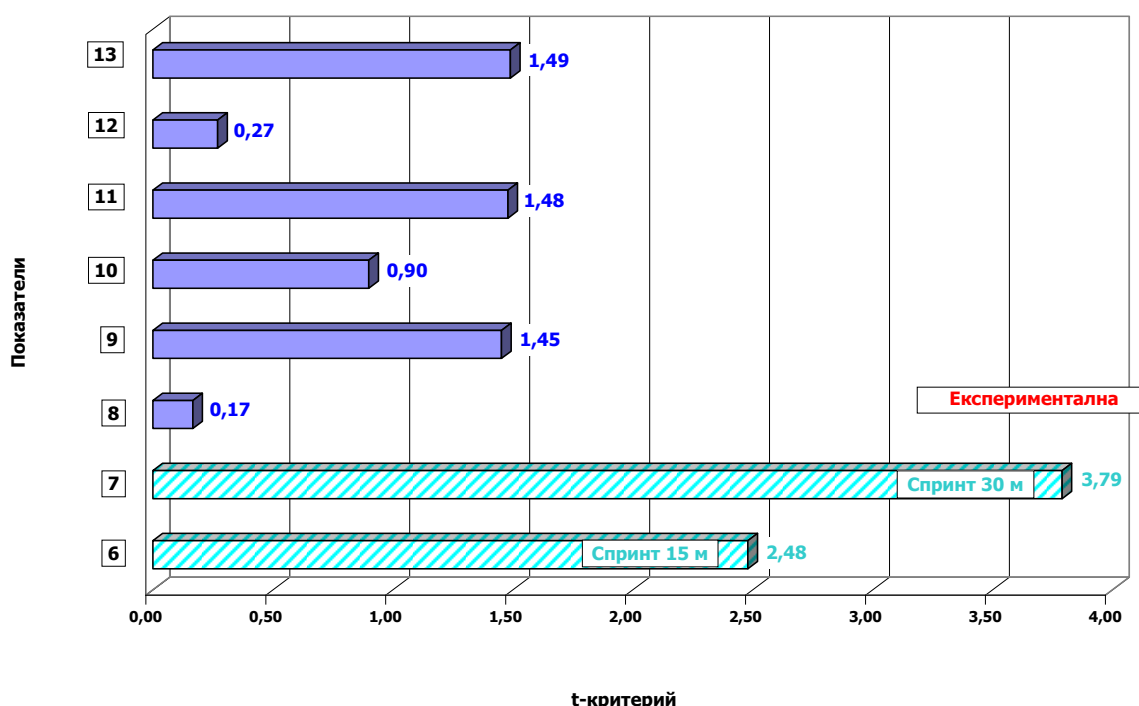


Figure 10. Significance of differences between the average levels of physical fitness indicators at the beginning of the observed period

This is evidence that at the beginning of the observed period, the boys from the experimental group showed a significantly higher level of development of speed abilities and linear speed.

Regardless of this fact, however, in general, it can be assumed that at the start of the experiment the two groups had a relatively equivalent level of physical fitness, which is an important condition for the correctness of the intended sports-pedagogical experiment.

III.1.3 . Average values and variability of the signs characterizing the technical and tactical skills of football players at the beginning of the sports and pedagogical experiment

The third group of studied signs reveals the level of development of the specific technical-tactical skills of the studied 12-13-year-old Turkish football players. As stated in the Research Methodology, information about them is provided by 7 specialized exercises included in the test battery developed by us.

The analysis of **Table 10** shows that the young football players from the experimental group have very similar achievements in indicators 15 and 16, which means that for them the ability to move along the route with the ball does not represent a particular difficulty.

Table 10 . Average values and variability of the studied signs of *technical and tactical preparedness* of football players from *the experimental* group at *the beginning* of the sports and pedagogical experiment

No.	Indicators / Parameters	Mean	S	V	minutes	max
14.	<i>Dribbling the ball (40 m)</i>	11.17	1.10	9.85	13.40	9.50
15.	<i>Illinois test - no ball</i>	18.53	0.90	4.86	20.18	17.50
16.	<i>Illinois test – with a ball</i>	25.00	2.06	8.24	30.15	21.10
17.	<i>Illinois test - index</i>	6.47	1.84	28.43	9.97	2.93
18.	<i>Juggling a ball</i>	31.82	11.43	35.92	20.00	54.00
19.	<i>Kicks in the door - with a comfortable</i>	6.55	0.74	11.31	5.00	8.00
20.	<i>Knock on the door - with an awkward</i>	2.95	0.84	28.43	2.00	5.00

At the same time, however, others have difficulty controlling the ball, which affects their results.

Juggling a ball is an extremely important technical and tactical skill for football players. As can be seen from **Table 10** , the results for indicator 18 range between 20 and 54, and the average achievement for the group is 31.82. This shows that a large part of the boys need to make serious efforts in the future to develop this skill.

Scoring a goal is the most important goal of the game of football. Moreover, success in their development is achieved by those who can shoot with both the comfortable and the uncomfortable foot. As can be seen from **Table 10** , quite naturally the accuracy of shots on goal is higher when shooting with the comfortable foot than with the uncomfortable one – 6.55 points (65.59%) and 2.95 points (29.50%) respectively.

The comparative analysis of the commented results with those of the football players from the control group shows that at the beginning of the experimental period the boys from the experimental group had an advantage in 5 out of 7 tests. At the same time, the control group showed a higher level in terms of the ability to dribble the ball and juggle the ball (indicators 17 and 18). In order to determine whether the observed differences are significant, the comparative method was applied Student 's t -test (**Figure 11**).

As is clear from the figure, for most indicators the values of the t -criterion are lower than the already mentioned critical value 2.02. This gives grounds, with a high guarantee probability ($P_t \geq 95\%$) , for these indicators to accept the null hypothesis as true, i.e. to claim that at the beginning of the working period there are no significant differences between the two groups in terms of:

- the ability to move around the field with a change of direction both without and with the ball and
- the skill of juggling the ball.

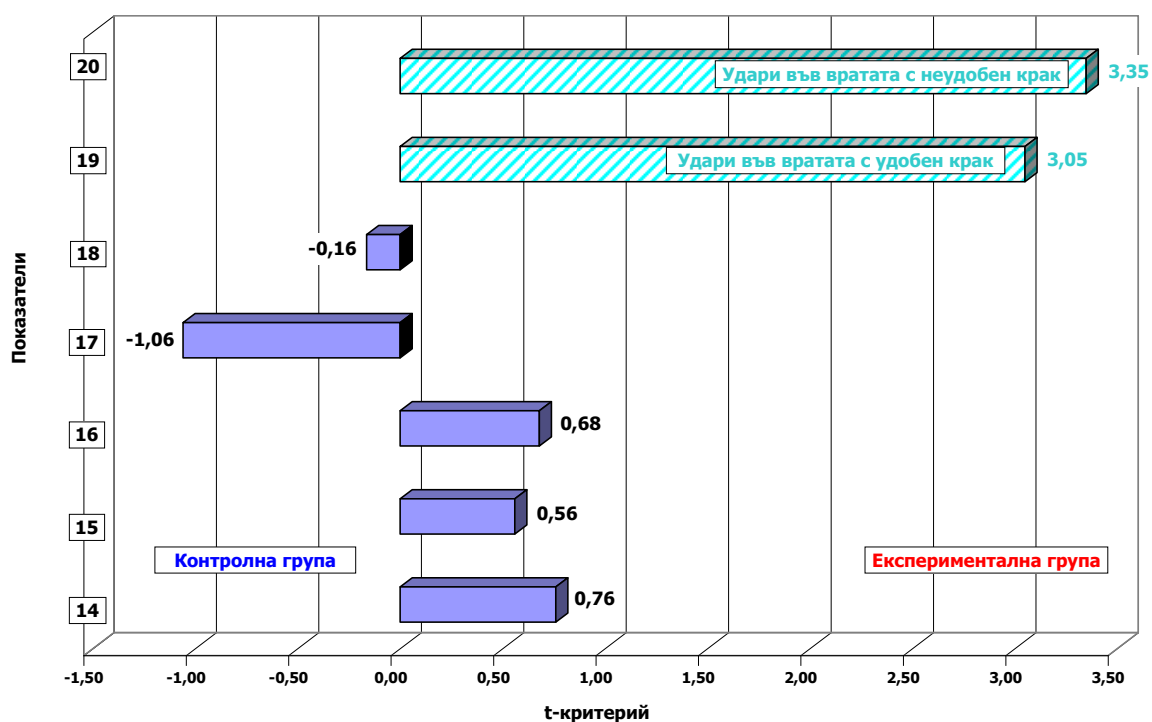


Figure 11. Significance of differences between the average levels of the signs characterizing technical-tactical skills at the beginning of the observed period

At the same time, the values of t for the last two indicators are higher than the critical ones ($t_{19} = 3.05$ and $t_{20} = 3.35$). This is evidence of significantly greater accuracy in goal shots by boys from the experimental group with both the comfortable and uncomfortable foot.

The interest of the study is to establish the degree of homogeneity of the two groups in terms of the characteristics characterizing the technical and tactical skills of young football players at the beginning of the experimental period.

The analysis shows that the experimental group is homogeneous in terms of the ability of the football players to move around the field at high speed, without the ball and with dribbling. To this group, with some conditionality, the accuracy of shots on goal with a comfortable foot can also be attributed. Inhomogeneity is observed in terms of the ability of the boys from the experimental group to juggle with a ball.

It is necessary to note here that from a pedagogical point of view, the high variability means that during the future training process when working on developing (with us) the skills of juggling with a ball and speed dribbling with a change of direction, as well as the accuracy of shots on goal with the uncomfortable foot, the individual approach should be widely used. This will increase the effectiveness of the efforts made, both by the competitors and by the coaches.

III.1.4 . Average values and variability of the indicators characterizing the measured psychological abilities at the beginning of the sports - pedagogical experiment

The third group of indicators included in the attached test battery provide information about the signs characterizing some basic psychological abilities that play an important role in building a successful football player (**Table 12**) .

Table 12 . Average values and variability of the signs characterizing the psychological abilities of football players from the experimental group at the beginning of the sports-pedagogical experiment

No.	Indicators / Parameters	Mean	S	V	minutes	max
21 .	<i>Time perception</i>	4.56	0.44	9.66	1.20	0.02
22 .	<i>Tapping feet</i>	13.66	1.45	10.61	16.33	11.50
23 .	<i>Schulte table</i>	57.60	12, 12	21.04	88.97	39.03

The analysis of the table shows that the coefficients of variation V for indicators 21 and 22 are low enough to consider that the experimental group is homogeneous in terms of the level of development of the young football players included in it, the perception of time and the speed of cyclic movements of the lower limbs.

It is also seen that the differences between the individual boys in this group in terms of concentration, distribution and flexibility of attention are slightly greater, which places it in the zone of relative homogeneity in terms of this important psychological quality for football.

A closer look at the group's results shows that at the beginning of the period, the average time at which the subjects stopped the stopwatch was 4.56 s, i.e. 0.44 s away from the desired 5.00 s, with the minimum deviation in the positive direction being 0.02 s , and the maximum in the negative direction being 1.20 s .

When analyzing **Figure 15**, it becomes clear that the lowest (13.64%) is the relative share of football players in whom deviations from the norm (5 s) are in a positive direction, i.e. their results are higher than 5.00 s . The highest (45.45%) is the relative share of football players whose individual results are lower than the average for the entire experimental group level (4.56 s). About 41% are those whose results are higher than the average, but lower than the desired 5 s .

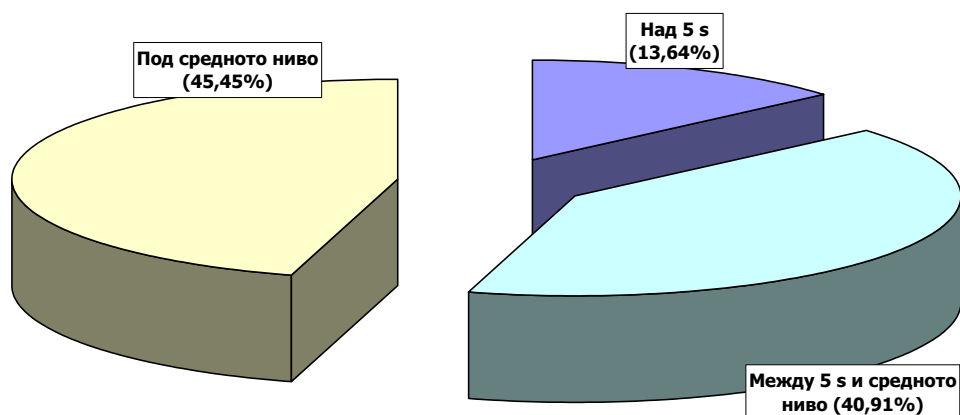


Figure 15. Relative shares of deviations from the norm (5 s) in the study of the perception of time of football players from the experimental group at the beginning of the observed period

Of interest for the study are the results of indicator 23 (Schulte table). As can be seen from **table 12** , at the beginning of the observed period, the football players from the experimental group managed to complete the test in an average of 57.60 s . At the same time, it is clear from **figure 16** that only 9.09% of them can be considered to have a high level of development of the studied attention parameters.

The positive fact is that the relative share of those who showed results within the norm is quite high, while boys with a low level of concentration , distribution and flexibility of attention are only 18.18%.

In a similar way, the dissertation also analyzed the input (initial) results of the football players from the control group.

Based on the hypothesis testing, with full justification, with a high degree of statistical reliability ($P_t \geq 95\%$), it can be concluded that at the beginning of the observed period there were no significant differences between the average levels of development in the two groups (experimental and control) of the signs characterizing the psychological characteristics of the studied young football players (**Figure 20**) .

This is an important condition for correctness at the beginning of the organized sports-pedagogical experiment.

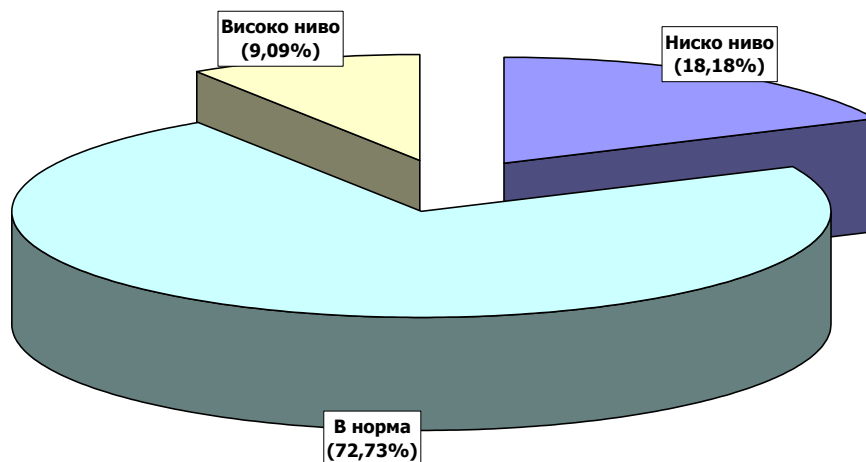


Figure 16. Relative shares of deviations from the norm in the study of the attention parameters of football players from **the experimental** group at **the beginning** of the observed period

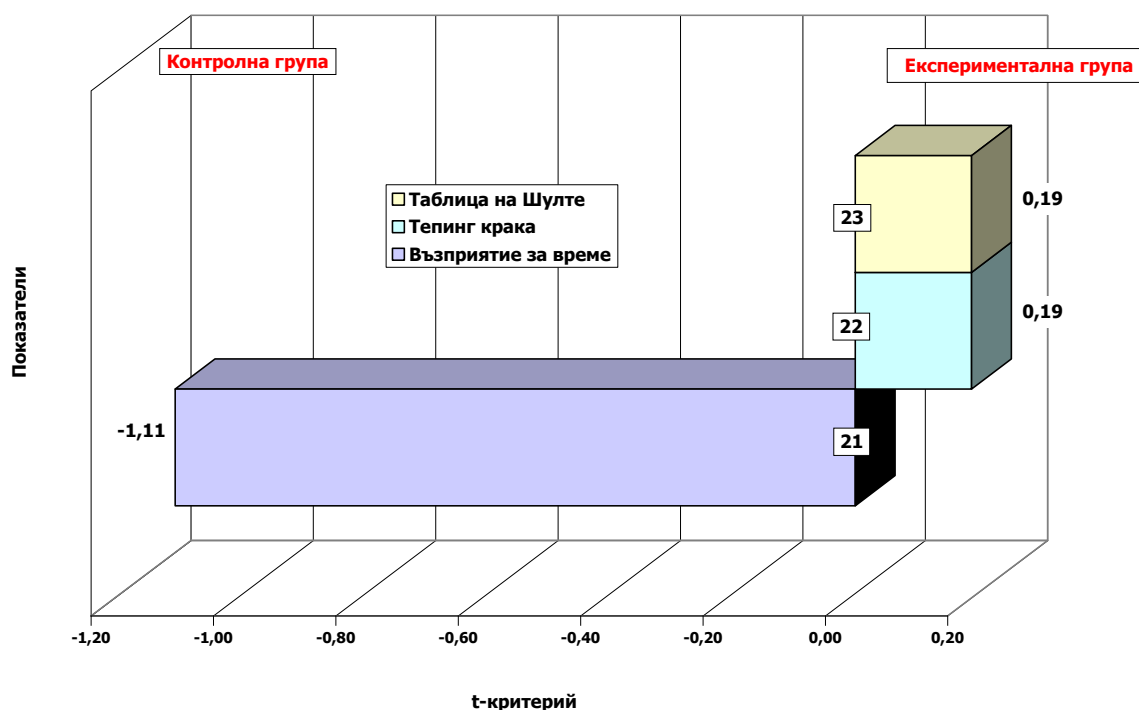


Figure 20. Significance of differences between the average levels of the signs characterizing **the psychological characteristics** of football players at **the beginning** of the observed period

III.2 . Verification of the effectiveness of the optimized methodology applied during the sports and pedagogical experiment

III.2.1 . Significance of the observed changes in the level of physical development after applying the experimental methodology

To address the goal and objectives of the study, at the end of the sports and pedagogical experiment, data were collected on both the physical development and other signs of the specific working capacity of the 12-13-year-old Turkish football players we studied.

presented in **Table 14** from the analysis of variation of the collected information on the signs of physical development show that at the end of the observed period the average height of the boys from the experimental group group is 157.45 cm , and the average weight – 45.590 kg . The calculated body mass index is within the norm for the studied age group ($BMI_{end} = 18.34 \text{ kg / m}^2$) .

Table 14. Average values and variability of the studied signs of physical development of 12-13-year-old football players from the experimental group at the end of the observed period

No.	Indicators \ Parameters	Mean	S	V	minutes	max
1.	<i>Height</i>	157.45	6.98	4.43	147.00	164.00
2.	<i>Weight</i>	45.59	5.93	13.01	37.00	63.00
3.	<i>Chest circumference - respiratory difference</i>	8.91	1.45	16.27	7.00	12.00
4.	<i>Body Mass Index (BMI)</i>	18.34	1.48	8.07	15.82	21.50
5.	<i>Quetelet Index</i>	288.86	27.98	9.69	244.90	351.96

The comparative analysis of the levels of security of the football players from the experimental group shows that the positive changes in the height and weight indicators did not have a significant impact on the security index . At the end of the period, the initial levels were maintained: 27.27% children with underweight and 72.73% - in the normal range.

The verification of the reliability of the observed changes in the average levels of morphological characteristics (**Figure 22**) shows that during the experiment, significant positive changes in the indicators of physical development occurred in the boys from the experimental group. Evidence of this is the values of the calculated comparative Student's t-test, which, in general, are higher than the critical one.

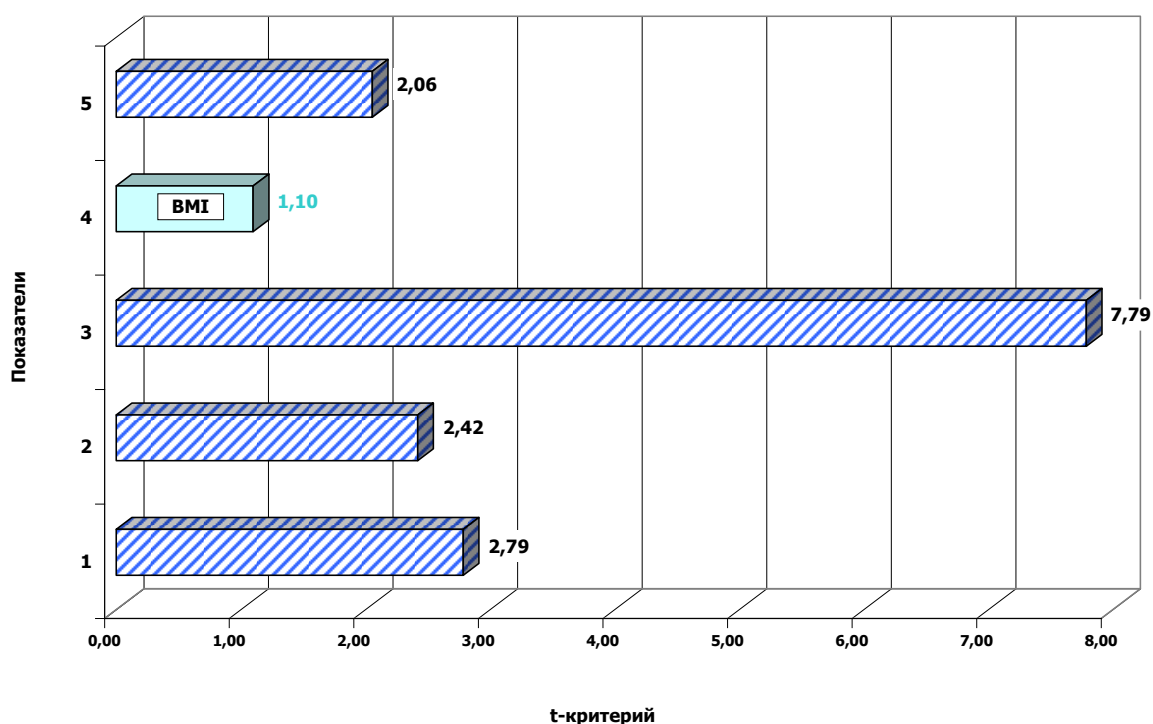


Figure 22. Significance of differences between mean levels of morphological traits in the football players from the experimental group

Tracking the changes in the homogeneity of this group gives reason to believe that at the end of the period, a stabilization of all studied morphological features occurred and, therefore, an increase in the homogeneity of the experimental group in terms of the information they carry.

The results of the variational processing of the data from the second (final) sports-pedagogical testing of the boys from the control group show that positive changes in the level of morphological signs are also observed in this group.

III.2 . 2. Significance of the observed changes in the level of physical fitness after applying the experimental methodology

The analysis of **Table 16** shows that, overall, under the influence of the applied specialized impact with the means provided for in the new training methodology, positive changes occurred in the level of all studied signs of physical fitness in the boys from the EG.

Testing the null hypothesis (**Figure 29**), with a high guarantee probability, proves that the significant positive changes that occurred relate to:

- speed endurance;
- sprinting capabilities at short distances;

- the explosive power of the lower limbs in both vertical and horizontal muscle efforts and
- jumping endurance.

Table 16. Average values and variability of the studied signs of *physical fitness* of football players from *the experimental group* group at *the end* of the sports-pedagogical experiment

No.	Indicators / Parameters	Mean	S	V	minutes	max
6.	<i>Sprint 15 m</i>	2.53	0.1 9	7.36	2.93	2.15
7.	<i>Sprint 30 m</i>	4.87	0.40	8.10	5.75	4.40
8.	<i>Vertical jump from a place</i>	36.32	5.56	15.31	23.05	47.04
9.	<i>Vertical rebound with boost</i>	36.95	7.97	21.57	20.96	53.06
10.	<i>Long jump</i>	186.30	17.22	9.24	151	217
11.	<i>Shuttle Run</i>	18.34	0.9 5	5.17	20.30	17.04
12.	<i>20 rebounds</i>	10.92	1.36	12.47	12.80	8.50
13.	<i>Running 6 min.</i>	1316.70	253.99	19.29	750	1810

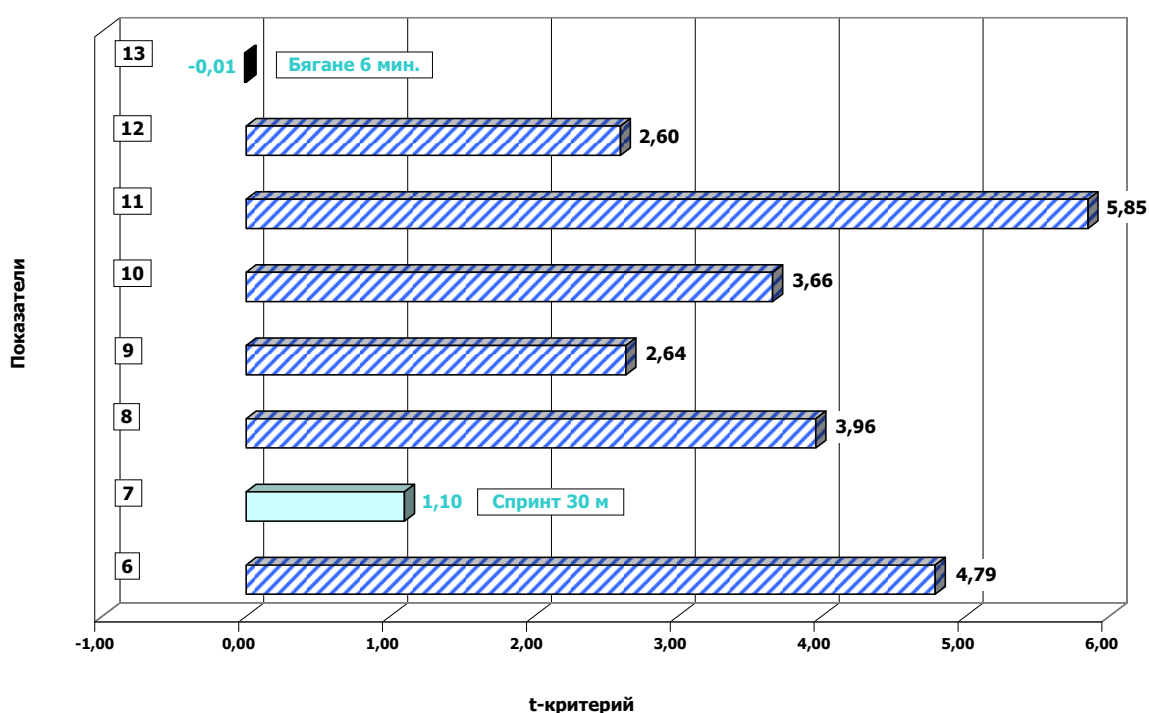


Figure 29. Significance of differences between the average levels of *physical fitness indicators* in football players from *the experimental group*

However, with regard to linear speed, the null hypothesis can reasonably be accepted as true, and the observed changes in the average level of indicator 7 (30 m sprint) can be explained by random causes.

A good visual representation of the changes in the homogeneity of the experimental group in terms of signs of physical fitness is given in **Figure 30**.

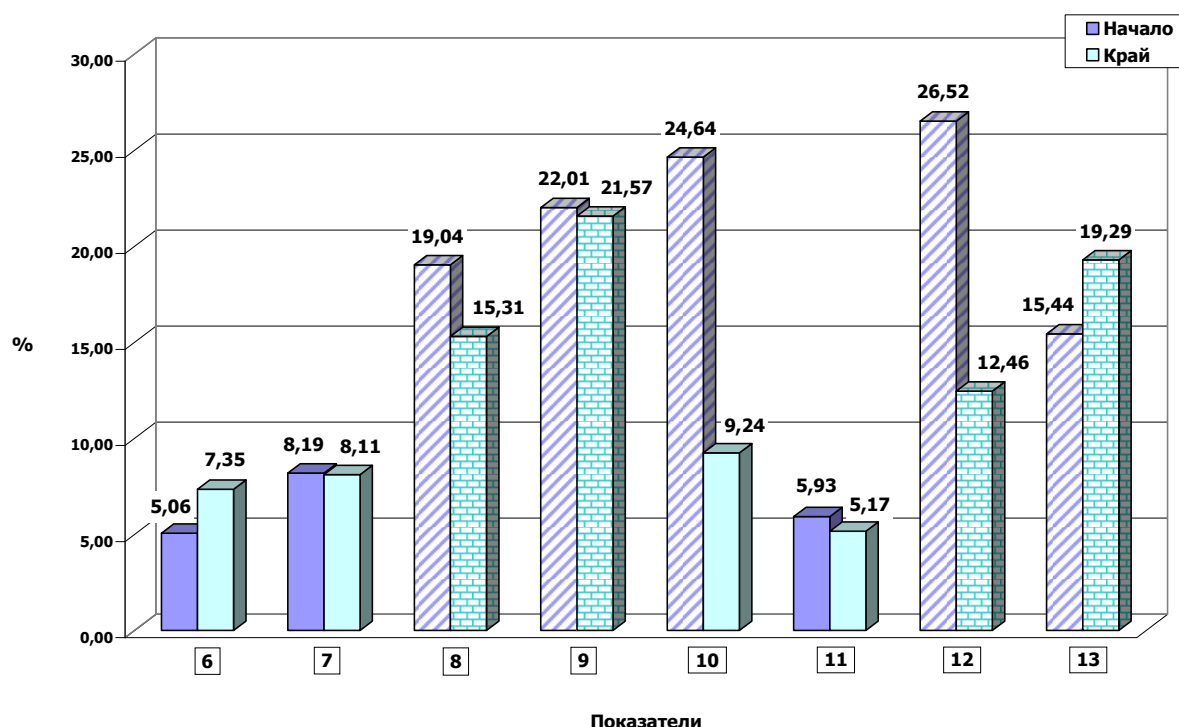


Figure 30. Changes in the homogeneity of the experimental group for the duration of the experiment in relation to the signs of physical fitness

The comparative analysis shows that positive changes occurred in the control group during the experiment, which were associated with improved endurance (speed and jumping), sprinting capabilities, and explosive strength of the lower limbs during vertical muscle efforts from a standing position.

For the needs of the study, a check was also carried out on the significance of the differences between the average levels of the two studied populations, reported at the end of the experiment (**Figure 34**).

The analysis of the figure shows that at the end of the period of application of training effects using the experimental methodology, the experimental group significantly outperformed the control group in terms of the explosive strength of the lower limbs in both horizontal and vertical muscle efforts, the linear speed and speed capabilities of the boys included in it.

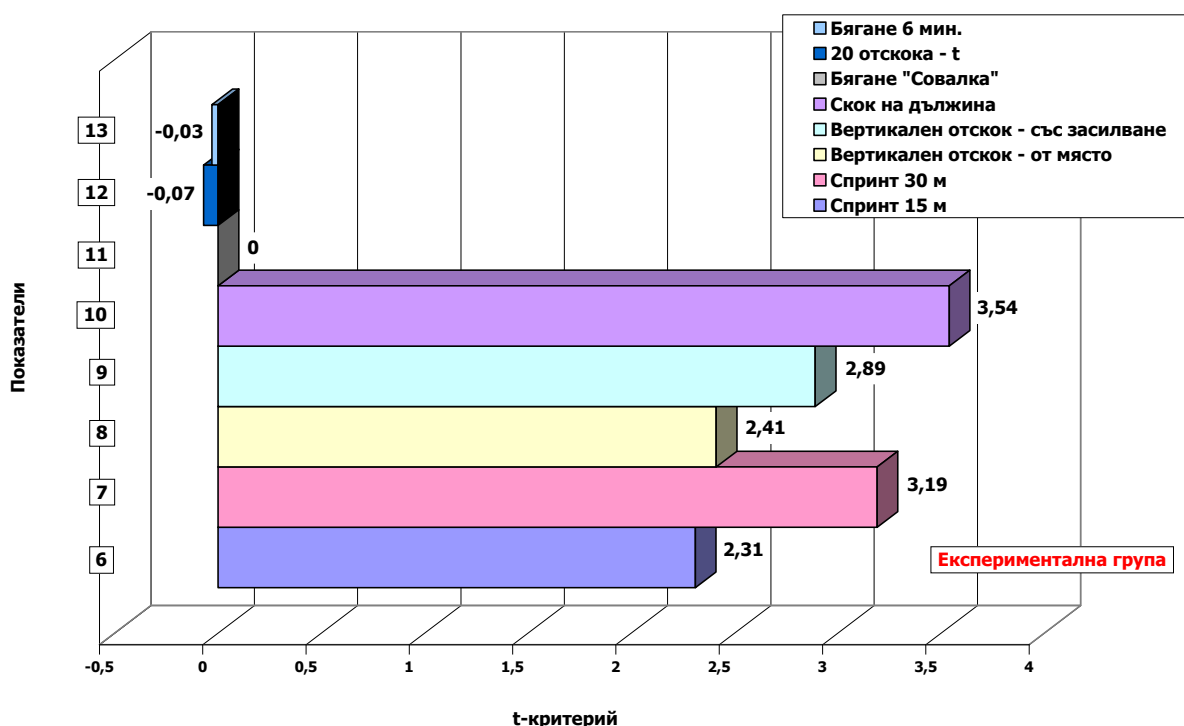


Figure 3 4. Significance of differences between the average levels of *physical fitness indicators* at the *end* of the observed period

In terms of jumping and general endurance (indicators 12 and 13), the boys from the control group have an advantage, but the differences are too small. However, we believe that before it is proposed for implementation in wide practice, the experimental methodology should be adjusted in the direction of increasing the volume of training loads and including new means for developing the above-mentioned motor qualities.

III.2.3 Significance of the observed changes in the level of technical and tactical preparedness after applying the experimental methodology

One of the important tasks of the applied training methodology is aimed at developing the specific technical and tactical preparedness of young football players.

The analysis of **Table 18** shows that under the influence of the applied training effects included in the optimized work methodology, positive changes occurred in almost all signs of technical and tactical readiness during the experiment. However, as is clear from **Figure 36**, these changes are significant only in terms of the specific skills of the young players from the experimental group, which allow them to more effectively:

Table 18. Medium values and variability of the studied signs of *technical - tactical preparedness* of the football players from *the experimental* group at *the end* of the sports and pedagogical experiment

No.	Indicators / Parameters	Mean	S	V	minutes	max
14.	<i>Dribbling the ball (40 m)</i>	9.71	1.06	10.92	12.50	8.10
15.	<i>Illinois test - no ball</i>	16.95	0.91	5.38	18.65	14.76
16.	<i>Illinois test – with ball</i>	23.67	2.04	8.62	28.92	19.34
17.	<i>Illinois test - index</i>	6.72	2.03	30.22	10.89	3.11
18.	<i>Juggling a ball</i>	37.55	11.28	30.04	24.00	59.00
19.	<i>Kicks in the door - with a comfortable</i>	7.59	0.67	8.83	6.00	9.00
20.	<i>Knock on the door - with an awkward</i>	4.36	0.79	18.10	3.00	6.00

- to move around the field without the ball, both in a straight line and with changes in direction and speed;
- to take shots at goal with both the dominant and non-dominant foot and
- to carry the ball at high speed over short distances.

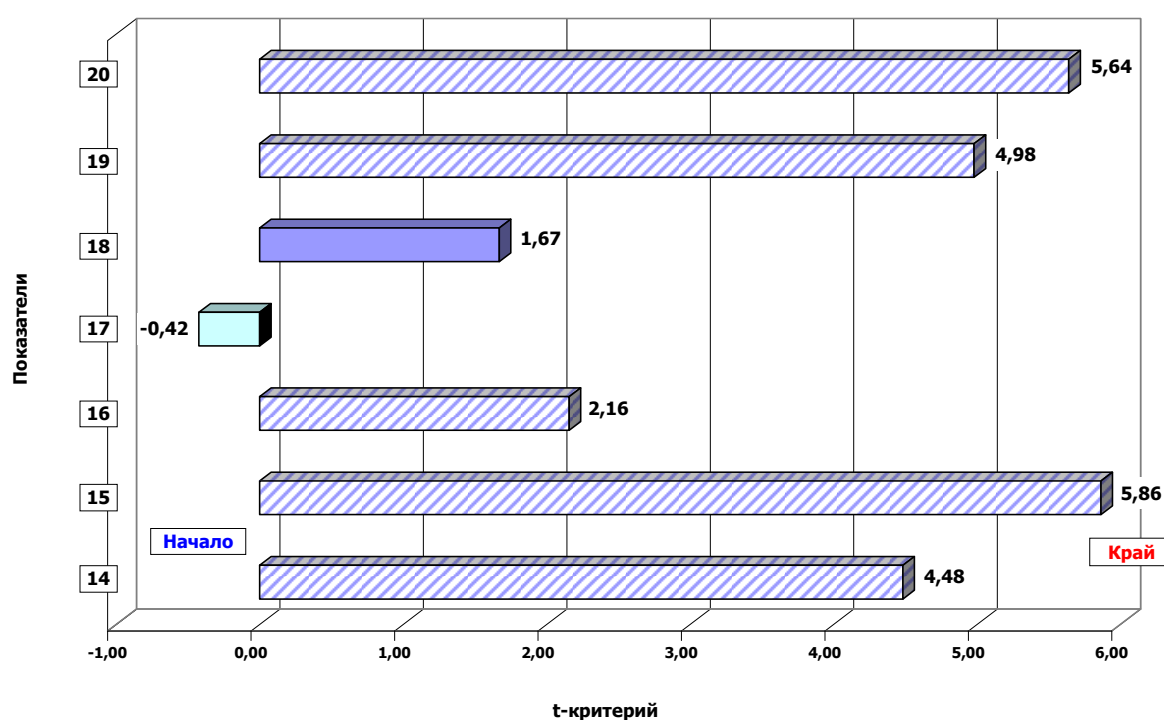


Figure 36. Significance of the differences between the average levels of the signs of *technical and tactical preparedness* in football players from *the experimental* group

Proof of this finding are the values of the comparative t -criterion, which for 5 of the signs of technical and tactical preparedness observed by us are higher than $t_{cr} . (2.02)$.

At the same time, for indicators 17 and 18, the values of t are lower than the critical one. This gives grounds, with a high guarantee probability, to accept the null hypothesis

regarding the boys' ability to move around the field with dribbling while continuously changing direction and leading foot. A similar dependence is also observed regarding the ability to juggle the ball. This requires adjustments to be made to the approved methodology, aimed at increasing the volume and intensity of the specified specific skills.

Regarding the variability of the studied traits, it is necessary to note that, overall, the experimental group maintained its homogeneity within the framework reported at the beginning of the period.

The analysis of the results shows that in the control group, positive changes occurred in all studied signs of technical and tactical preparedness during the experiment.

The null hypothesis test gives grounds with a high guarantee probability to consider that in 5 of the 7 indicators included in this group the observed improvements are insignificant and can be explained by random causes. Regarding the effectiveness of shots on goal with both the comfortable and uncomfortable foot for the competitors, the alternative hypothesis is valid – the changes that occurred during the experiment are significant.

To address the goal and objectives of the study, at the end of the observed period, a comparative analysis of the results of the two groups (experimental and control) was carried out on the signs characterizing the level of technical and tactical skills of young football players (**Figure 41**).

The analysis of the figure shows that at the end of the period, for 5 of the indicators included in this characteristic group, the advantage is in favor of the boys from the experimental group.

It is also noted that for 4 of the indicators, with a high guarantee probability ($P_t \geq 95\%$), the alternative hypothesis can be accepted as true, according to which at the end of the period, the football players from the experimental group significantly outperform those from the control group in terms of:

- the ability to move around the field at high speed with a change of direction without the ball ($t_{15} = 5.84$);
- the ability to quickly dribble the ball over short distances ($t_{14} = 4.39$);
- the effectiveness of shots on goal with both the unfavourable and favourable foot ($t_{20} = 4.05$ and $t_{19} = 3.76$).

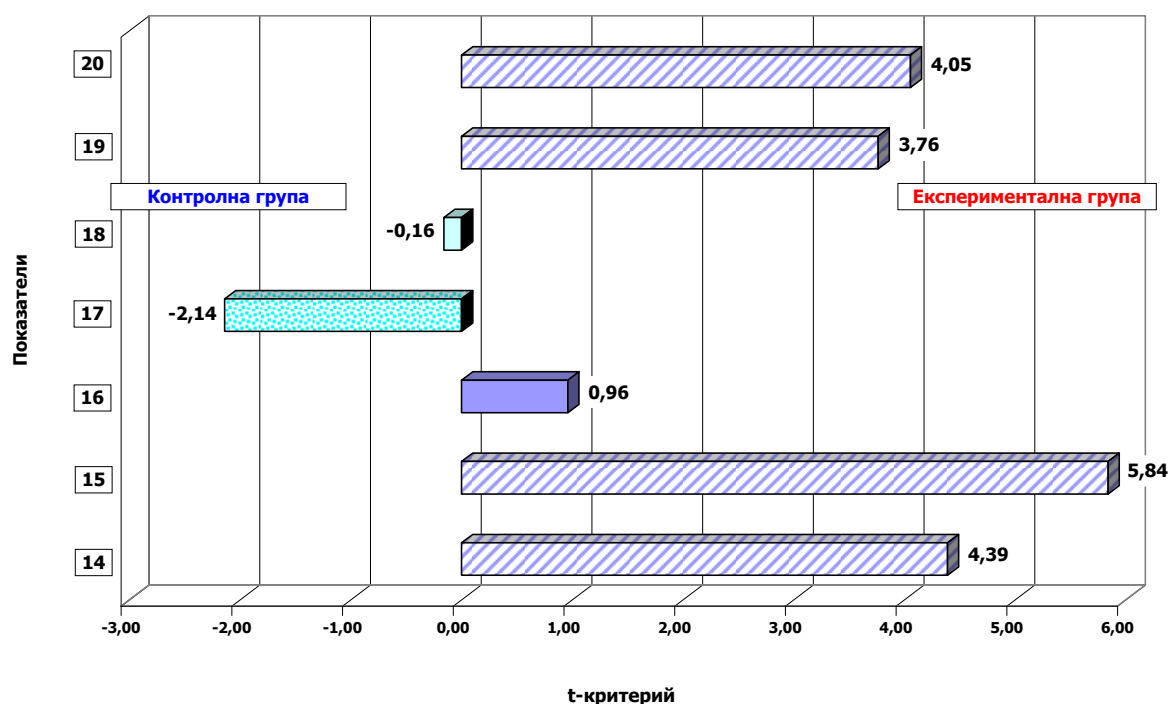


Figure 41. Significance of differences between the average levels of signs of *technical and tactical readiness* at the end of the observed period

However, regarding the important skill of dribbling the ball at speed and with a change of direction (indicator 16), the advantage over the boys from the control group can be explained by random reasons.

The finding is also supported by the result of indicator 17 (Illinois test - index). This gives reason to believe that the better results of the football players from the experimental group in moving around the field with the ball are due not to their better abilities to skillfully lead the ball, but to the higher level of development of their speed. And of course, this must be taken into account and corrected in future work with them.

An important emphasis for increasing the sports fitness of the boys from the experimental group is also increasing the relative share of juggling exercises.

III.2.4 . Significance of the observed changes in the level of psychological abilities after applying the experimental methodology

The results of the variational processing of the data from the final testing regarding the signs characterizing the psychological qualities of young football players are presented in **Table 20**.

Table 20. Average values and variability of the traits characterizing *psychological qualities* of the football players from *the experimental group* at *the end of the sports-pedagogical experiment*

No.	Indicators / Parameters	Mean	S	V	minutes	max
21 .	<i>Time perception</i>	4.74	0.27	5.70	-0.68	0.01
22 .	<i>Tapping feet</i>	12.50	1.25	10.00	15.34	10.45
23 .	<i>Schulte table</i>	53.98	11.35	21.03	80.43	41.34

It shows that the educational and training activities conducted during the observed period also had an impact on the psychological characteristics of the boys in the experimental group.

The first thing that is striking is the optimization towards improving the sense of time. As it becomes clear, at the end of the period the average deviation from the target (5 s) has decreased from 0.44 to 0.26 s . However, the result obtained is not good enough to consider the change as significant - the calculated t -criterion for indicator 21 (sense of time) is only 1.66 (*figure 42*).

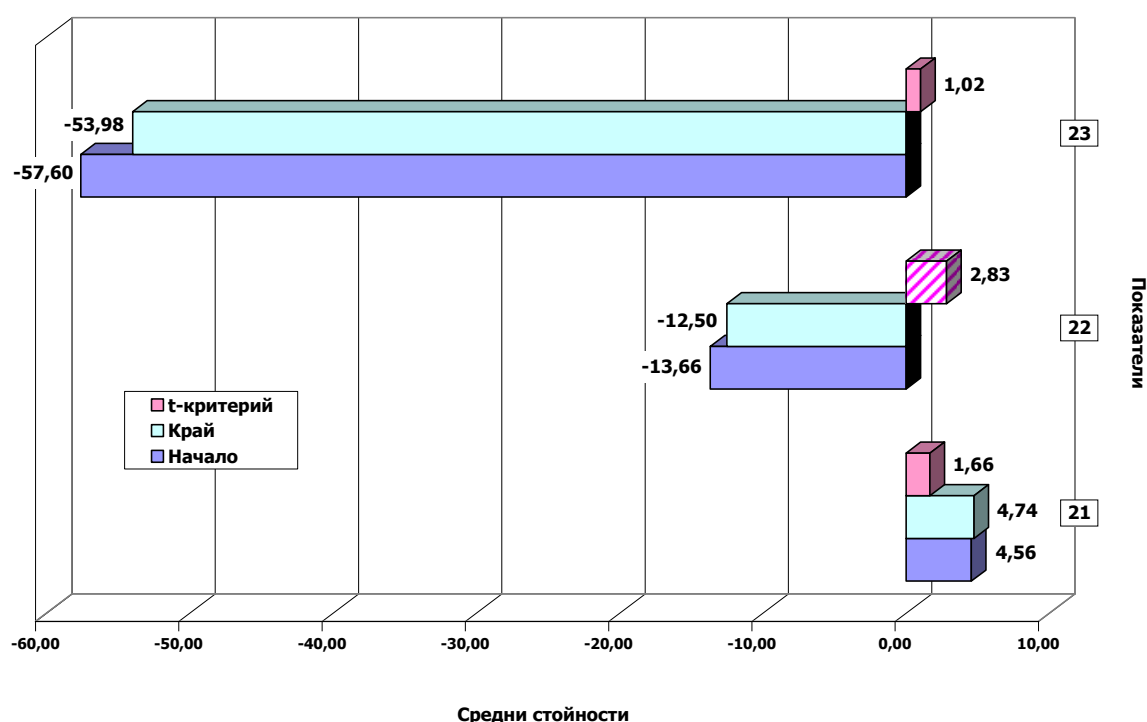


Figure 42. Comparative analysis and significance of the differences between the average levels of the signs characterizing *the mental qualities* of the boys from *the experimental group* at *the end of the observed period*

This means that the observed change could be explained by chance causes.

A similar relationship is observed for the last (23rd) indicator. The faster (by 4 s) performance of the test (Schulte table) is not sufficient to consider the change significant. Therefore, the null hypothesis regarding the attention parameters can be reasonably confirmed.

Completely different for the results at the 22nd indicator (tapping test). As can be seen from **Figure 42**, the change in the arithmetic mean value by 1.08 s allows here to reject the null hypothesis and accept the alternative one as true. According to it, under the influence of the training tools applied during the sports and pedagogical experiment conducted by us, significant positive changes occurred in the frequency of movements of the lower limbs in the young football players from the experimental group included in it. Confirmation of this finding is the value of the comparative t - criterion ($t_{22} = 2.83$).

Very close to the results of the experimental group are those of the control group (**Table 21**).

Table 21 . Average values and variability of the traits characterizing psychological qualities of the football players from the control group at the end of the sports-pedagogical experiment

No.	Indicators / Parameters	Mean	S	V	minutes	max
21 .	<i>Time perception</i>	4.84	0.3	6.20	-0.62	0.05
22 .	<i>Tapping feet</i>	12.94	0.81	6.26	14.33	11.16
23 .	<i>Schulte table</i>	55.63	9.56	17.18	73.97	41.56

The examination of the significance of the differences between the average levels of the signs characterizing the psychological qualities of the studied football players from the two groups at the end of the observed period (**Figure 44**) shows that the observed differences are insignificant from a statistical point of view and can be explained by random causes.

In conclusion, regardless of the specifics of the studied age, we believe that the lack of qualitative changes in the parameters of attention and orientation in time of young football players can be considered as a weakness of the training in Turkish teams for adolescents. It is necessary to take adequate measures from this age to develop psychological qualities necessary for athletes to achieve high sportsmanship in the chosen sport.

This, in our opinion, will increase the overall level of preparedness of Turkey's future football hopes.

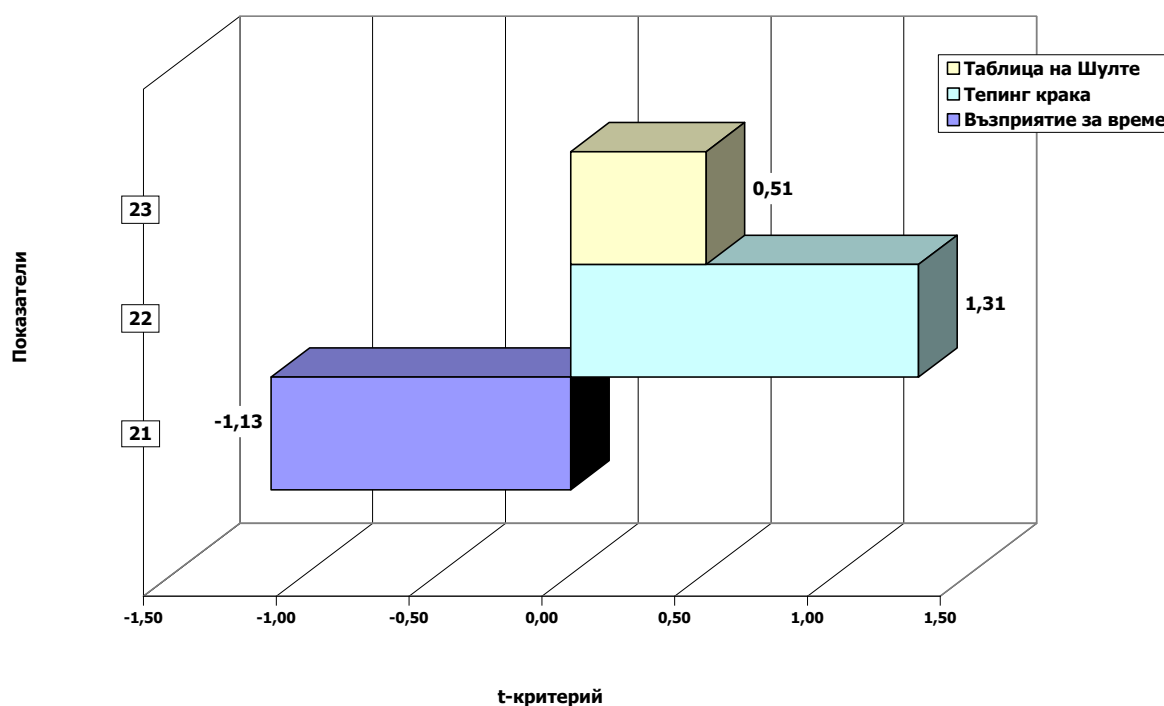


Figure 44. Significance of the differences between the average levels of the signs characterizing *the mental qualities* of the studied football players at *the end* of the observed period

III.3 . Factor structure of physical development and specific work capacity of 12-13-year-old Turkish football players

The processing of the results of the sports-pedagogical research conducted both at the beginning and at the end of the experimental period, with the help of the so-called factor analysis, allowed the factor structures to be revealed and the main factors of the physical development and specific working capacity of 12-13-year-old Turkish football players to be identified.

The results of the factor analysis of the original data (input level) are presented in **Table 22** .

As can be seen from it, at the beginning of the period the factor structure was made up of 6 main factors, which explained a high relative share (78.6%) of the initial variance of the studied phenomenon (physical development and specific work capacity). A clear idea of the relative shares of each of the derived factors is given in **Figure 45** .

The figure shows that the unexplained variance at the beginning of the period is 21.40%. This is a sign and proof of the quality of the test battery we applied.

Table 22. Factor structure of physical development and specific working capacity of 12-13 year old Turkish football players at the beginning of the experimental period

No.	I	II	III	IV	V	VI	h ²	1 - h ²
1 .	-0.187	0.784	0.137	0.074	-0.188	0.187	0.744	0.256
2 .	0.009	0.986	0.008	0.020	-0.014	0.116	0.987	0.013
3 .	0.192	0.567	-0.176	-0.241	-0.569	-0.046	0.773	0.227
4 .	0.279	0.776	-0.191	-0.049	0.178	-0.050	0.754	0.246
5 .	0.127	0.963	-0.080	-0.008	0.064	0.053	0.958	0.042
6 .	0.877	0.071	-0.020	-0.261	-0.063	-0.032	0.848	0.152
7 .	0.583	-0.027	0.007	-0.475	-0.333	0.217	0.725	0.275
8 .	-0.884	-0.034	0.038	-0.009	0.247	-0.079	0.851	0.149
9 .	-0.790	-0.319	0.189	-0.029	0.191	-0.089	0.807	0.193
10 .	-0.910	0.169	-0.196	0.111	0.030	0.042	0.909	0.091
11 .	0.905	0.040	0.225	-0.107	0.050	0.150	0.908	0.092
12 .	0.540	-0.121	0.523	-0.249	0.091	0.093	0.658	0.342
13 .	0.026	-0.285	-0.468	0.235	0.444	-0.323	0.658	0.342
14 .	0.488	0.326	0.349	0.023	-0.390	-0.224	0.669	0.331
15 .	0.833	0.186	0.018	-0.281	0.000	-0.031	0.809	0.191
16 .	0.411	0.009	0.809	-0.191	0.006	-0.177	0.892	0.108
17 .	-0.085	-0.113	0.902	-0.031	0.006	-0.180	0.867	0.133
18 .	0.052	0.084	-0.721	0.051	0.386	-0.301	0.772	0.228
19 .	-0.208	-0.051	-0.133	0.753	0.030	-0.104	0.642	0.358
20 .	-0.242	0.043	-0.154	0.797	-0.059	0.245	0.782	0.218
21 .	0.063	0.082	-0.225	-0.135	-0.030	0.741	0.629	0.371
22 .	-0.224	0.141	-0.148	-0.086	0.770	0.073	0.698	0.302
23 .	0.141	0.158	0.206	0.308	0.114	0.736	0.737	0.263
Yes ²	25.67%	16.92%	12.96%	8.45%	7.52%	7.08%	78.60%	

The first factor is the most significant and has the highest relative share (25.67%). It is determined by 8 indicators, in which the factor weights occupy values between 0.540 and 0.910. As can be seen from **Figure 46** , almost all the signs (except one) that characterize the level of physical fitness of young football players are presented here. This gives us reason to identify the factor as " **football athleticism** " . Including the ability to move across terrain at high speed (indicator 15) in this factor is completely logical.

The second factor (**Figure 47**) explains a much lower relative share of the initial variance (16.92%). The indicators that make it up provide information about the physical development of the studied football players, which is why, quite logically, the factor can be defined as " **morphological** " .

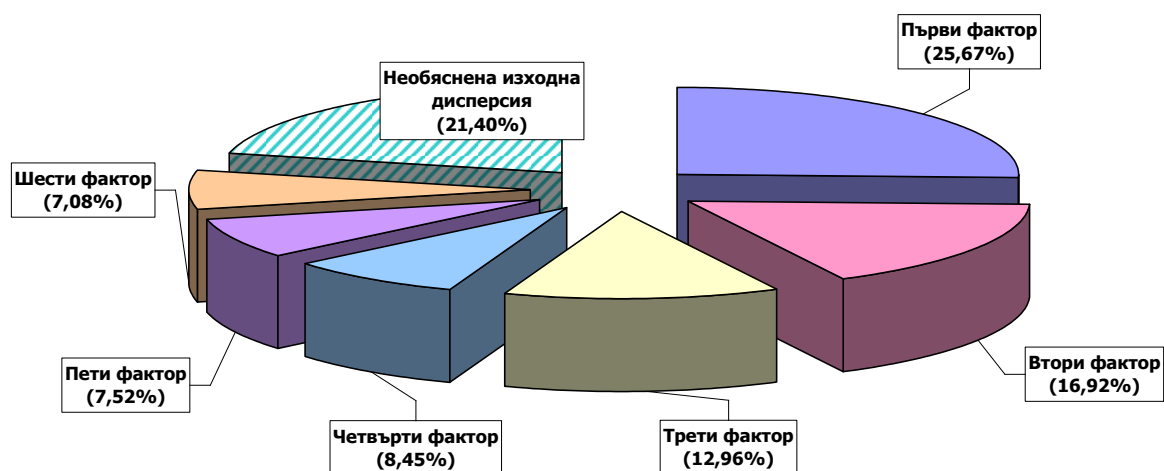


Figure 45 . Relative shares of the baseline variance explained by each factor in the physical development and specific work capacity of 12-13-year-old Turkish football players at *the beginning* of the experimental period

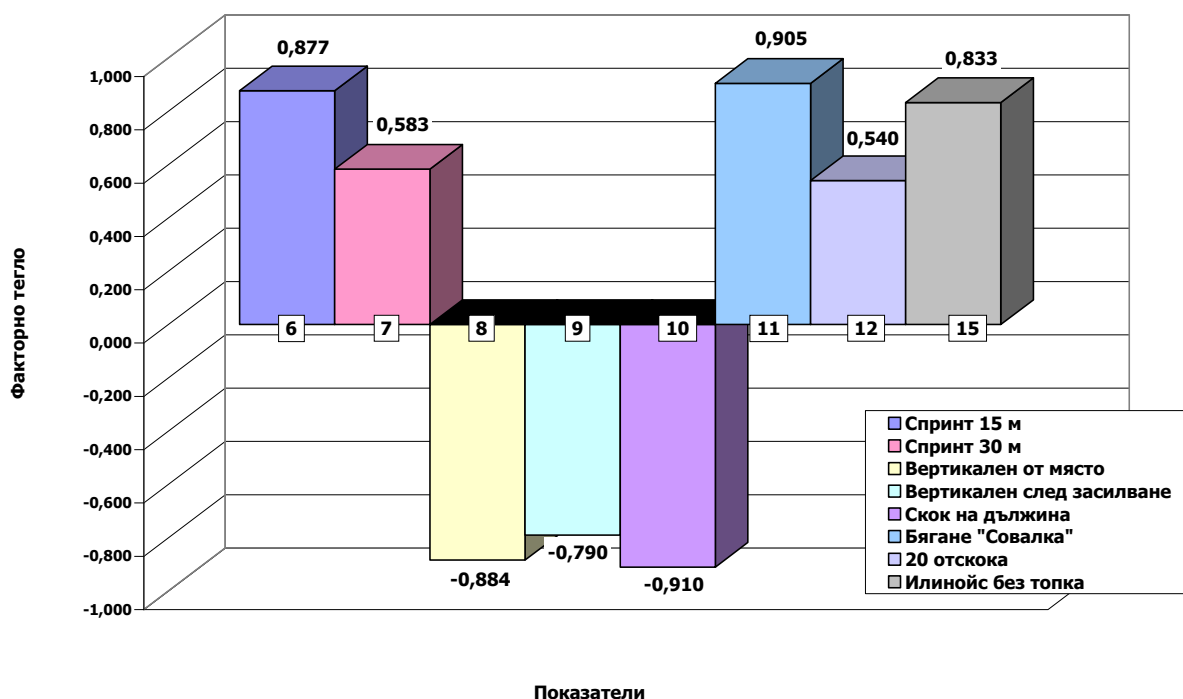


Figure 46. Factor structure of physical development and specific work capacity at *the beginning* of the period – *1st factor*

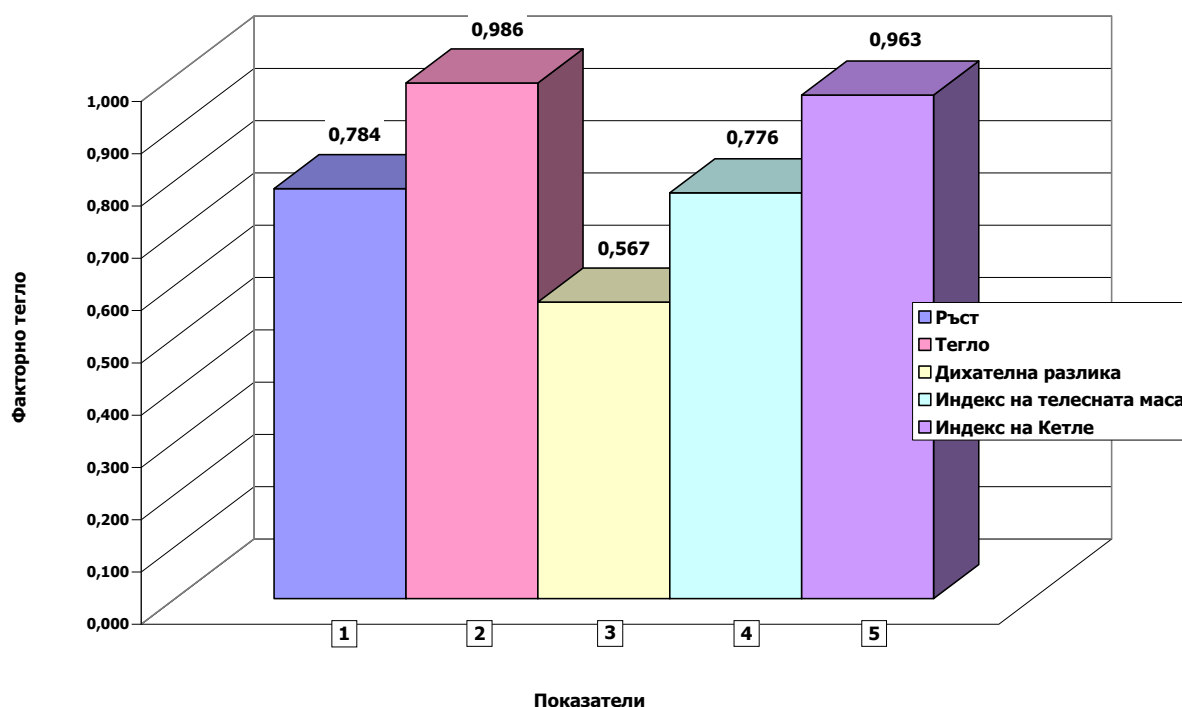


Figure 47. Factor structure of physical development and specific work capacity at the beginning of the period – *IInd factor*

The third factor (12.96% - **figure 48**) is formed by 3 indicators with high factor weights, which are included in the test battery to the group of technical and tactical preparedness. This gives grounds for this factor to be identified as a "**specific ball handling skill**".

The remaining factors are characterized by lower than 10% relative shares of the explained variance, therefore they will not be discussed in detail here.

The second (final) factor matrix is presented in **Table 23**.

The comparative analysis of the two factor matrices (initial and final) shows that despite the inclusion of another (VII) factor to the second matrix (**Table 23**), at the end of the experiment a decrease in the relative share of the explained initial variance was observed by just over 4%.

Moreover, there is a noticeable decrease in the relative share of the first factor from 25.67% to 16.62% and it is no longer so categorically different from the others, but is almost equal to the second (respectively 16.62% and 16.15% - **figure 49**). On the other hand, the last 3 factors (from V to VII -th) are distinguished from the others and have a very low contribution to the physical development and specific working capacity of the studied population.

Table 23. Factor structure of physical development and specific working capacity of 12-13 year old Turkish football players at *the end of the experimental period*

No.	I	II	III	IV	V	VI	VII	h ²	1 - h ²
1 .	0.732	-0.258	0.076	-0.037	0.101	-0.430	0.011	0.805	0.195
2 .	0.973	-0.062	0.111	0.004	0.094	0.023	0.061	0.975	0.025
3 .	0.666	0.393	-0.210	0.098	-0.175	0.038	-0.109	0.695	0.305
4 .	0.810	0.142	0.096	0.014	0.021	0.364	0.074	0.823	0.177
5 .	0.946	0.026	0.110	0.005	0.066	0.167	0.067	0.945	0.055
6 .	-0.020	0.786	-0.032	0.087	-0.111	0.048	-0.141	0.661	0.339
7 .	0.088	0.369	0.542	0.270	0.091	0.308	-0.061	0.617	0.383
8 .	-0.024	-0.892	-0.039	-0.067	-0.021	-0.182	0.049	0.838	0.162
9 .	-0.345	-0.679	-0.018	0.257	0.062	-0.064	0.112	0.667	0.333
10 .	-0.044	-0.652	-0.299	-0.085	-0.374	0.285	-0.172	0.774	0.226
11 .	-0.123	0.734	-0.439	0.282	0.078	0.010	0.015	0.834	0.166
12 .	-0.108	0.508	-0.190	0.409	0.272	-0.162	0.240	0.630	0.370
13 .	-0.036	0.022	0.004	-0.209	0.149	-0.098	-0.759	0.653	0.347
14 .	0.256	-0.063	0.737	-0.012	-0.051	-0.061	-0.130	0.637	0.363
15 .	0.050	0.187	0.868	-0.171	0.091	0.056	0.049	0.834	0.166
16 .	-0.002	0.176	0.478	0.700	-0.126	-0.100	0.188	0.812	0.188
17 .	-0.037	0.053	-0.110	0.848	-0.194	-0.144	0.162	0.821	0.179
18 .	-0.139	-0.049	-0.057	-0.798	-0.319	-0.117	0.162	0.803	0.197
19 .	0.154	0.164	-0.682	-0.054	0.012	-0.072	0.188	0.559	0.441
20 .	-0.054	0.195	-0.663	-0.164	0.005	0.089	-0.260	0.583	0.417
21 .	0.230	0.058	0.039	-0.126	0.149	0.798	0.148	0.755	0.245
22 .	0.129	-0.304	-0.115	-0.284	0.316	0.084	0.517	0.576	0.424
23 .	0.070	0.035	0.011	0.010	0.881	0.124	-0.070	0.802	0.198
Yes ²	16.62%	16.15%	13.74%	10.71%	6.02%	5.75%	5.36%	74.35%	

The comparative analysis of the two factor structures gives grounds to formulate the following **conclusions** :

- **morphological factor "** stands out as the most significant, which at the start was determined as the second factor;
- on the other hand, "**football athleticism** " is losing some of its significance, as evidenced by the reduced relative share in the factor structure of this aspect of sports training;
- reduces the importance of "**specific ball handling skill** ", which drops from third place and at the end of the experiment structures the fourth factor of the final factor matrix;
- the fourth initial factor "**efficiency of shots on goal** " at the end of the period participates in the construction of the third final factor;

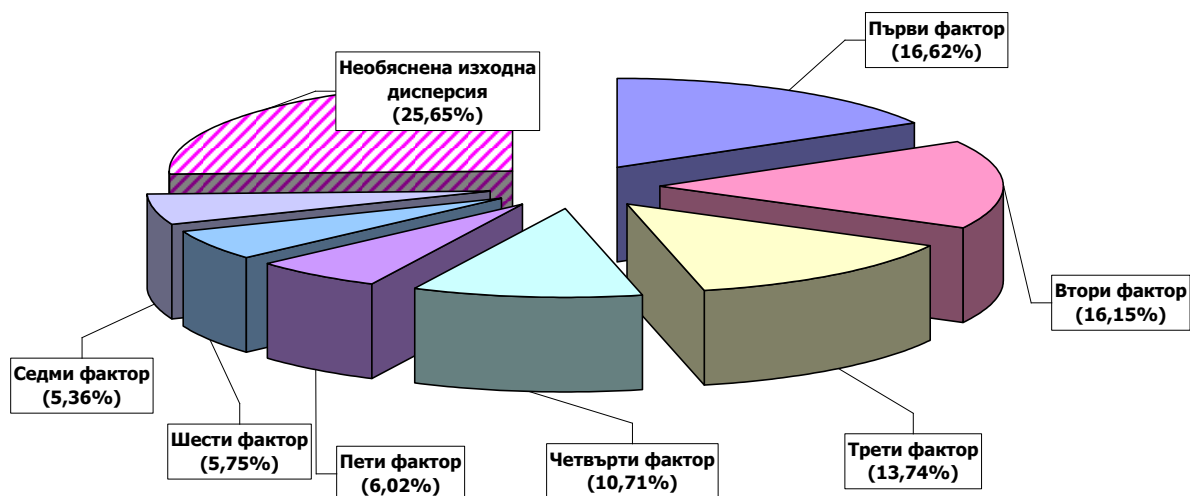


Figure 49 . Relative shares of the baseline variance explained by each factor in the physical development and specific work capacity of 12-13-year-old Turkish football players at the end of the experimental period

- both at the beginning and at the end of the period, "**psychological abilities**" find their place among the last and almost insignificant factors;
- The picture is similar with regard to **general endurance** (indicator 13), which does not find a place in the factor structure of physical development and specific work capacity at the beginning of the experiment, and at its end appears only in the last VII factor.

III.4 . Problems of optimizing the physical development and specific performance of 12-13-year-old Turkish football players

The next direction of our development aims to present some possibilities for optimizing the future teaching and training process with young 12-13-year-old Turkish football players.

"The main function of the optimization subsystem is to ensure that the coach makes optimal strategic decisions regarding the development and permanent adjustment of the training plan, i.e. the regulator of the management system" (Broglie , J., 2012: 166).

Implementing quality control over the level of the main signs of physical development, physical fitness, technical-tactical skills and psychological abilities is extremely

important for ensuring high efficiency of the training process with adolescent football players.

In this sense, as a reliable optimization criterion, many authors accept the signal score T. As noted in the Research Methodology, this score allows for the comparison of differently sized tests and indicators (presented in number, %, s, cm, m, kg). etc.).

For the needs of our study, variational processing of the results was performed for all young football players participating in the experiment (**Table 24**).

Table 24. Sample signal assessments of physical development and specific work capacity of 12-13-year-old Turkish football players at the end of the experimental period

No.	Indicators \ Parameters	Mean	S	MU (EG)		C . D . (KG)	
				Mean	T	Mean	T
1.	Height	158.74	7.46	162.00	29.37	169.00	38.76
2.	Weight	47.31	7.77	49.00	27.18	53.00	32.32
3.	Chest circumference – respiratory difference	8.62	1.27	9.00	28.00	8.00	20.13
4.	Body Mass Index (BMI)	18.69	2.08	18.67	24.92	18.56	24.37
5.	Quetelet Index	297.02	39.23	302.47	26.39	313.61	29.23
6.	Sprint 15 m	2.71	0.15	2.98	7.10	2.59	33.10
7.	Sprint 30 m	5.12	0.41	5.15	24.30	5.54	14.79
8.	Vertical jump from a place	31.21	5.08	27.00	16.72	30.00	22.62
9.	Vertical Bounce - Boost	29.30	6.03	25.15	18.12	26.00	19.53
10.	Long jump	160.86	32.65	135.00	17.08	128.00	14.94
11.	Shuttle Run	19.34	1.46	21.60	9.50	18.23	32.58
12.	20 rebounds	11.98	2.85	12.00	24.94	9.50	33.71
13.	Running 6 min.	1318.21	232.82	1450.00	30.66	1670.00	40.11
14.	Dribbling the ball (40 m)	10.44	1.35	10.50	24.54	12.67	8.47
15.	Illinois test - no ball	17.81	1.35	17.34	28.49	19.09	15.53
16.	Illinois test – with ball	23.95	2.00	24.56	21.94	26.84	10.54
17.	Illinois test - index	6.14	1.93	7.22	19.39	7.75	16.64
18.	Juggling a ball	37.81	10.85	28.00	15.96	30.00	17.80
19.	Kicks in the door - with a comfortable	7.14	0.93	7.00	23.46	6.00	12.71
20.	Knock on the door - with an awkward	3.88	0.94	4.00	26.27	4.00	26.27
21.	Time perception	4.79	0.28	4.35	9.46	4.38	10.54
22.	Tapping feet	12.71	1.07	12.78	24.34	13.11	21.26
23.	Schulte table	54.77	10.44	45.32	34.05	47.00	32.44

The calculated statistical parameters, revealing the average level (mean - arithmetic mean) and variability (s - standard deviation), allow the calculation of the signal scores T of each of the football players from the studied age group, for each of the indicators included in the applied test battery.

It is also necessary to note that the specified mechanism allows for the calculation of the so-called generalized assessment of the physical development and specific working

capacity of each competitor, as an average sum of the scores ($\Sigma T_{1-23} / 23$) that he received on all indicators.

The assessment was carried out in a 50-point scoring system, which allows for taking into account even smaller changes in the level of development of each of the signs.

As an example, here we present the results of the assessment of one of the participants in the experimental group (M. U.), who had a summarized assessment of the level of his sports fitness at the end of the experimental period of 22.27 points .

As can be seen from **Figure 54** , MU is a competitor with very good physical development, information about which is provided by the first 5 indicators of the model. Proof of this finding are the high scores (between 29.37 points and 26.39 points) that he received for the height and weight indicators.

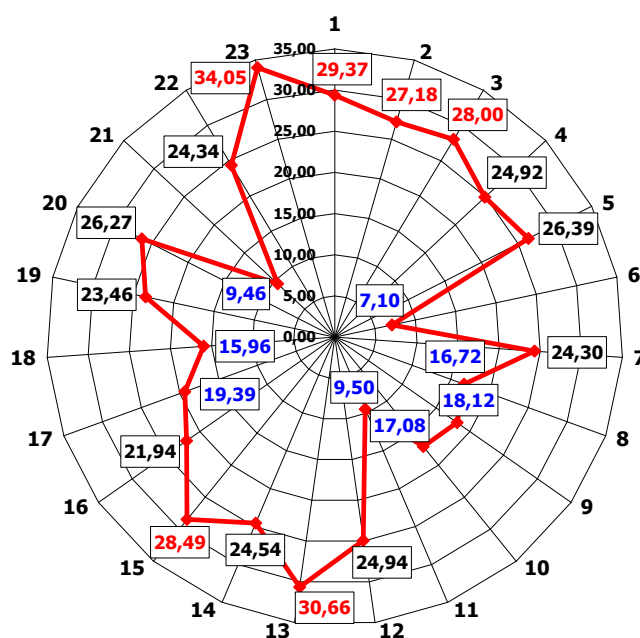


Figure 54. *Individual optimization model of physical development and specific work capacity – M. U. (EG)*

The strongest aspects of his preparedness are:

- high degree of concentration, flexibility and attention span;
- high level of development of general endurance;
- well-developed ability to move around the terrain (without a cannon ($T_{15} = 28.49$ points));
- good efficiency of shots on goal with the one that is inconvenient for him.

The lowest T scores presented to the model (below 20 points) provide grounds for the emphasis in future training work with MU to be primarily directed towards developing:

- sprint capabilities;
- the sense of time orientation;
- speed endurance;
- ball handling skills;
- the explosive power of the lower limbs during muscular efforts in both the vertical and horizontal planes and
- the ability to dribble the ball at high speed.

To facilitate the assessment of adolescent Turkish football players in the observed age group, normative tables have been developed for all the characteristics we studied. As an example, here we present the normative basis for the assessment of morphological characteristics (**Table 25**).

The second mechanism that can be used in the process of optimizing training is related to the results of the factor analysis. On this basis, the following can be identified as the characteristics that have the greatest contribution to the physical development and specific performance of 12-13-year-old Turkish football players:

- the morphological status of the competitors;
- the level of development of motor skills:
 - ≈ the explosive power of the lower limbs in vertical muscular effort;
 - ≈ sprints opportunities ;
 - ≈ speed endurance ;
 - ≈ the explosive power of the lower limbs during horizontal and muscular efforts;
 - ≈ the jump endurance ;
- the level of development of specific technical and tactical skills.

All this means that when planning the next stage of sports training, the emphases for the training work of each athlete, determined on the basis of the signal scores T, must be rearranged , depending on the significance of the individual signs forming the first and most important factors.

Table 25 .

Normative table 1. Morphological signs

Value T (Points)	Value P (%)	Height (cm)	Weight (kg)	Respiratory difference	Body Mass Index (kg / m ²)		Kettle Index (g / cm)
		1 .	2.	3.	4 .		5.
50	99.38	177.39	66.73	11.79	19.38	19.82	395.09
49	99.18	176.64	65.96	11.67	19.15	20.05	391.17
48	98.93	175.90	65.18	11.54	18.93	20.27	387.25
47	98.61	175.15	64.40	11.41	18.71	20.49	383.32
46	98.22	174.40	63, 63	11.29	18.49	20.71	379.40
45	97.73	173.66	62.85	11.16	18.26	20.94	375.48
44	97.13	172.91	62.07	11.03	18.04	21.16	371.55
43	96.41	172.17	61.30	10.91	17.82	21.38	367.63
42	95.55	171.42	60.52	10.78	17.60	21.60	363.71
41	94.52	170.67	59.74	10.65	17.37	21.83	359.79
40	93.32	169.93	58.96	10.52	17.15	22.05	355.86
39	91.93	169.18	58.19	10.40	16.92	22.28	351.94
38	90.32	168.44	57.41	10.27	16.68	22.52	348.02
37	88.50	167.69	56.63	10.14	16.45	22.75	344.09
36	86.44	166.94	55.86	10.02	16.21	22.99	340.17
35	84.14	166.20	55.08	9.89	15.98	23.22	336.25
34	81.60	165.45	54.30	9.76	15.74	23.46	332.32
33	78.82	164.71	53, 53	9.64	15.51	23.69	328.40
32	75.81	163.96	52.75	9.51	15.27	23.93	324.48
31	72.58	163.21	51.97	9.38	15.04	24.16	320.56
30	69.15	162.47	51.19	9.25	14.80	24.40	316.63
29	65.54	161.72	50.42	9.13	14.57	24.63	312.71
28	61.79	160.98	49.64	9.00	14.33	24.87	308.79
27	57.93	160.23	48.86	8.87	14.10	25.10	304.86
26	53.99	159.48	48.09	8.75	13.86	25.34	300.94
25	50.00	158.74	47.31	8.62	13.63	25.57	297.02
24	46.01	157.99	46.53	8.49	13.39	25.81	293.09
23	42.07	157.25	45.76	8.37	13.16	26.04	289.17
22	38.21	156.50	44.98	8.24	12.92	26.28	285.25
21	34.46	155.75	44.20	8.11	12.69	26.51	281.33
20	30.85	155.01	43.42	7.98	12.45	26.75	277.40
19	27.42	154.26	42.65	7.86	12.22	26.98	273.48
18	24.19	153.52	41.87	7.73	11.98	27.22	269.56
17	21.18	152.77	41.09	7.60	11.75	27.45	265.63
16	18.40	152.02	40.32	7.48	11.51	27.69	261.71
15	15.86	151.28	39.54	7.35	11.28	27.92	257.79
14	13.56	150.53	38.76	7.22	11.04	28.16	253.86
13	11.50	149.79	37.99	7.10	10.81	28.39	249.94
12	9.68	149.04	37.21	6.97	10.57	28.63	246.02
11	8.07	148.29	36.43	6.84	10.34	28.86	242.10
10	6.68	147.55	35.65	6.71	10, 10	29.10	238.17
9	5.48	146.80	34.88	6.59	9.87	29.33	234.25
8	4.45	146.06	34.10	6.46	9.63	29.57	230.33
7	3.59	145.31	33.32	6.33	9.40	29.80	226.40
6	2.87	144.56	32.55	6.21	9.16	30.04	222.48
5	2.27	143.82	31.77	6.08	8.93	30.27	218.56
4	1.78	143.07	30.99	5.95	8.69	30.51	214.63
3	1.39	142.33	30.22	5.83	8.46	30.74	210.71
2	1.07	141.58	29.44	5.70	8.22	30.98	206.79
1	0.82	140.83	28.66	5.57	7.99	31.21	202.87

IV. CONCLUSIONS AND RECOMMENDATIONS

The following conclusions to be formulated :

1. At *the beginning of the experimental period* , in general, the observed differences between the average levels of *physical development signs in the two groups* were insignificant, which is *evidence of correctness at the start* of the experiment.

2. The specific training interventions applied did not have a significant impact on *the physical development* of the boys from the studied groups.

3. Under the influence of the applied training effects, during the experiment, significant positive changes occurred in the level of development of the following *special physical qualities in the football players from the EG* :

- speed endurance;
- sprinting capabilities over short distances;
- explosive strength of the lower extremities and
- jumping endurance.

In *CG*, significant positive changes have almost the same characteristics, but the increases are lower.

4. At *the end of the period* *The experimental group significantly outperformed the control group* in terms of:

- the explosive power of the lower extremities;
- linear speed and
- the speed capabilities of the boys involved in it.

5. Significant changes have occurred in the level of *specific technical and tactical skills* of the *EG competitors* :

- to move around the field without the ball, both in a straight line and with changes in direction and speed;
- to take shots at goal with both the dominant and non-dominant foot and
- to carry the ball at high speed over short distances.

The improvements observed in the CG players can be explained by random causes . An exception is observed in terms of the effectiveness of shots on goal.

6. At *the end of the period, the football players from the experimental group significantly outperformed those from the control group* in terms of:

- the ability to move around the field at high speed without the ball;

- the ability to quickly dribble the ball over short distances and
- the effectiveness of shots on goal.

significant positive changes in the frequency of lower limb movements occurred in the football players of both groups . ***The lack of qualitative changes in the parameters of attention and orientation in time*** , however, can be considered a ***weakness of the training*** in the Turkish teams among adolescents.

8. At ***the beginning of the period*** ***The factor structure of physical development and specific work capacity is made up of 6 main factors*** , which explain a high relative share (78.6%) of the initial variance of the studied phenomenon and can be identified as:

- "football athleticism";
- "morphological" factor;
- "specific ball handling skill";
- "goal shooting efficiency" and
- "psychological abilities".

9. ***At the end of the experiment, the following changes*** in the factor structure were observed :

- the most significant is the so-called "morphological factor";
- "football athleticism" is losing some of its significance;
- reduces the importance of "specific ball handling skills";
- "the effectiveness of shots on goal" increases its importance;
- "psychological abilities" find their place only in the formation of the last and almost insignificant factors.

10. ***An optimized methodology for early training*** of Turkish football players has been developed.

Normative assessment tables have been developed , which allows for easier assessment and determination of emphasis in future training work.

Recommendations for practice:

1. Before it is proposed for implementation in wide practice, ***corrections should be made*** to the approved methodology, aimed at:
 - increasing the volume of training loads and including new means for developing motor skills, in which no significant positive changes occurred during the experiment;
 - increasing the volume and intensity of training impacts to develop the skills of moving around the field while holding the ball and for skillful juggling with it.
2. When planning the next stage of sports training, ***an assessment and determination of the emphasis for the training work of each athlete should be carried out*** , as well as, if necessary, they should be rearranged , depending on the significance of the individual characteristics forming the first and most important factors.
3. From this age onwards, ***adequate measures should be taken to develop the psychological qualities*** necessary for football players to achieve high sportsmanship in their chosen sport.
4. ***To continue the work on implementing the developed training methodology*** , which will allow the developed regulatory framework to be optimized in 2-3 years.