

**NATIONAL SPORT ACADEMY “VASIL LEVSKI”
DEPARTMENT “BASKETBALL, VOLLEYBALL, HANDBALL”**

LYUBOMIRA LYUBOMIROVA VASILEVA

**“Methods for Development of Specific Efficiency of 10-
12-year-old Volleyball Players”**

ABSTRACT

**on a dissertation for acquiring the educational and scientific degree “Ph.D.” in
scientific field 7.6. Sport “Theory and Methods of Sports Science”**

Scientific advisor:

Prof. Dimitar Petrov Mihailov, Ph.D.

Sofia, 2023

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The dissertation volume is 278 pages, of which 60 pages contain appendices. It is visualized with 62 tables and 64 figures; there are six appendices. The reference list includes 147 sources (99 are in Cyrillic and 48 are in Latin) and three Internet sites.

The numbering of the tables and figures in the abstract matches that of the dissertation.

The dissertation was discussed and approved for the official defense at a meeting of the “Basketball, Volleyball, Handball” department at Faculty Pedagogy at NSA “Vassil Levski” (official report 1299/04.04.2023). According to Order 357/26.04.2023, it was approved for public defense.

The public defense of the dissertation will take place on 28.07.2023 in hall A3 of the National Sports Academy "Vasil Levski", Sofia.

INTRODUCTION

The issue of specific efficiency of 10-12-year-old volleyball players is highly relevant in modern training methodology. The control and optimization of motor abilities in adolescents is complex and requires a detailed study of numerous factors that significantly correlate with athletic performance and can be developed and improved through training means and methods. Clarifying the problem in the present dissertation work has important theoretical and practical significance, providing an opportunity to make strategic decisions for the continuous updating of training interventions with the main goal of developing the specific work capacity of young volleyball players. On the other hand, the synchronization of combining "the useful with the enjoyable" is a skill of sports specialists, from which the seed of inspiration sprouts in young volleyball players and their aspiration for growth in the ladder of volleyball success.

CHAPTER I. THEORETICAL FOUNDATIONS OF THE STUDY

According to T. Yancheva (2004), "modern sports require personalities. The higher the development of a sport and its athletic achievements, the more complex and detailed the problems faced by coaches and athletes in the process of preparation and competition. Elite sports impose extremely high demands on athletes regarding the precise regulation of actions, states, behavior, and efforts because athletic performance is the result of the comprehensive manifestation of the individual." Furthermore, "the pursuit of perfection and harmony" in volleyball defines the significant place of this spectacular team sport in the cultural life of society (Hristova Serafimova, V., 2015).

"When performing physical exercises, people master their own nature" (Ponomarev, N., 1971). Young people obtain "functional satisfaction" from engaging in various physical exercises. This means that the more they engage in sports, the greater their need for systematic activities will be (Rachev, K., 1999).

I.1. Morphological, physiological, and psychological characteristics of the pubertal age

In sports science, it is emphasized multiple times that the effect of training on the adolescent body will be higher if the training means and methods are applied in accordance with the sensitive periods of human motor function. The biological phase of sexual development in adolescents, known as "puberty," is highly important in terms of the overall transformation of the child's body. Significant changes in physical development occur, the nervous system and psyche are influenced, and organs and systems undergo complete differentiation. During puberty, quantitative and qualitative changes occur (increased muscle mass, bone length, internal organs, etc.), the pattern of sexual dimorphism is determined, the reproductive system develops, and secondary sexual characteristics emerge. This phenomenon is referred to as the "pubertal growth spurt" (Tanner, M., 1962).

The pubertal age is defined as a "difficult age" in which the child's body transitions into that of a mature (adult) individual from a psychosocial adaptation perspective (including self-affirmation in life), biological changes, and hormonal reorganization. This period is the most responsible and critical because adolescents shape their worldview and turn to the world. If the first seven years are attributed to the home, here the sports educator also plays a leading role in shaping the upbringing. Puberty is characterized as a constant, prolonged, and long-term stress, and many authors believe that it should not be avoided but rather artificially provoked and mastered, turning it into a weapon for education and preparation for life (Bahchevanov, D., Zhelyazkov, Zh., 1991).

Many authors pay attention to the differences in the individual physical development of adolescents (heterochrony) - acceleration (accelerated rates of development) and retardation (delayed rates of development). As a result, the development of adolescents does not always correspond to the standard characteristic of a specific chronological age (Arestov, Yu., 1968, Motylyanskaya, R., 1961, Savov, S., 1975, etc.). Heterochrony refers to the difference between the calendar age (year, month, day) and the biological age, which provides information about the actual level of morphofunctional development of adolescents (Bratanov, B., 1974, Pilich, S., 1968, Shnalel, G., 1961).

The relevance of issues related to children and youth sports is constantly increasing. The interest of sports educators, psychologists, physiologists, and the general public in physical education and sports training for the younger generation is due to the role they play today in the overall development of individuals and the preparation of reserves for high-level sports.

According to K. Rachev (1999) and other authors, the organization of the educational and training process with young athletes, teaching methods, selection of training means, volume, and degree of load should be based on age-related regularities and the development of children, as physical exercises have a constructive effect only when applied in accordance with the capabilities of the growing organism. Further improvement of the system for comprehensive control is necessary, with detailed control related to age requirements, sports qualification, and specific characteristics of the competitive activity. On the other hand, "the problem of control, assessment, and optimization of sports training is extremely important, but due to its complexity, it is solved at different levels, both in individual countries and in different sports" (Borukova, M., 2014).

A. Krestovnikov (1951), A. Korobkov (1953), V. Farfel (1961), and others have found that the frequency of movement reaches its maximum development around the age of 12-13. The earlier manifestation of speed compared to other motor qualities is explained by the inherent plasticity and mobility of the nervous processes in the child's organism. According to R. Motylyanskaya (1963), "short-term speed exercises correspond to the abilities of the cardiovascular system of adolescents and do not impose excessive demands on the growing organism."

As early as 1948, researcher I. Yablonovsky established that "at the age of 8-9, speed decreases, and at 10-12 years old, adolescents enter their most favorable period for increasing speed."

Children easily perform jumping exercises and exercises requiring speed and agility. These exercises are vital for them because they delay the ossification of the epiphyseal cartilage of long bones, thus increasing the potential for continued development in the young organism. V. Yakovlev (1965) believes that "the most accelerated rates of natural improvement in agility coincide with the early and middle school age (7-8 to 12-13 years old)."

"The modern sedentary lifestyle of adolescents is in contradiction with the physiological needs of the body for physical activity, and its absence leads to increased morbidity and a decrease in academic and labor performance" (Mitрева, B., 2015). Furthermore, due to the deepening sedentary behavior and high mental load, the process of education and training is associated with maintaining health (Bozhkova, A., 2007).

I.2. Volleyball as a means for the harmonious development of the adolescent body

Volleyball is a sport that comprehensively develops all motor qualities, positively influences the psyche, and builds good personal and interpersonal relationships. The game is characterized by continuously changing and unexpected situations that require rapid creative solutions and inventiveness. It brings about many emotional experiences that need to be controlled in order for athletes to respond adequately in each critical situation. This develops analytical abilities, aids in making quick and accurate decisions, enhances operational thinking and mental activity, as well as fosters valuable moral virtues.

Sports pedagogy practice shows that the initial steps towards elite sports, early training and sports specialization, and the selection of young promising athletes play a significant role in achieving great sporting results on a global scale. Modern volleyball continuously "rejuvenates" the Olympic age of athletes and their international achievements, which places a strong emphasis on raising the requirements for the younger generation and their level of specific performance capabilities.

According to St. Dimitrov (2005), "every athlete carries some potential within them, and the sports educator is the one who should take responsibility for creating the best possible conditions for this potential to be energized and manifested, in accordance with the age sensitivity of adolescents."

Volleyball is characterized by increased demands for the manifestation of speed abilities - the ability to execute technical elements and game strategies, individual actions, or movements on the court at a high speed in minimal time. In sports games, including volleyball, "speed of thinking" is considered a form of speed - the maximum speed of operational thinking to choose the appropriate action in specific situations (Bachvarov, M., 2000).

I.3. The Nature of Sports Training for 10-12 Year Old Volleyball Players

According to Kr. Rachev (1999), optimizing the means, methods, and main content of the educational and training process for young athletes is one of the main problems in contemporary scientific research in the field of sports.

The age of 11-12 is a period during which the differentiation of motor abilities intensifies, and the first signs of individuality become apparent. It is during this age that boys begin the narrow specialization into specific positions in volleyball.

According to Antonova, V. (2015), "by engaging naturally with the imagination, abilities, and interests of children, physical education and sports will contribute to their full physical, intellectual, and personal development, as well as the formation of practical skills in adolescents."

The dynamic nature of team play in volleyball requires a high level of development in terms of speed, jumping ability, agility, speed-strength endurance, and flexibility in a harmonious combination.

Speed is one of the most important qualities of a volleyball player. Without speed, effective defensive play, retrieving tipped balls, providing blocking and spiking, timely formation of a block, and executing various attacking combinations—playing different balls that vary in direction, height, distance from the net, and flight speed—are all impossible.

It has been repeatedly established in scientific research that the age of 10-12 is sensitive and suitable for the development of speed. Therefore, systematic and methodically correct work should be done to develop and improve the speed qualities of future volleyball players. In this regard, speed exercises should constitute a significant part of the overall physical training. When viewed through the prism of volleyball, exercises that develop speed in direct connection with technique and tactics are particularly beneficial for young athletes. It is recommended that these exercises be performed within the boundaries of the court to promote simultaneous development of spatial orientation.

"The interval-variable method is suitable for developing speed in volleyball players. With this method, the load is maximal but short-term, ranging from 5 to 20 seconds. The frequent change of efforts is an excellent training tool that allows for a high-frequency impulse to be maintained in the working muscles for a longer period, up to 20 seconds" (Tsv. Zhelyazkov, 1998).

Volleyball requires excellence in terms of "technique" in handling the ball, which inevitably speaks to an exceptionally high level of agility development. Just like speed, agility is sensitive during the 10-12-year-old period. Several authors associate agility with increased accuracy of perception (sense) of movements in space and time.

In scientific literature, coordination is often described as part of the motor quality of agility. According to Brestnichki, G. (2017), "coordination is necessary for better body control and execution of refined, rational, and precise movements. It is of utmost importance in team sports, where coordination with the ball, teammates, and opponents is required."

The complexity of the volleyball game explains the resulting tasks for individual, group, or team decisions with the execution of specific motor actions and quick transitions to new decisions and actions. In the early stages of training, the development of general agility is necessary, gradually transitioning to specific agility, which is crucial in the conditions of developing specific efficiency in 10-12-year-old volleyball players.

I.4. Hypothesis of the dissertation

The hypothesis we are testing states that the specific efficiency of the athletes will significantly improve through the implementation of a scientifically-based methods with a focus on speed and agility training in the training process of 10-12-year-old volleyball players. We believe that this approach will lead to increased effectiveness and athletic achievements among the youth.

CHAPTER II. OBJECTIVE, TASKS, METHODOLOGY, AND ORGANIZATION OF THE RESEARCH

II.1. Objective and tasks of the research

The objective of this study is to enhance the specific efficiency of 10-12-year-old volleyball players through the implementation of an adapted volleyball methodology with a focus on speed and agility training in the training programs, taking into account the age-specific characteristics of the participants.

To achieve this objective, we have set the following **tasks**:

1. Conduct a literature review to explore the state of the research problem. Develop a questionnaire and a test battery for the studied sample.
2. Determine the level of awareness, attitudes, and opinions of sports coaches towards the implementation of an adapted volleyball methodology with a focus on speed and agility training in the training programs of young volleyball players.
3. Assess the average level of development and variability of the studied indicators in 10-12-year-old volleyball players through a preliminary and main pedagogical experiment.
4. Develop a volleyball methodology with emphasis on speed and agility training that is suitable for implementation in the training programs of 10-12-year-old volleyball players.
5. Identify existing interdependencies among the studied indicators in 10-12-year-old volleyball players.
6. Determine the effect of the implemented adapted methodology in the volleyball training programs for 10-12-year-old volleyball players.

II.2. Subject, Object, and Sample of the Research

The subject of the research includes anthropometric indicators, motor qualities, their comprehensive nature, and their manifestation in various forms during volleyball training, as well as elements of volleyball technique studied in the training process of sports clubs involving boys aged 10-12 years.

The object of the research in the dissertation work is the specific functional capacity of boys aged 10-12 years who actively participate in volleyball in a sports club.

Due to the nature of the applied comprehensive research methodology and the demonstrated results during the initial testing in five leading youth volleyball clubs in our country, we distinguish the following two ***groups of participants***:

1. Participants in the I-stage - preliminary pedagogical experiment (PPE), totaling 56 boys aged 10-12 years, engaged in volleyball in 3 sports clubs, including:
 - 11 boys from VC "Victoria" Plovdiv;
 - 32 boys from VC "Lyulin" Sofia;
 - 13 boys from VC "Arda" Kardzhali.

Participants in the II-stage - main pedagogical experiment (MPE), consist of 36 boys aged 10-12 years. Out of these, 21 boys from VC "Levski Sofia" have been selected as the experimental group (EG) who are being trained under the guidance of the doctoral candidate using a modern methodology with emphasis on speed and agility, suitable for implementation in training programs for 10-12-year-old volleyball players, aimed at improving their specific performance (see Appendix No. 6). The control group (CG) includes 15 boys who are athletes of VC "Minyor" Pernik and are following a commonly accepted training program for sports clubs. At the end of the experiment, this group is re-evaluated using the same test battery for the purpose of comparative analysis.

II.3. Research Methodology

The present study covers the period from April 2015 to March 2023.

To achieve the goal, an experimental methodology was developed to enhance specific performance with emphasis on speed and agility in 10-12-year-old volleyball players. This methodology is described in detail and illustrated in the dissertation and Appendix No. 6.

The overall research utilized the following scientific research methods:

II.3.1. Study and analysis of specialized scientific and methodological literature (including internet research).

II.3.2. Survey research.

To examine the opinions of 22 sports pedagogues actively involved in coaching young volleyball players in sports clubs in Bulgaria, Italy, and France, a survey questionnaire (Appendix No. 1) consisting of 16 closed-ended questions was developed. The responses were processed using alternative analysis to determine the relative proportions of the respective answers. Additionally, the website www.poll daddy.com was used as a program to process the results obtained from the survey research.

II.3.3. Anthropometry (Table №1 and Figure №2).

II.3.4. Sports-pedagogical testing (Table №1 and Figure №2).

Table №1. Measured indicators in the current study

№	ИЗМЕРВАНИ ПОКАЗАТЕЛИ	МЕРНИ ЕДИНИЦИ	ТОЧНОСТ НА ИЗМЕРВАНЕ	ПОСОКА НА НАРАСТВАНЕ
1.	Дължина на тялото (ръст прав)	см	1	+
2.	Телесна маса (тегло)	кг	1	+/-
3.	Ръст с обтегната ръка (разтег)	см	1	+
4.	Индекс за охраненост (BMI)	индекс	0,01	+/-
5.	Бягане 18 м	сек	0,01	-
6.	Странично придвижване	брой	1	+
7.	Слаломно бягане	сек	0,01	-
8.	Совалка „9-3-3-9м“	сек	0,01	-
9.	Подскочно придвижване	сек	0,01	-
10.	Вертикален отскок (А и Б)	см	0,1	+
11.	Хвърляне на плътна топка	м	0,1	+
12.	Подскоци „дама“	брой	1	+
13.	Специфичен лабиринт	сек	0,01	-
14.	Динамична гъвкавост на трупа (по Е. Флайшман)	брой	1	+
15.	Търкаляне на топка в бегот 18 м	сек	0,01	-
16.	Бягане с дрибъл 18 м	сек	0,01	-
17.	Подаване на топка с две ръце отгоре - „Подаване в цел на стена“	брой	1	+
18.	Подаване на топка с две ръце отгоре - „Подаване в цел, в близост до мрежата“	брой	1	+
19.	Подаване на топка с две ръце отдолу - „Подаване в цел на стена“	брой	1	+
20.	Подаване на топка с две ръце отдолу - „Подаване в цел, в близост до мрежата“	брой	1	+
21.	Долен лицев начален удар	брой	1	+
22.	Горен лицев начален удар	брой	1	+
23.	Забиване по посока на засилването - „Забиване от зона №4 по правата“	брой	1	+
24.	Забиване по посока на засилването - „Забиване от зона №4 по диагонала“	брой	1	+
25.	Забиване по посока на засилването - „Забиване от зона №2 по правата“	брой	1	+
26.	Забиване по посока на засилването - „Забиване от зона №2 по диагонала“	брой	1	+

II.3.5. Pedagogical observation

Pedagogical observation is used to obtain direct and reliable information about the overall progress of the conducted experiment. Specially designed protocols (Appendix 2) were used to record all tested individuals - the study participants in the preliminary and main pedagogical experiments (a total of 92 boys from 5 volleyball clubs).

II.3.6. Pedagogical experiment

The pedagogical experiment was conducted to assess the impact of the experimental methodology on the participants. It involved implementing the specific training program focusing on speed and agility in 10-12-year-old volleyball players from the experimental group (EG), who trained under the guidance of the doctoral candidate in modern methodology. The control group (CG) followed a conventional training program commonly used in sports clubs. At the end of the experiment, both groups were re-evaluated using the same test battery for comparative analysis.

II.3.7. Mathematical and statistical methods for data processing:

- Analysis of variation - to determine the mean levels and variability of the measured indicators for each observed group, by calculating the mean value (\bar{X}), standard deviation (S), and coefficient of variation ($V\%$). To provide a more comprehensive characterization of the mean level and dispersion (according to Y. Brogli, L. Petkova, 1986), additional statistical measures such as minimum value (X_{min}), maximum value (X_{max}), range (R), skewness (As), and kurtosis (Ex) were also used.
- Correlation analysis - to establish the strength of the relationship between the investigated variables within each observed group.
- Comparative t-test (Student's t-test) - to assess the practical difference between the experimental group (EG) and the control group (CG), Cohen's d coefficient was used.
- Index method - Body Mass Index (BMI) was calculated as an index of body mass.

II.4. Organization of the research

The overall organization of the research was conducted in four main stages, as outlined:
Research Work Plan

I. Literature review. Survey. Formulation of research hypothesis, objectives, and tasks.
April - September '15

II. Development of a test battery. Preliminary pedagogical experiment. Methodology development. October '15 - August '16

III. Main pedagogical experiment - Stage 1 and Stage 2. Mathematical and statistical processing of collected data, visualization, and analysis of results. September '16 - December '17

IV. Preparation of the dissertation. Implementation of dissertation defense procedures. January '18 - March '23 Official defense of the dissertation. June 28, 2023.

CHAPTER III. ANALYSIS OF RESEARCH RESULTS

III.1. Analysis of the Results from the Survey

During the period from April to May 2015, a survey was conducted involving 22 volleyball specialists engaged in coaching activities with young athletes from 14 leading international volleyball clubs with traditions in the sport, including Bulgaria, Italy, and France. The participating clubs were as follows:

- 10 clubs from Bulgaria: "CSKA," "Levski," "Slavia," and "Lyulin" Sofia, "Maritza" and "Victoria" Plovdiv, "Arda" Kardzhali, "Minyor" Pernik, "Zvezdets" Gorna Malina, and "Bozhur Volley" Bozhurishte.
- 2 clubs from Perugia, Italy: "Palavolo Perugia" and "Asd School Volley Perugia."
- 2 clubs from France: "Amiens longueau metropole" in Amiens, Picardy region, and "CASE Volleyball Club" in Saint-Étienne, Rhône-Alpes region.

To survey the opinions of sports pedagogues, a questionnaire was developed consisting of 16 closed-ended questions (Appendix 1), of which 13 specifically relate to the problem of interest and are extensively analyzed in the dissertation. The results of the conducted survey are graphically represented in the form of figures for better clarity and comprehensibility using Microsoft Excel software (from Fig. 3 to Fig. 15). In this study, we will focus on six of these figures.

Through this scientific-applied research, we believe that by gathering the opinions of sports pedagogues actively practicing as coaches among young volleyball players, we can contribute to identifying existing areas for improvement in the management of the educational and training process for 10-12-year-old volleyball players.

In our view, **the expected results** arising from the nature of the applied scientific approach and the specialization of the participants are valuable resources and tools in the process of improving the educational and training methodology for young volleyball players.

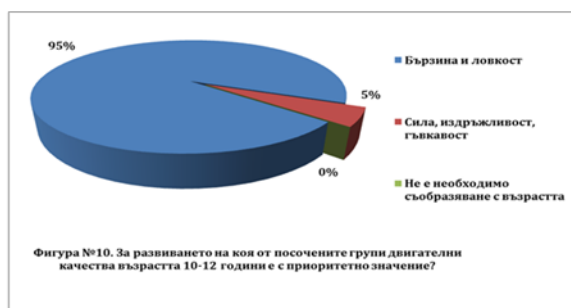
Based on the responses obtained from the survey, we can summarize the following:

- It is advisable to conduct 3-4 or more training sessions per week with a duration of over 75-90 minutes for this age group.



- It is beneficial for 15-30 minutes of each training session to be focused on developing the motor skills of the young athletes.

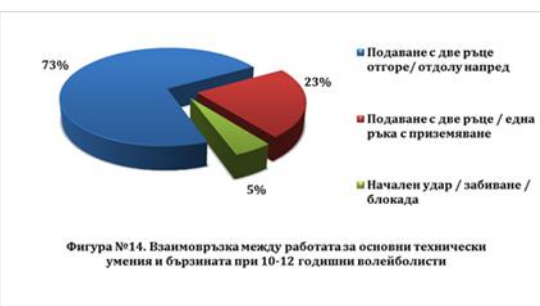
- According to 95% of the surveyed specialists, in the educational and training process of 10-12-year-old volleyball players, it is best to emphasize the development of motor skills such as speed and agility.



- The work on developing motor skills has a positive impact on volleyball skills, and vice versa - specific exercises to master volleyball techniques positively affect the development of motor skills in young athletes.

- According to 91% of specialists, volleyball exercises with a ball have the strongest influence on the development of agility and coordination in 10-12-year-old athletes.

- The quality of speed is most strongly influenced by exercises to improve volleyball skills such as overhead and underhand passing.



III.2. Analysis of the Results from the Preliminary Sport-Pedagogical Testing

In the period from October 2015 to February 2016, a preliminary pedagogical experiment (PPE) was conducted involving 56 boys aged 10-12 years who were engaged in volleyball in 3 sports clubs from different cities in Bulgaria: VC "Viktoria" Plovdiv, VC "Lyulin" Sofia, and VC "Arda" Kardzhali.

III.2.1. Anthropometric Characteristics of the Participants in the Preliminary Experiment

The analysis of the established mean values and variability of anthropometric indicators in 10-12-year-old volleyball players from the preliminary sport-pedagogical experiment (Table No. 4) allows us to summarize that with regard to indicators No. 1 "Height standing" and No. 3 "Height with an extended arm (wingspan)," the sample is highly homogeneous. Larger differences are observed in indicators No. 2 "Body mass (weight)" and No. 4 "Body Mass Index (BMI)," which are considered relatively stable for the examined group.

Table No. 4: Mean level and dispersion of anthropometric indicators in the boys from the preliminary experiment

	n	X min	Xmax	R	\bar{X}	S	V %	As	Ex
№1. Ръст	56	137	180	43	156.41	10.07	6.44	0.30	-0.68
№2. Тегло	56	30	76	46	47.43	10.20	21.51	0.72	0.36
№3 Разтег	56	180	232	52	201.86	12.62	6.25	0.29	-0.67
№4. BMI	56	13.84	26.4	12.56	19.21	3.12	16.22	0.61	-0.09

III.2.2. Mean Values and Variability of Motor Fitness Indicators in Boys from the Preliminary Experiment

The analysis of the obtained results from the preliminary sport-pedagogical experiment (Table No. 5) provides us with grounds to summarize that for two of the studied motor fitness indicators (No. 8 "Shuttle run 9-3-3-9m" and No. 10A "Maximal reached height"), there is little dispersion of values, while for all other indicators in this group, the sample is relatively homogeneous.

Regarding the distribution shape, the results do not exceed critical values, meaning that the distribution is symmetrical and has normal kurtosis.

Based on the obtained information for assessing the level of specific physical fitness of the examined group, we can conclude that the selection of parameters in the test battery is adequate for implementation in 10-12-year-old volleyball players.

Table No. 5: Mean level and dispersion of motor fitness indicators in boys from the preliminary experiment.

	N	X min	Xmax	R	\bar{X}	S	V%	As	Ex
№5. Бягане 18 м	56	3.25	5.67	2.42	4.44	0.55	12.30	-0.02	-0.27
№6. Странично придвижване	56	12	17	5	14.41	1.55	10.73	0.16	-0.99
№7. Слаломно бягане	56	3.78	8.02	4.24	5.41	0.86	15.96	0.48	0.76
№8. Совалка „9-3-3-9 м“	56	7.69	10.93	3.24	9.03	0.80	8.84	0.61	0.12
№9. Подскочно придвижване	56	6.04	9.22	3.18	7.39	0.89	11.99	0.50	-0.73
№10 А. Максимално достигната височина	56	207	274	67	236.45	17.72	7.50	0.42	-0.63
№10 Б. Вертикален отскок	56	20	54	34	34.59	7.83	22.65	0.44	0.01

№11. Хвърляне на плътна топка	56	4.7	8.6	3.9	6.50	1.07	16.54	0.21	-0.95
№12. Подскоци „дама“	56	17	39	22	28.53	4.68	16.40	0.324	0.045
№13. Специфичен лабиринт	56	5.9	8.81	2.91	7.52	0.84	11.16	-0.19	-1.11
№14. Динамична гъвкавост на трупа	56	14	26	12	20.12	2.85	14.15	-0.2	-0.47
№15. Търкаляне на топка в бегот	56	5	8.87	3.87	7.17	1.12	15.65	0.09	-1.16
№16. Бягане с дрибъл	56	4.02	8.43	4.41	5.89	1.09	18.51	0.51	-0.47

III.2.3. Mean Values and Variability of Sport-Technical Preparedness Indicators in Boys from the Preliminary Experiment

Analyzing the results regarding the indicators of sport-technical preparedness from the preliminary pedagogical experiment (Table No. 6), we can summarize that significant dispersion of values is observed in 10-12-year-old volleyball players for the studied indicators. This can be attributed to the limited accumulated experience of the young athletes and the coordination complexity of the elements in volleyball technique.

The average achievements in 10-12-year-old volleyball players range from 4-5 successful attempts out of 10 possible for all the studied technical indicators.

Interestingly, despite their young age, some boys from the examined group do not encounter difficulties in performing 4 of the volleyball techniques (including No. 19 "Underhand passing against the wall") and have almost complete success in testing for the remaining 6 indicators ($X_{\max} = 8-9$).

This summary allows us to assert that it is possible to work on developing the entire arsenal of technical and tactical skills in volleyball game with 10-12-year-old players.

Table No. 6: Mean level and dispersion of sport-technical preparedness indicators in boys from the preliminary experiment

	n	Xmin	Xmax	R	\bar{X}	S	V	As	Ex
№17. Подаване отгоре в цел на стена	56	1	9	8	4.5	2.34	51.90	0.47	-0.77
№18. Подаване отгоре в цел до мрежата	56	2	9	7	4.93	2.27	46.08	0.27	-1.23
№19. Подаване отдолу в цел на стена	56	0	10	10	5.25	2.42	46.12	-0.01	-0.69
№20. Подаване отдолу в цел до мрежата	56	0	8	8	4.39	1.90	43.34	0.08	-0.56
№21. Долен лицев начален удар	56	0	9	9	4.32	2.10	48.56	-0.17	-0.29
№22. Горен лицев начален удар	56	0	9	9	5.09	2.38	46.84	-0.28	-0.84

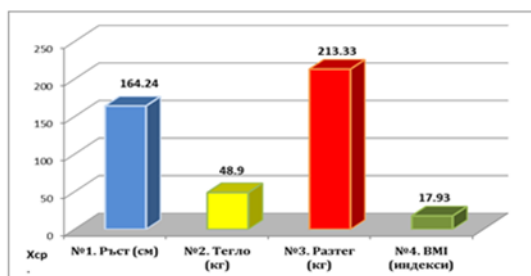
№23. Забиване от зона №4 по правата	56	1	9	8	4.7	1.73	36.75	0.09	-0.51
№24. Забиване от зона №4 по диагонала	56	0	10	10	4.05	2.42	59.58	0.44	0.26
№25. Забиване от зона №2 по правата	56	1	10	9	4.75	2.20	46.34	0.47	-0.07
№26. Забиване от зона №2 по диагонала	56	0	10	10	4.56	2.56	56.40	0.07	-0.91

III.3. Analysis of Results from the Main Sport-Pedagogical Testing

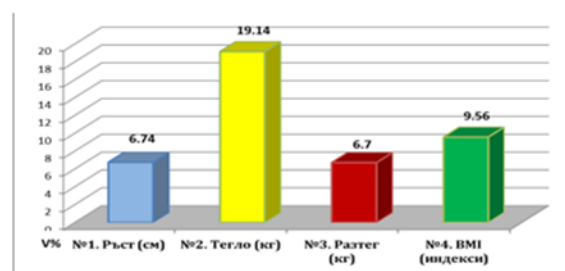
The main pedagogical experiment (MPE) was conducted from September 2016 to June 2017, involving 36 volleyball players aged 10-12 years. Out of them, 21 boys from VK "Levski Sofia," who are being trained under the guidance of a doctoral student specializing in modern volleyball methodology with a focus on speed and agility, aimed at improving the specific performance of the young athletes, were assigned to the experimental group (EG). The control group (CG) consisted of 15 boys from VK "Minyor" Pernik, who followed the commonly accepted training program for sports clubs.

Prior to the start and at the end of the 2016/2017 sports season, three training sessions were allocated for conducting the tests with the EG and CG.

The obtained results were processed using variation analysis and specialized computer programs such as SPSS and Microsoft Excel.

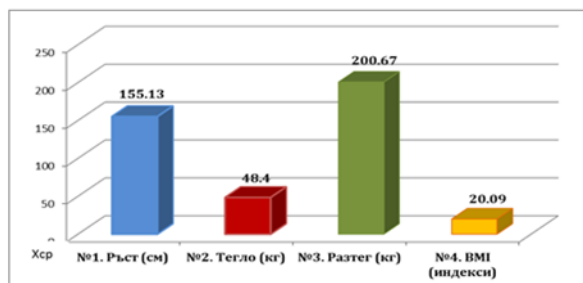


Фигура №22 Средни стойности на антропометричните показатели при момчетата от ЕГ

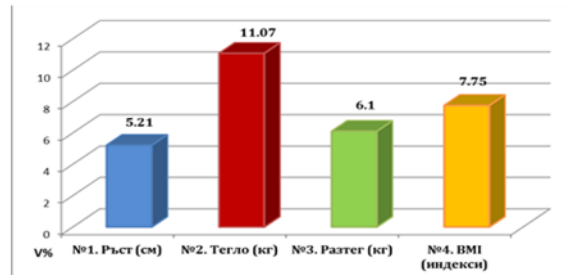


Фигура №23 Вариативност на антропометричните показатели при момчетата от ЕГ

"The figures from #22 to #25 present the data from the calculated values of the anthropometric indicators obtained through the variation analysis of the "baseline" (initial) testing of the participants in the main pedagogical experiment. The mean values of indicators #1 "Height in a standing position," #3 "Arm span," and "Body Mass Index" are higher in the boys from the experimental group compared to those from the control group. As for indicator #2 "Weight," no significant differences in the mean values are observed between the two groups."



Фигура №24 Средни стойности на антропометричните показатели при момчетата от КТ

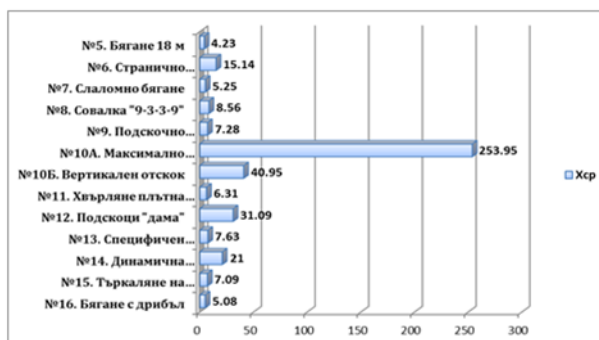


Фигура №25 Вариативност на антропометричните показатели при момчетата от КТ

The analysis of the established mean values and variability of anthropometric indicators in the volleyball players from the main sport-pedagogical experiment allows us to summarize that the sample is highly homogeneous regarding the indicators of "Height," "Wingspan," and "Body Mass Index (BMI)." The attribute of "Body Mass (Weight)" is determined to be relatively stable for the examined population, which is supported by the analysis of the results from the preliminary experiment.

III.3.2. Average values and variability of indicators for physical fitness among the examined volleyball players

The group of indicators providing information about the achieved level of physical fitness among the examined 10-12-year-old volleyball players is presented in Figures 26 to 29.

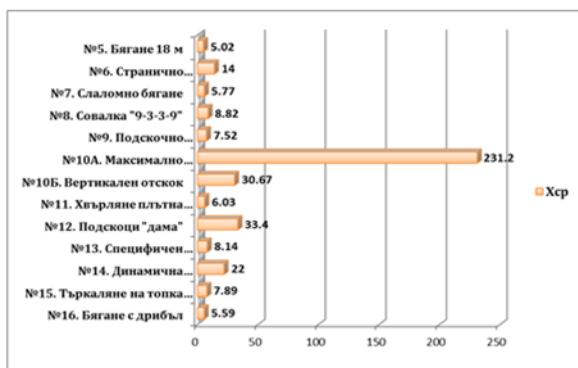


Фигура №26 Средни стойности на показателите за двигателна годност при момчетата от ЕТ

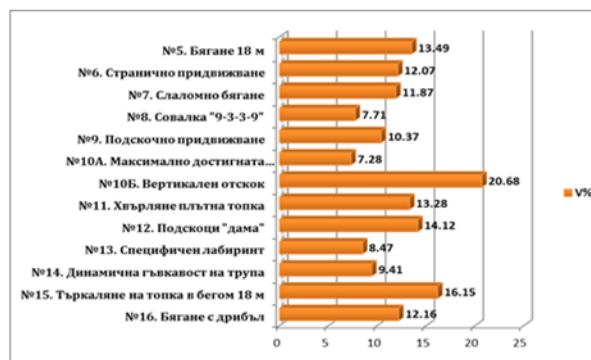


Фигура №27 Вариативност на показателите за двигателна годност при момчетата от ЕТ

By comparing the two samples of boys from the main sports-pedagogical experiment, we observe that in terms of the measured indicators of physical fitness, the control group shows homogeneity in 4 out of 12 tests, while the experimental group shows homogeneity in only two tests. In all other indicators, the values of both teams do not fall within the stability zone and are considered relatively homogeneous, with variation coefficients ranging from 10.24% to 21.34%. These findings indicate relative stability for the examined population.



Фигура №28 Средни стойности на показателите за двигателна годност при момчетата от КГ



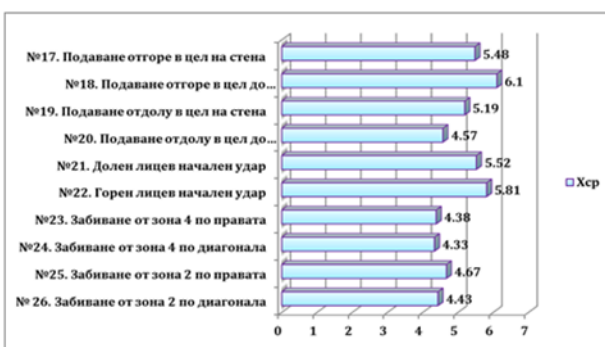
Фигура №29 Вариативност на показателите за двигателна годност при момчетата от КГ

It is interesting to note that homogeneity regarding indicators No. 8 "Serving 9-3-3-9 m" and No. 10A "Maximum achieved height" is observed in all five tested teams of 10-12-year-old boys from the preliminary and main pedagogical experiment.

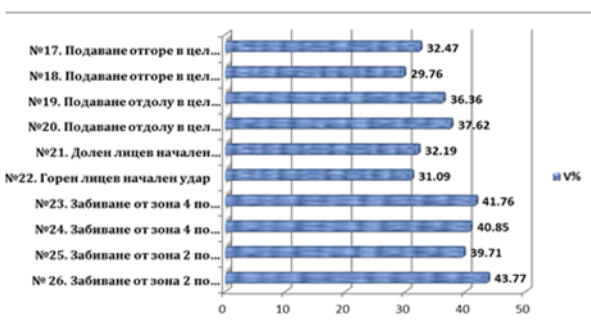
The average values of the examined indicators in the experimental group (EG) and control group (CG) are close, with the exception of indicators No. 10A, No. 10B, and No. 14, where a more significant difference is observed. In terms of "Maximum achieved height" and "Vertical jump," the team from "Levski Sofia" has an advantage, while in terms of "Dynamic trunk flexibility," better results are recorded among the boys from "Minyor" Pernik.

III.3.3. Average values and variability of indicators for technical preparedness among the examined volleyball players

Figures 30 to 33 present the calculated values of the sport-technical indicators during the initial testing of the volleyball players from the main pedagogical experiment.



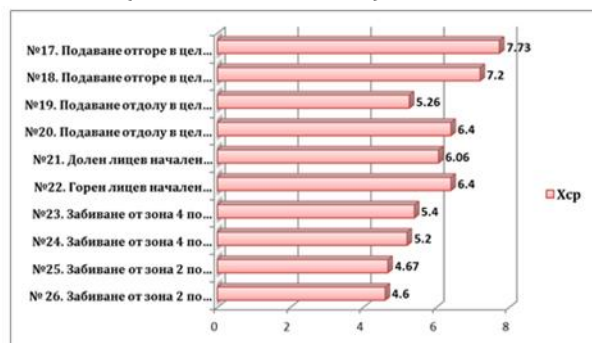
Фигура №30 Средни стойности на показателите за спортно-техническа подготовка при момчетата от ЕГ



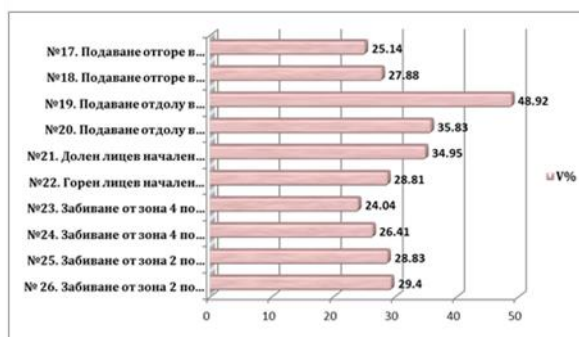
Фигура №31 Вариативност на показателите за спортно-техническа подготовка при момчетата от ЕГ

By comparing the two samples of examined individuals from the main pedagogical experiment regarding the indicators reflecting the dynamics of technical abilities, we can summarize that the control group of boys is more homogeneous and has a moderate dispersion in a larger number of indicators (9 out of 10) compared to the experimental team "Levski Sofia".

Unlike the examined teams in the preliminary stage of this study (mean = 4-5), the average achievements in the experimental group range from 4 to 6 successful attempts out of 10 possible, while in the control group, the volleyball players reach an average of 7 successful attempts, particularly in the indicators for "Overhead Passing to the Wall and to the Net" (No. 17 and No. 18).



Фигура №32 Средни стойности на показателите за спортно-техническа подготвеност при момчетата от КГ



Фигура №33 Вариативност на показателите за спортно-техническа подготвеност при момчетата от КГ

The average values of 9 out of 10 volleyball indicators are higher in the boys from the control group compared to those from the experimental group, indicating that the players from VC "Minyor" demonstrate greater confidence in performing technical maneuvers during the initial testing.

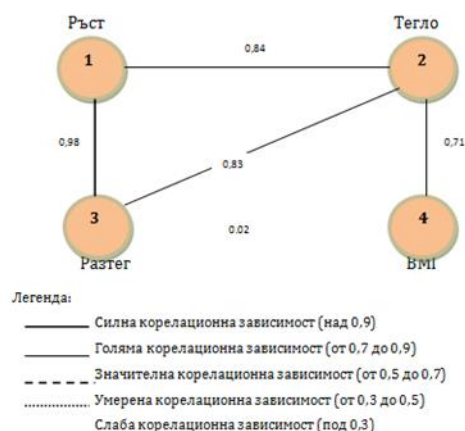
It is important to note that the athletes from VC "Minyor" have the least dispersion in the values of volleyball preparedness indicators during the initial testing compared to all the examined youth teams in this study - the three teams from the preliminary experiment and the experimental VC "Levski Sofia." This indicates a good choice of control sample.

III.4. Correlation analysis of the examined test indicators.

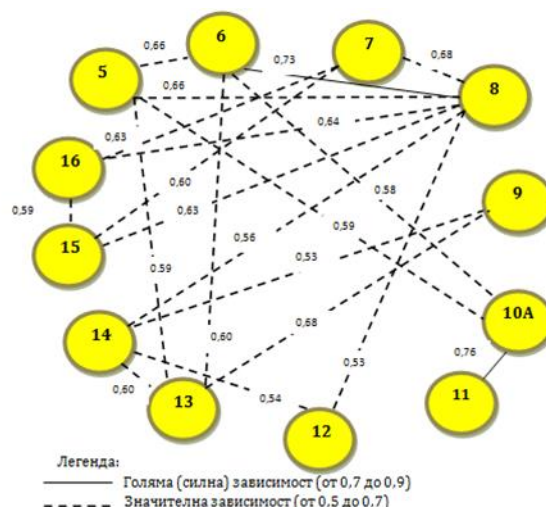
After analyzing the correlation matrix and correlation-structural models (Figures 34 to 39), we can confirm the assertion of sports science that the performance of technical volleyball skills above the net is closely dependent on the development of anthropometric indicators No. 1 "Height" and No. 3 "Flexibility".

Interestingly, the "Body Mass Index" (No. 4 BMI) has the highest number of significant connections (a total of 7) with the indicators of physical fitness, even though it does not show a significant relationship with any of the indicators of technical preparedness.

The structural model between anthropometric indicators and sport-technical preparedness in 10-12-year-old volleyball players is not well balanced - indicators from No. 17 to No. 21 do not show significant connections with any of the anthropometric indicators. Indicator No. 14 "Dynamic trunk flexibility" from the group of physical fitness indicators also does not correlate significantly with any anthropometric characteristic.

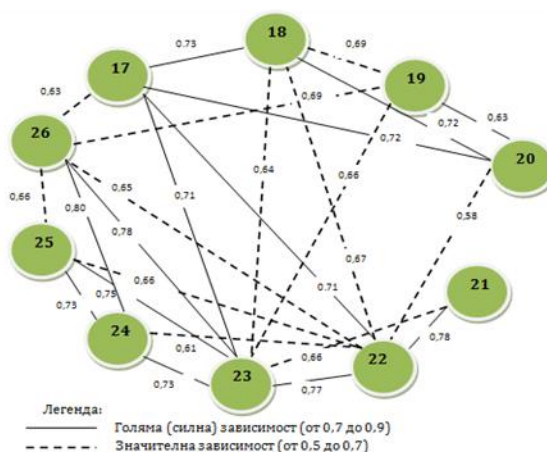


Фигура №34 Корелационно-структурен модел на по-значимите връзки между антропометричните показатели при 10-12 годишни волейболисти

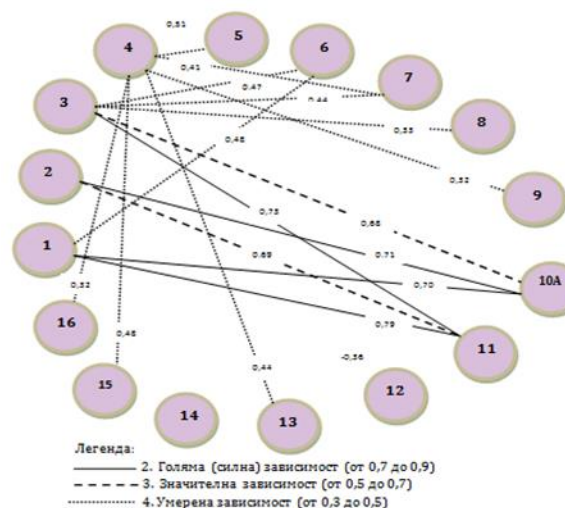


Фигура №35 Корелационно-структурен модел на по-значимите връзки между показателите за двигателна годност при 10-12 годишни волейболисти

Among the technical indicators, the greatest number of significant connections (a total of 8) is observed between No. 22 "Upper frontal initial strike" and No. 23 "Spiking towards the strengthening zone - Spiking from Zone No. 4 straight." The lower frontal initial strike (No. 21) has the weakest interaction with the other examined sport-technical indicators.

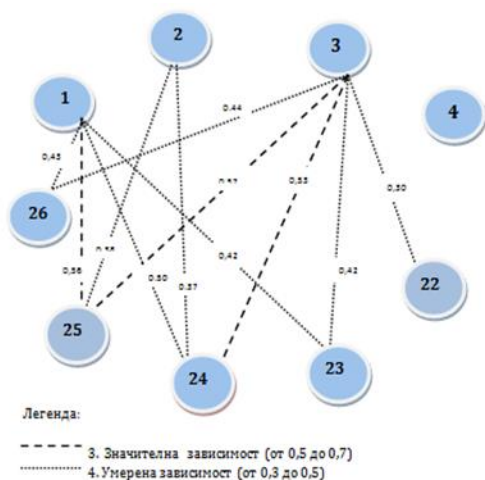


Фигура №36 Корелационно-структурен модел на по-значимите връзки между техническите показатели при 10-12 годишните волейболисти



Фигура №37 Корелационно-структурен модел на по-значимите връзки между отделните групи показатели за антропометрия и двигателна годност при 10-12 годишни волейболисти

Figure №38 presents the significant correlations between anthropometric indicators and sport-technical preparedness in 10-12-year-old volleyball players. Immediately noticeable



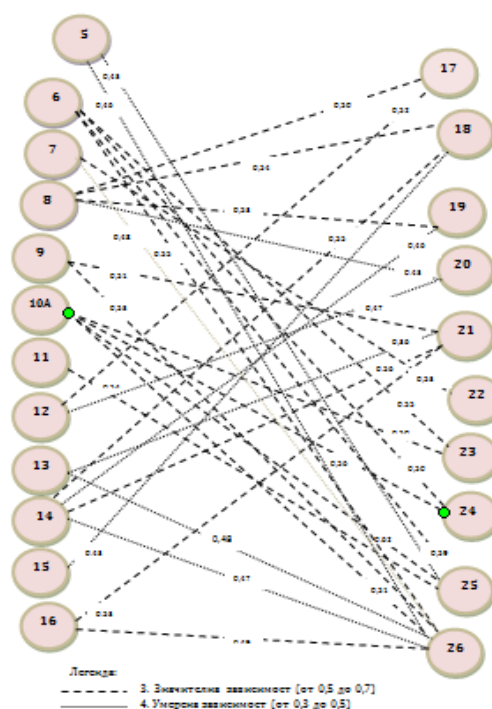
Фигура №38 Корелационно-структурен модел на по-значимите връзки между отделните групи антропометрични показатели и техническа подготовка при 10-12 годишни волейболисти

Upon detailed examination of the results, we can conclude that anthropometric indicators have a weak influence on the performance of technical skills in volleyball, specifically in controlling the ball with both hands from above and below, which are of primary importance in the training of 10-12-year-old boys. This provides us with an additional impetus to decide that anthropometric indicators (from №1 to №4) should not be prioritized in the growth of results in the current study.

Upon detailed examination of the correlation-structural model presented in Figure №39, it should be noted that each indicator of physical fitness shows a more significant relationship with one of the technical preparedness groups in 10-12-year-old volleyball players. Out of the seven presented connections, indicator №26 "Spiking from Zone №2 along the diagonal" stands out with four significant dependencies (ranging from 0.5 to 0.7).

The established significant dependencies ($r=0.5-0.7$) between physical and sport-technical preparedness for the examined group reach a total of 19, indicating a well-selected test battery for 10-12-year-old volleyball players.

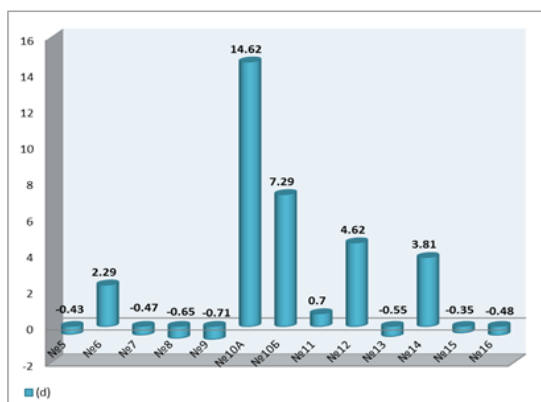
is the imbalance in the structural model, as indicators from №17 to №21 do not show significant relationships with any of the anthropometric indicators. Regarding the "Body Mass Index" (BMI), there is a substantial difference compared to the interaction of anthropometric characteristics with indicators of physical fitness. From the analysis of the results, it becomes clear that the №4 BMI does not exhibit a significant correlation with any of the indicators of technical preparedness.



Фигура №39 Корелационно-структурен модел на по-значимите връзки между отделните групи показатели за физическа готовност и техническа подготовка при 10-12 годишни волейболисти

III.5. Assessing the Impact and Effectiveness of the Experimental Volleyball Methodology.

According to the Student's t-test for independent samples, for all analyzed indicators of



Фигура №40 Прираст на резултатите по показателите за двигателна
годност при момчетата от ЕГ

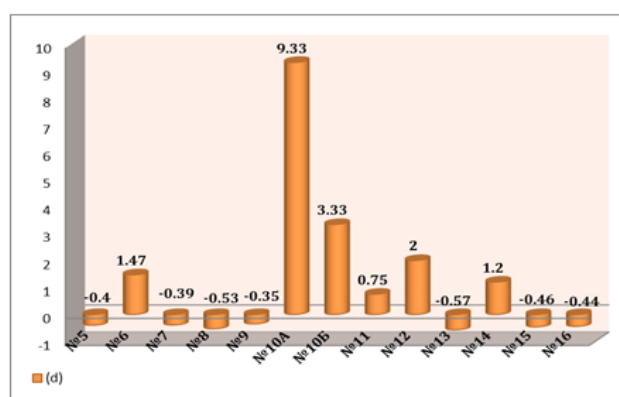
With the exception of test №12 "Dama Substitutions," the coefficient of Cohen's d indicates a very high practical significance of differences in six indicators, high significance in five indicators, and moderate significance in one indicator for physical fitness (test №11 "Throwing a Dense Ball").

The analysis of the investigated indicators of physical fitness in 10-12-year-old volleyball players reveals that the percentages of variation within the experimental and control groups fall within the normal distribution and are supported by a high confidence probability of $P(t) \geq 95\%$.

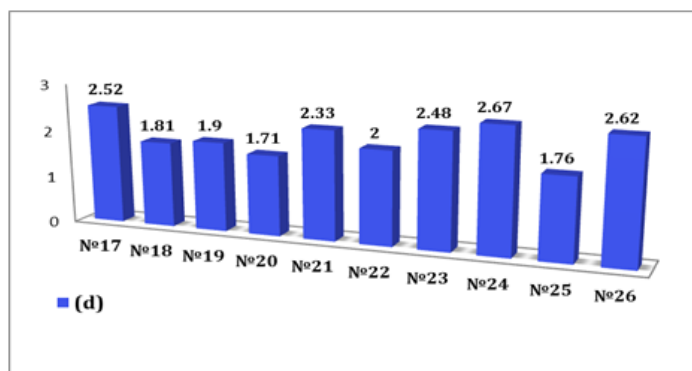
According to the reported results of the mean values, the experimental group surpasses the control group in their achievements for all investigated indicators throughout the experiment.

As a result of the applied experimental methodology in volleyball for 10-12-year-old boys in the experimental group, a significant improvement in their results is observed for all investigated indicators within the domain of physical fitness by the end of the experiment.

physical fitness (Figure №40 and №41), a statistically significant improvement in results is observed. All values are higher than the critical value, with $t_{\alpha}=2.10$ for physical exercise (EG) and $t_{\alpha}=2.15$ for control group (CG) at a significance level of $\alpha=0.05$. This provides evidence to accept the alternative hypothesis, which states that the observed empirical difference (temp) is not random, meaning it is statistically significant and can be generalized to the general populations [46].

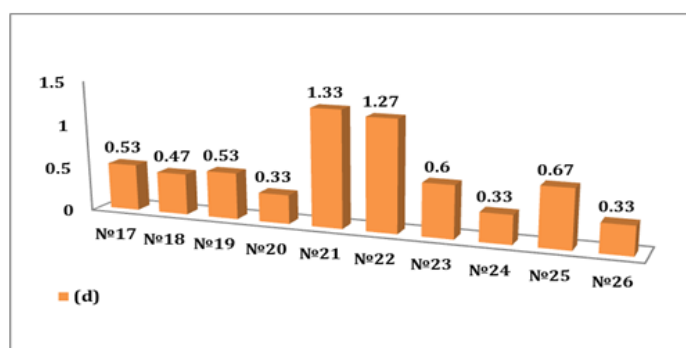


Фигура №41 Прираст на резултатите по показателите за двигателна
годност при момчетата от КГ



Фигура №42 Прираст на резултатите по показателите за спортно-техническа подготовка при момчетата от ЕГ

probability of $P(t) = 100\%$. This provides grounds to accept the alternative hypothesis, which states that the observed difference (temp) based on empirical data is not random but statistically significant, and it can be generalized to the general populations [46].



Фигура №43 Прираст на резултатите по показателите за спортно-техническа подготовка при момчетата от КГ

According to the Student's t-test for independent samples, for all analyzed indicators of sport-technical preparedness in the experimental group (Figure 42 and Figure 43), a statistically significant improvement in the results is observed (unlike the control group). All values are higher than the critical value ($t_{\alpha} = 2.10$) at a significance level of $\alpha = 0.05$, and they are supported by a confidence

The average values of the initial testing for 9 out of 10 indicators of sport-technical preparedness are higher in the "Minyor" volleyball players, with an equal result (mean = 4.67) for both the experimental group (EG) and the control group (CG) regarding indicator No. 25, "Spiking the ball from zone No. 2 along the straight line." This confirms the

significant superiority of the CG before the experiment in terms of this group of indicators.

During the experiment, the EG significantly improved its mean values compared to the control group (mean). According to the reported results for 8 out of 10 investigated indicators of sport-technical preparedness, the EG surpasses the achievements of the CG, with 7 of the achievements also supported by the practical significance of the differences according to Cohen's d coefficient.

The experimental group exhibits a significantly higher growth in all investigated indicators of sport-technical preparedness compared to the control group, with the lowest recorded growth value in "Levski Sofia" ($d_{\min} = 1.71$ units) proving to be better than the highest growth value in "Minyor" Pernik ($d_{\max} = 1.33$ units).

CHAPTER IV. CONCLUSIONS AND RECOMMENDATIONS

IV.1. Conclusions

The conducted analysis of literary sources, the survey study, as well as the pedagogical experiments conducted in real conditions provide us with the basis to draw the following conclusions regarding sports pedagogy:

1. In the educational and training process of 10-12-year-old volleyball players, it is beneficial to focus on developing motor qualities such as speed and agility, which are sensitive to this age period. From the analysis of the survey results, it became clear that speed is most influenced by exercises aimed at improving volleyball skills, specifically the two-handed overhead and underhand ball passing techniques. Agility and coordination, on the other hand, are developed through specific exercises that address each element of volleyball technique in the educational and training process for 10-12-year-old boys. According to sports specialists, it is possible to work on developing the entire range of technical and tactical skills in volleyball for 10-12-year-old players.
2. The players from VC "Minyor" (control group) have the least variation in the values of volleyball preparedness during the initial testing compared to the other four teams in the present study - three teams observed in the preliminary pedagogical experiment ("Arda" Kardzhali, "Lyulin" Sofia, and "Viktoria" Plovdiv) and the experimental group VC "Levski Sofia," indicating a good selection of the control sample. The average values of 9 out of 10 indicators of sport-technical preparedness are higher in the boys from the control group compared to those from the experimental group, i.e., the players from VC "Minyor" demonstrate significantly more confidence in performing technical maneuvers during the initial testing.
3. After analyzing the correlation matrix and correlation-structural models, we can confirm the claim of sports science that the performance of volleyball technical skills above the net is closely dependent on the development of anthropometric indicators, specifically Indicator 1 "Height" and Indicator 3 "Flexibility." "Body Mass Index" (Indicator 4 BMI) has the highest number of significant correlations (a total of 7) with indicators of physical fitness but does not show a significant correlation with any indicator of technical preparedness. Anthropometric indicators have a weak influence on the performance of technical skills in volleyball, particularly in controlling the ball with two-handed overhead and underhand techniques, which are of primary importance in the training of 10-12-year-old boys.
4. According to the Student's t-test for independent samples, the analyzed indicators of physical fitness show a statistically significant improvement in results, with all values in the experimental group (EG) being higher than the critical value. This provides evidence to accept the alternative hypothesis, which claims that the observed difference (temp) based on empirical data is not random, meaning it is statistically

significant and can be generalized to the general populations. The variation percentages in the studied populations for physical fitness in the experimental and control groups fall within the normal distribution and are supported with a high level of confidence probability $P(t) \geq 95\%$ in their respective groups. With the exception of Test 12 "Dot Jumps," the "Cohen's d" coefficient indicates a very high practical significance of differences between the experimental and control groups for 6 indicators, high significance for 5 indicators, and moderate significance for one indicator of physical fitness (Test 11 "Medicine Ball Throw").

5. As a result of the applied experimental methodology in volleyball for 10-12-year-old boys in the experimental group (EG), a significant improvement (d) is observed in their results across all investigated indicators of physical fitness. The experimental group outperforms the control group in their achievements across all studied indicators of physical fitness throughout the experiment, as indicated by the reported mean values (\bar{X}). There is a statistically significant improvement in the results of sport-technical preparedness in the experimental group (in contrast to the control group), with values exceeding the critical value for all analyzed indicators and supported with a confidence probability of $P(t) = 100\%$ in the respective group.
6. Throughout the experiment, the experimental group (EG) has significantly improved its mean values in terms of indicators of sport-technical preparedness compared to the control group (\bar{X}), with the reported results surpassing the achievements of the control group in 8 out of 10 investigated indicators. It is noteworthy that the control group had significantly higher initial values in these tests. For 7 of the mentioned indicators, there is evidence of moderate to very strong practical significance, confirmed by the "Cohen's d" coefficient.
7. The experimental group exhibits a significantly higher improvement in all investigated indicators of sport-technical preparedness compared to the control group, with the lowest recorded value for improvement in "Levski Sofia" ($d_{\min} = 1.71$ units) surpassing the highest value for improvement in "Minyor" Pernik ($d_{\max} = 1.33$ units).
8. The observed differences between the mean achieved levels (\bar{X}) and the improvement in results (d) of the investigated indicators in favor of the experimental group of 10-12-year-old volleyball players compared to the control group demonstrate the significance of the applied experimental methodology.

These conclusions give us full grounds to summarize that:

The experimental scientifically-based training methodology focusing on speed and agility had a positive impact on the specific performance of 10-12-year-old volleyball players from "Levski Sofia" Volleyball Club (experimental group), with their overall improvement in results significantly surpassing the achievements of the control group. This conclusively confirms the validity of our working hypothesis.

IV.2. Contributions to Sports Science

The theoretical and practical investigation and the systematic conclusions drawn in this study allow us to highlight the following important scientific contributions to sports science:

1. The selection of parameters in the test battery presented in this study is adequate for application in 10-12-year-old volleyball players.
2. The current state and trends in the development of specific performance in 10-12-year-old boys actively practicing volleyball in a sports club have been reported.
3. Correlational dependencies have been established among the investigated indicators of anthropometry, physical fitness, and sport-technical preparedness.
4. The mean values of the investigated populations in 10-12-year-old volleyball players have been revealed.
5. The variability of the investigated indicators of physical fitness and sport-technical preparedness has been disclosed.
6. The role of the applied methodology for developing specific performance with a focus on speed and agility in 10-12-year-old volleyball players has been proven.

IV.3. Recommendations

In order to improve the specific performance and optimize the sports training of 10-12-year-old volleyball players, we recommend the following:

1. Implementation of the developed test battery for assessing the specific performance in young volleyball players, in order to systematically evaluate their capabilities. To facilitate the recording of results, specially designed protocols (Appendix №2) can be used.
2. It is recommended to conduct 3-4 or more training sessions per week, with a duration of 75-90 minutes or longer.
3. Eight sports activities from the monthly training plan should focus on developing speed and agility.
4. Allocate 15-30 minutes of each training session to the development of motor skills, with a specific emphasis on speed and agility.
5. Enhance the volleyball skills repertoire and the development of motor skills in a cohesive and interconnected manner.
6. Implement the proposed methodology to facilitate faster mastery of the basic techniques of volleyball and enhance the specific performance of 10-12-year-old volleyball players (Appendix №6).

LIST OF SCIENTIFIC PUBLICATIONS
on the topic of the dissertation work

1. Vasileva, L. Age sensitivity and emphases in volleyball training for 10-12-year-old boys and girls, Sports and Science, Issue No. 5, Sofia, 2015.
2. Vasileva, L. Analysis of physical development and specialized preparation of 10-12-year-old volleyball players, Sports and Science, Issue No. 3, Sofia, 2016.
3. Vasileva, L. Analysis of sport-technical preparedness of 12-year-old volleyball players, Sports and Science, Issue No. 4, Sofia, 2017.
4. Vasileva, L. *Sports-pedagogical testing as a control method for measuring the specific efficiency with 10-12-year-old volleyball players*, Activities in physical education and sport, Vol. 07, No 1, Skopje, Macedonia, 2017.

