



**NATIONAL SPORTS ACADEMY  
„Vassil Levski“**

**DEPARTMENT OF "SNOW SPORTS"**

**VALENTIN YANKOV VUKOV**

**IMPROVEMENT OF THE ADMISSION AND  
CONTROL SYSTEM FOR YOUNG  
BIATHLONISTS IN SPORTS SCHOOLS IN THE  
REPUBLIC OF BULGARIA**

**ABSTRACT**

of a dissertation  
for awarding the educational and scientific degree  
"DOCTOR" in  
professional direction  
7.6. "Sports"

Supervisor:

Associate Professor Krastyo Todorov Zgurovski, PhD

Official Reviewers:

Associate Professor Nikolay Angelov Panayotov, PhD

Prof. Rositsa Stefanova Tsrova, PhD

**Sofia, 2023**

**The dissertation work has been approved, discussed and proposed for official defense by the "Snow Sports" Department at Vasil Levski National Academy of Sciences.**

**The dissertation contains 163 standard typewritten pages. Illustrated with 12 tables, 34 figures and 10 appendices. The bibliography includes 81 literary sources, of which 48 in Cyrillic, 20 in Latin and 12 Internet resources.**

**The defense of the dissertation will take place on 21.02.2023 at 1:00 p.m. in hall A3 of the National Academy of Sciences, V. Levski".**

## **INTRODUCTION**

The growing importance of sport and its social functions - prestigious, educational, healing, social-integrative, cognitive, etc., leads to intensive development of scientific research in each of its fields.

Biathlon - the modern "winter biathlon" - consists of cross-country skiing with weapons at established distances and shooting at targets from a prone and upright position from a firing range. The specific feature of biathlon lies in the complex combination in one competition of two sports with different physiological effects on the body - cross-country skiing and shooting. It hardly occurred to the Finnish soldiers, who as early as 1555 (according to Russian chronicles) used skis during combat operations, that after 400 years their dangerous activity would turn into a sports discipline.

Today, unfortunately, the big sports clubs in biathlon pay less and less attention to the work in children's and youth schools (DYS) and rely mainly on episodic results of talented children, and not on a scientifically based system of sports training, which guarantees for achieving high and stable sports results. This leads to a decrease in the number of our elite competitors in this sport and the elimination of entire generations of talented young biathletes.

Most good biathletes of the recent past were students of sports schools (SU).

Their high results in the field of sportsmanship undoubtedly prove that the system of work in sports schools has a significant contribution to their realization. There, the best conditions are created for the educational, training and educational process of sports talents. Unfortunately, the excessively long period of transition, almost 33 years, had its negative impact on them as well. Some of these schools were closed, in others the quality and conditions for the educational and training process are not at the required level. In the few remaining sports schools in Bulgaria, the selection and control criteria are low, and this reflects on the sports results, which are unfortunately very unsatisfactory.

Taking into account the listed facts, the Ministry of Youth and Sports, as well as the Ministry of Education and Science, are making efforts to restore sports schools in Bulgaria. The ambition of the government and sports specialists is that these schools once again become centers for the preparation of the reserve for high sportsmanship. This is the direction of the dissertation being developed.

## **FIRST CHAPTER**

### **STATUS OF THE PROBLEM ACCORDING TO LITERATURE DATA**

### **I.1.1. Historical development of sports schools in Bulgaria, good practices in Europe and the world**

Since the middle of the last century, the specialized training of young elite athletes has been a priority of the state. For this purpose, in 1949 in Bulgaria, TFS (Technical School for Physical Culture and Sports) was established in the city of Plovdiv, and in 1974, a similar one was opened in the village of Pravets. In the same year, they were transformed into Secondary Sports Schools, gradually opening their doors in the cities of Varna, Ruse, Pleven, V. Tarnovo, Haskovo, Burgas, etc.

By 1990, 36 sports schools (SU) were operating in the country. In 1991, changes were made to the network, the number of students and the number of sports, with the view that the number of classes should not exceed 360, and the number of students – 9,600. Out of 36 SUs with admissions by state order, 20 remain, with 16 being announced zero reception and they are left with damping functions. At the end of 1992, a new change in the network of secondary schools was proposed, and from 20 secondary schools with 8,000 students, 9 with 4,575 students remained, giving the municipalities the opportunity to open additional sports classes by taking over their financial support.

As of September 1, 2004, 17 sports schools were operating in the country - Sofia-city - 3, Northern Bulgaria - 5 and Southern Bulgaria - 9.

In accordance with the provisions of the Organizational Regulations, the Ministry of Youth and Sports (MMS) finances 246 full-time positions for sports teachers and sports specialists in SU (2003 to 2007) and 293 full-time positions for sports teachers (2007 - until June 2008. ).

In 2004 SU "Gen. Vladimir Stoychev" has been designated as a secondary manager of budgetary credits to the Ministry of Internal Affairs. Until now, it is under the Ministry of Education and Science.

In 2008, 21 SUs functioned in the country - one state and 20 municipal, distributed territorially as follows:

Sofia-city – 3; Northern Bulgaria – 8 in the cities of Pleven, Ruse, Varna, Vratsa, Dobrich, Silistra, Targovishte and Razgrad; Southern Bulgaria – 10 in the cities of Plovdiv, Burgas, Haskovo, Sliven, Samokov, Chepelare, St. Zagora, Yambol, Pernik and Kyustendil.

By 2011, there were 21 sports schools in the country, of which 20 were municipal and one was state. During the academic year 2011-2012, a municipal sports school was opened in the town of Sandanski, and for the academic year 2012-2013, a state admission plan was approved for the newly opened municipal sports school in the town of Veliko Tarnovo.

At the present time, 23 sports schools are operating on the territory of the Republic of Bulgaria, of which 19 are municipal and 4 state, financed by the state

budget through the budget of the Ministry of Youth and Sports. The "Vasil Levski" Sports School, Plovdiv, is also in the process of conversion.

According to data from foreign authors (Bartow, G., Smith, Ch., 1978; Coosy, B., Power, F., 1983; Colly, R., 1988; Reep, J., 1991, etc.), under different form, sports schools are also created in the rest of the world - in France and Great Britain they exist as sports classes, and in the USA, Japan, Italy and Norway they are called sports high schools.

In 1975, Loi Mazeaud founded in Paris the sports academy "INSEP" (Institut National du Sport et de l'Éducation Physique), where talented athletes from the national teams in various sports can live, study and prepare year-round.

The special thing about sports schools is that both education and sports are developed in parallel and at a high level, emphasizing the high efficiency of the educational and training process. The necessary living conditions (boarding schools) have been created, as well as outdoor and indoor sports facilities. Students and sports teachers are given opportunities to conduct a two-time training regimen, as well as financial support for the training of young athletes in the conditions of sports camps. The necessary quality nutrition for athletes is provided (depending on the type of sport, students are divided into separate categories of nutrition), the necessary recovery is applied.

Only the best young athletes and the most promising children have the right to study in a sports school. This was Bulgaria's Olympic reserve. The schools themselves were created on the model of sports schools in the former USSR. That is why admission to sports schools is a very demanding and strictly controlled process.

### **I.1.2. State of Bulgarian sport and sports schools in Bulgaria**

Over the past 32 years, a number of social and economic changes have occurred in our country. They naturally affected the field of sports and affected the system of high sportsmanship to the greatest extent. Along with culture, sport was the face of Bulgaria to the world. Native athletes won medals and fame from various international competitions and Olympic Games. In all types of sports, we have had worthy representatives who, with the help of highly qualified coaches, perform excellently at various international events. Bulgarian sport was a benchmark for preparation, level and quality of work with elite athletes who are graduates of the various sports schools (SU) in the country. Bulgaria's best performance at the Olympics was in Moscow '80, where Bulgaria took 3rd place in the medal standings with 8 gold, 16 silver and 17 bronze medals. In the last few years, native athletes have not achieved the desired results. We are already on the side of the weak, the unprepared and are not able to meet the high training



requirements and the huge competition in the various sports. Sports schools made it possible to predict sports development, for early selection and specialization of talented child athletes. Their coaches prepared the annual and multi-year programming and carried out the sports training of the students at a high level in order to achieve a high sports result and prize ranking during participation in competitions. Today, the model of this type of school is introduced and developed around the world, while in Bulgaria things are different.

Sports schools are the nucleus responsible for the selection and development of future elite athletes. As an educational and educational institution for the training and preparation of "gifted children"-athletes, their main goal is to prepare well-motivated athletes to achieve high and stable results, with opportunities to win prizes in the highest ranking competitions. The dominant activity in SU is the educational and training process. The main factor for its realization is the correct programming and organization of training in the specific type of motor activity.

As a result of a number of accumulated and unresolved problems over the years, the educational and training process in the SU is characterized by a significant decrease in quality. The coordination and operational interaction between sports schools, sports organizations, school sports schools and united children's complexes during the selection and development of the

sports talent of student athletes has been violated. The sports clubs have limited the work with preparatory groups of children's and youth schools, which are the main units for attracting and selecting talented children. As one of the main reasons, we can point to the demographic collapse in the country, as a result of which in to a great extent reduces the possibility of quantitative and qualitative selection on the part of staffing, which leads to a lowering of the level of students who are candidates for sports schools. There are no mechanisms for diagnosing motor capabilities, as well as researching the interests of applicants for sports who wish to practice in a sports school. The centers for scientific and applied activity in sports are closed, this is also a problem in carrying out quality selection and control of the training process in sports schools. The quality of the educational and training process of the students from the sports schools, which are part of the country's sports reserve, is far from scientifically based methods and the high requirements of elite sports. There is a lack of interest on the part of the Bulgarian sports federations (BSF) in the selection of young talents, the selection of sports teaching personnel, as well as their retraining. The methodologies and uniform programs that are in the sports curricula at SU are outdated or do not meet the modern criteria for conducting an educational and training process. Sports teachers work according to their own methods and programs, which in many cases turns out to be an

obstacle to achieving high sports results and calls for placing in competitions from the international sports calendar. The fact that nearly  $\frac{1}{4}$  of sports teachers in sports schools do not have an educational qualification and the necessary professional qualification that is required to occupy this position is not unimportant. The lack of opportunity to acquire qualifications and prospects for future realization on the labor market is a prerequisite for the outflow of candidates for sports schools. At the insistence of the Ministry of Youth and Sports, the Ministry of Education and Science responded promptly and in accordance with the new State Education Requirements (SED) - from 2011/2012 vocational training was introduced after the 9th grade. Thus, SU graduates will graduate with one of the following three majors: assistant coach in the respective sport, assistant fitness instructor and organizer of sports events and championships (sports management). Those who want to develop and improve can continue their studies in the same specialties at the National Sports Academy - Sofia. This is a very important moment for the orientation of student-athletes with the aim of their successful future professional integration during or after the completion of their sports career.

Based on our research, we found that the lack of interest in SU is also due to the low level of teaching in general education subjects, which is the main factor for parents whose children are talented athletes not to apply

to SU. This is proof that the way to solve the problems accumulated over the years in the work of the SU requires interaction between the individual state institutions, municipalities, sports organizations, BOK and higher schools. It is necessary to build an effective unified system for preparation of student-athletes from SU, which would create a basis for development and to some extent bring guarantees for improving results and their realization in studies and sports.

### **I.1.3. Essence and specific features of the system for selection, admission and ongoing control of adolescent biathletes in sports schools in Bulgaria**

Sports selection (selection) is a package of methods for analysis and evaluation of children's giftedness or predisposition for development in a given sport.

A number of authors (Guzhalovsky, A. A, 1986; B. A. Ashmarin, Yu. A. Vinogradov, Z. N. Vyatkina, 1990; L. M. Matveev, 1999) consider selection as a continuous process and define several stages in its development.

- The first stage, called initial selection, has the task of determining (selecting) those children who have potential abilities for good results in a specific type of sport.
- The second stage envisages test trials and pedagogical monitoring to determine the children's abilities for a specific sports discipline.

- The third stage is the longest. During this stage, observations are made in the learning process and the development of motor abilities in order to establish rates of learning motor tasks.

Control as a part of human cognitive activity is a process in which information is collected and the actual state of a given object is assessed with a view to its purposeful (pre-planned) development and improvement (Zhelyazkov, Ts., Dasheva, D., 2006).

According to the authors, the main goal of control in the field of sportsmanship is to optimize the training and competition process based on objective information about the effect of the applied training effects on the athlete. In carrying out the selection, admission and the effectiveness of control in the sports schools, sports federations and the correctness of the coaches are highly relied upon. In most schools, the advantage of the achieved sports results from the state championships is used. In certain sports, this cannot be an objective criterion in childhood. The reason for this is the existence of "individual characteristics at the time when children enter puberty (according to biological age).

#### **I.1.4. Statement of the problem. Systems for control and assessment of sports training in biathlon**

The complex development of motor skills poses the question of the evaluation and control of the specific functional training of the competitors. For this purpose, many researchers develop specific tests and indicators. A

significant contribution in this direction is made by the introduction of pulsometry, control of La, BE, VO<sub>2</sub>max, etc. biochemical and physiological indicators. In practice, in biathlon, it is often necessary to assess the level of preparation of young competitors. In this way, the necessary information is obtained, which serves as a guide for the level of their development - whether they have the necessary physical qualities and functional capabilities, practical skills, whether they are progressing in the work process of the educational and training process and whether there is a prospect of developing in the future as highly qualified competitors to achieve high and stable results.

The new State Education Requirements (SED) set high standards for the admission, selection and control of the training of sports talents in the system of sports schools. The educational and training process and training in biathlon are aimed at achieving high sports results and personal improvement at the level of "sportsmanship". The currently existing criteria for selection and control over preparation and applied test batteries for admission of young biathletes to sports schools in the country do not meet the standards of modern sports, as well as European educational requirements.

The study of the specialized literature gives us reason to formulate the following working hypothesis of our research:

**The implementation in practice of an up-to-date system for the reception and control of the preparation of adolescent biathletes from the sports schools in the Republic of Bulgaria is a prerequisite for increasing the effectiveness of the training-training and competition process through the development of a methodology of multi-year sports training.**

## **SECOND CHAPTER**

### **OBJECTIVE, TASKS AND METHODOLOGY OF THE RESEARCH**

#### **II.1. Purpose of the study**

The **purpose** of the study is to increase the effectiveness of the training process for young biathletes from sports schools in Bulgaria by improving the system for reception, control and methodology of a unified system of sports training.

#### **II.2. Tasks of the research**

The main tasks of the research for the realization of the set goal are:

1. Information research on the organization and results of the entrance exams for sports schools in Bulgaria - "Biathlon" profile.

2. Pedagogical analysis and summary of the admission system developed in 2012.

3. Proposal to update the admission system for adolescent biathletes in sports schools in the Republic of Bulgaria.

4. Verification of the effectiveness of the updated admission system (training control) of adolescent biathletes from sports schools in Bulgaria.

5. Development of Methodologies of multi-year sports training in biathlon in the age range 12-19 years.

### **II.3. Research methodology**

#### **II.3.1. Organization of the study**

The present study was conducted over a period of 10 years - 2013 - 2022.

The **object** of research is the system for admission and control of the training of students with the "Biathlon" profile from the sports schools in Bulgaria.

**Subject** of research are the main signs of physical fitness and special work capacity in 12-19 year old biathletes.

The subjects were: 202 biathletes aged 12 to 19, of which 100 were boys and 102 were girls.

#### **II.3.2. Research methods and indicators**

(divided into theoretical and practical research methods)

The following research methods have been applied to realize the set goal and tasks of the research:



### **II.3.2.1. Methods of theoretical research and analysis:**

**Bibliographic analysis** of specialized literature;

**Content-analysis** of documents to establish the status of the researched problem;

**Pedagogical modeling** for the development of a Unified system for sports training in biathlon in the age range 12-19 years.

#### **Prerequisites:**

The training and competition process of young biathletes should be tailored to the children's chronological age, not their biological age.

Training programs should take advantage of periods of acceleration of the adolescent organism to speed up adaptation processes.

Training and competition in developmental periods should not be focused on short-term goals and results.

Basic movements, skills and habits are not mastered precisely.

#### **Principles of the program:**

- Continuity of the training process;
- Complex development of motor skills;
- Gradual, strictly dosed and wave-like alternation of the volume and intensity of the training load;
- Organization and methodology of the training process, selection of training equipment, the volume and intensity of the load should be in accordance with the age

characteristics and development of the adolescent organism;

- The age-related problems of sports training should be considered from the position of unity and interdependence of remedial and educational tasks.

#### **II.3.2.2. Methods for establishing the empirical results:**

- **Targeted pedagogical (research) observation**
- A **confirmatory experiment** to determine the level of physical fitness of biathletes;
- **Sport-pedagogical testing** - to establish the level of physical fitness and special working capacity of the biathletes under investigation.

On the basis of the literary and documentary analysis, a sufficient number of tests and indicators meeting the requirements for reliability, credibility, objectivity and standard were selected, which are included in the test battery of the study. In a synthesized form, the 9 sports-pedagogical tests used to determine the physical fitness of biathletes are presented in (table 1).

*Table 1. Sports and pedagogical tests*

<b>№</b>	<b>Tests and Indicators</b>	<b>Units of Measure</b>	<b>Accuracy</b>
<b>1</b>	<b>Sprint</b>	<b>m</b>	<b>0,01 s.</b>
<b>2</b>	<b>Long jump from a standing position with two feet</b>	<b>m, sm</b>	<b>1 sm.</b>
<b>3</b>	<b>Elevation of the corpse from the occiput</b>	<b>Number of repetitions</b>	<b>Until refusal</b>
<b>4</b>	<b>Pushups</b>	<b>Number of repetitions</b>	<b>Until refusal</b>
<b>5</b>	<b>Smooth running 600m, 1000m, 3000m, 5000m</b>	<b>m</b>	<b>1,0 min and 0,01 s</b>
<b>6</b>	<b>Rollers 800 m - hands</b>	<b>m</b>	<b>1,0 min and 0,01</b>
<b>7</b>	<b>Rollers 800 m - legs</b>	<b>m</b>	<b>1,0 min and 0,01</b>
<b>8</b>	<b>Shooting test 10 rounds – prone</b>	<b>Hits</b>	<b>Points</b>
<b>9</b>	<b>Shooting test 10 cartridges - straight</b>	<b>Hits</b>	<b>Points</b>

### **II.3.3. Mathematical-statistical methods for processing the research results**

The research results are subjected to mathematical and statistical processing through: variation analysis, hypothesis testing, sigma evaluation method, factor analysis.

## **CHAPTER THREE**

### **RESULTS AND ANALYSIS**

#### **III.1. Average values and variability of the studied signs of special physical fitness**

The applied variation analysis in the processing of the output data from the conducted testing allowed to reveal the average levels and the variability of each of these signs.

The analysis of Table 2 shows that the male biathletes covered the sprint distance of 60 m in an average of 10.54 sec.

Quite naturally and according to our expectations, the speed and speed capabilities of each of the boys in the group are developed to a different level. Evidence of this is the recorded minimum ( $X_{\min} = 14.00$  sec.) and maximum ( $X_{\max} = 8.9$  sec.) values for indicator 1. This, of course, affects the variability of the indicator, information about which the coefficient of variation carries (V).

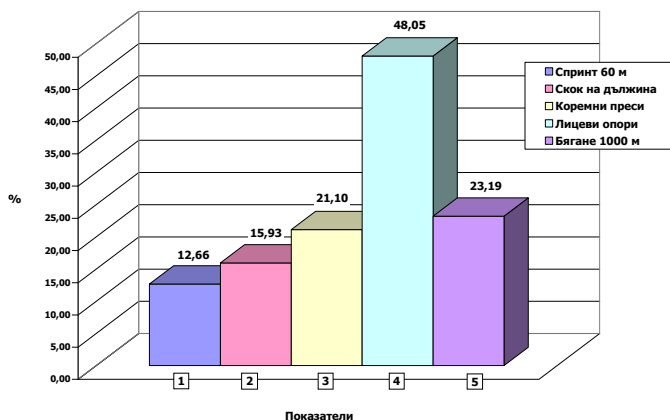
As can be seen from table 2 and figure 1,  $V_1 = 12.66$  % and therefore, the group of 12-14 year old biathletes studied by us is relatively homogeneous in terms of the level of development of speed and speed capabilities of the boys included in it.

Similar dependencies are also observed regarding the level of development of:

- the explosive power of the lower limbs during muscle efforts in the horizontal plane (index 2 – V2 = 15.93%);
- the explosive power of the abdominal muscles (index 3 – V3 = 21.10%) and
- general durability (indicator 5 – V5 = 23.19%);

**Table 2. Average values and variability of the signs of physical fitness of boys from grades 5-7**

№	Parameters Indicators	X	S	V	min	max	As	Ex
1.	Sprint 60 m	10,54	1,33	12,66	14,00	8,9	0,89	0,60
2.	Long jump	163,48	26,05	15,93	119	211	0,03	- 0,70
3.	Crunches	20,48	4,32	21,10	12	27	- 0,43	- 0,61
4.	Pushups	22,24	10,69	48,05	3	40	- 0,22	- 0,71
5.	Running 1000 m	266,62	61,83	23,19	420,0	197,0	1,53	1,29



**Figure 1. Dispersion of signs of physical fitness of the 5th-7th grade boys**

The same cannot be said, however, about the level of development of the explosive power of the upper limbs. As is clear from Figure 1, for indicator 4, the value of the coefficient of variation  $V$  is higher than 30% ( $V_4 = 48.05\%$ ), which gives reason to consider that the studied group of 12-14-year-old biathletes is inhomogeneous in relation to the stated motor quality. This means that in the future, on the basis of the individual approach, in the process of work on developing the explosive power of the upper limbs, adequate training effects should be selected and applied to each of the boys.

What are the results of the girls biathletes?

The results of the variation processing of the initial data from the conducted sports-pedagogical testing

(table 3) show that the girls achieved an average result according to indicator 1 (X1 girls = 10.43 sec.), which is better by 0.11 sec. than that of boys of the same age group.

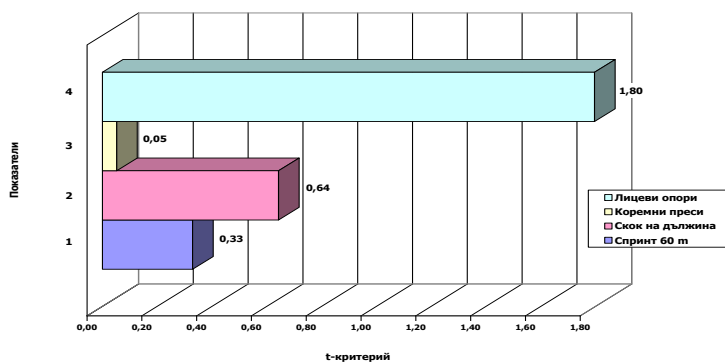
**Table 3. Average values and variability of the signs of physical fitness of girls in grades 5-7**

<b>№</b>	<b>Parameters Indicators</b>	<b>X</b>	<b>S</b>	<b>V</b>	<b>min</b>	<b>max</b>	<b>As</b>	<b>Ex</b>
<b>1.</b>	<b>Sprint 60 m</b>	10,43	0,77	7,40	12,59	9,09	0,76	1,62
<b>2.</b>	<b>Long jump</b>	158,55	24,25	15,30	103	194	- 0,69	0,23
<b>3.</b>	<b>Crunches</b>	20,41	4,10	20,10	12	27	- 0,16	- 0,20
<b>4.</b>	<b>Pushups</b>	17,23	7,39	42,92	3	30	- 0,30	- 0,15
<b>5.</b>	<b>Running 1000 m</b>	146,27	15,24	10,42	180	121	0,34	- 0,29

This seemingly illogical result is due to the fact that in the group of boys there are those whose achievements are very poor - the slowest boy achieved 14.00 seconds, while the slowest girl covered the distance of 60 m in 12.59 sec.

As can be seen from the table, for the next 3 indicators, quite naturally, a higher level of development of the studied signs characterizing the explosive power of the lower limbs during horizontal muscle efforts is observed in boys (indicator 2 - the advantage of boys is almost 5 cm ), abdominal explosive power (metric 3 - no advantage) and upper extremity explosive power (metric 4 - boys do 5 more push-ups on average).

However, the existence of differences between the average levels of the respective signs is not sufficient reason to conclude that boys are better physically prepared than girls. Therefore, in order to establish the significance of the observed differences, the null hypothesis was tested using the so-called comparative Student's t-test (Figure 2).



**Figure 2. Significance of the differences between the mean levels of the investigated characteristics of physical fitness in both sexes**



It should be noted here that the comparison is possible only on the first 4 indicators, since the distance that boys and girls run to establish the level of development of their general endurance is not the same - for boys it is 1000 m, and for girls – 600 m, which makes comparing the results incorrect.

Figure 2 shows that the calculated t-test values are between 0.05 (for indicator 3) and 1.80 (for indicator 4). As indicated in the research methodology, the critical value of this criterion, calculated according to Masalgin's table (Brogli, Ya., Petkova, L., Damyanova, R., 1990) is 2.02. This gives reason, with a high guarantee probability ( $P \geq 95\%$ ), to confirm the null hypothesis, according to which the differences we found between the levels of development of the observed signs of physical fitness in the 12-14-year-old biathletes of both sexes are insignificant. Therefore, there is no obstacle in this age period for physical training to be conducted jointly for boys and girls.

### **III.3.2. Factor structure and main factors of physical fitness of 12-14 year old biathletes (boys and girls)**

One of the important steps in clarifying the research problem is related to revealing the factor structure and identifying the main factors of the special physical preparedness in the boys and girls of the two

studied populations, which is of high informational value for optimizing the educational and training process.

The analysis of the results of the applied factor analysis shows that the factor structure of the special physical fitness in boys is made up of 4 main factors (table 4), which explain an extremely high percentage of the variance of the studied phenomenon (98.66%).

This means that the indicators included in the attached test battery are highly informative (valid) and carry reliable information about the special motor qualities of biathletes.

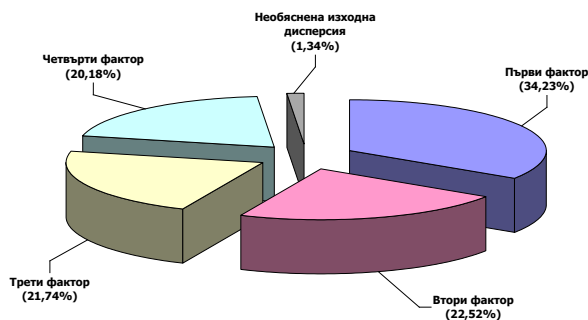
**Table 4. Factor structure of the special physical fitness of the male biathletes**

№	I	II	III	IV	$h^2$	$1 - h^2$
1.	<b>-0,727</b>	-0,422	-0,137	0,479	0,955	0,045
2.	<b>0,928</b>	0,209	0,153	-0,242	0,987	0,013
3.	0,311	<b>0,862</b>	0,269	-0,293	0,998	0,002
4.	0,140	0,197	<b>0,959</b>	-0,147	1,000	0,000
5.	-0,452	-0,350	-0,230	<b>0,783</b>	0,994	0,006
$\Sigma\alpha$	<b>34,23%</b>	<b>22,52%</b>	<b>21,74%</b>	<b>20,18%</b>	<b>98,66%</b>	

As can be seen from the table, the relative shares of the initial variance explained by each factor range

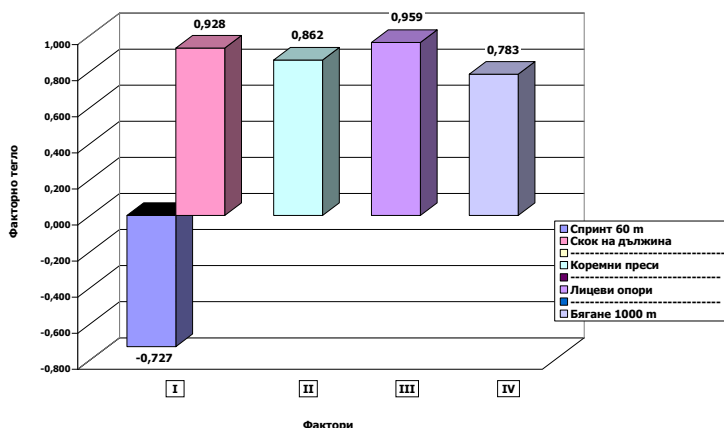
between 34.23% and 20.18%, and the unexplained variance is only 1.34%.

Figure 3 provides a good visual representation of this ratio.



**Figure 3. Relative shares of baseline variance explained by each factor in 12-14 year old biathletes**

The first factor (Fig.3) explains the highest percentage (34.23 %) of the initial variance of the physical fitness of the boys from this population. With the highest factor weight here are the first two indicators, respectively "sprint 60 m" (with a factor weight of 0.928) and "long jump" (with a factor weight of -0.727). This means that the most important for 12-14-year-old biathletes can be determined speed and sprinting capabilities and the associated explosive power of the lower limbs.



**Figure 4. Factor structure of physical fitness of 12-14 year old biathletes**

The second factor (Figure 3) explains a much lower percentage of the initial variance of the studied phenomenon – 22.52% and is determined by only one indicator (abdominal presses). It can be identified as "abdominal explosive power".

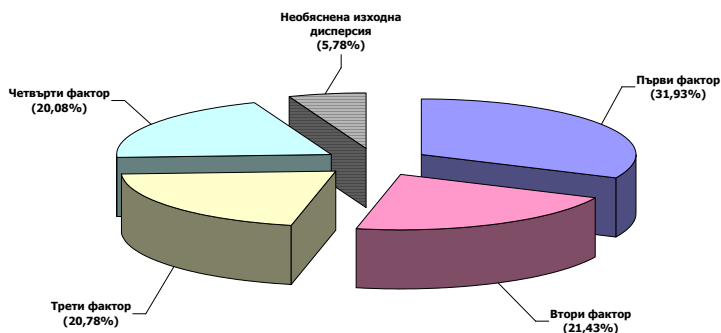
The third factor (21.74 %) is related to indicator 4 and has the highest factor weight (0.959). It determines the place in the factor structure of the physical fitness of the 12-14-year-old biathletes (Figure 4) of the explosive power of the upper limbs.

The fourth factor (20.18%, figure 3) reveals the importance of general endurance (indicator 5, factor weight 0.783), as an important element of the special physical fitness of 12-14-year-old biathletes (figure 4).

The analysis shows that the relative shares of baseline variance explained by each factor in female biathletes are very close to those of boys (table 5). A difference is observed only in relation to the lower (31.93 %) relative share of the initial variance of physical fitness explained by the first factor than that of boys (34.23 %), which is mainly at the expense of the percentage of unexplained variance - 5.78 % (Figure 5).

**Table 5. Factor structure of the special physical fitness of biathlete girls**

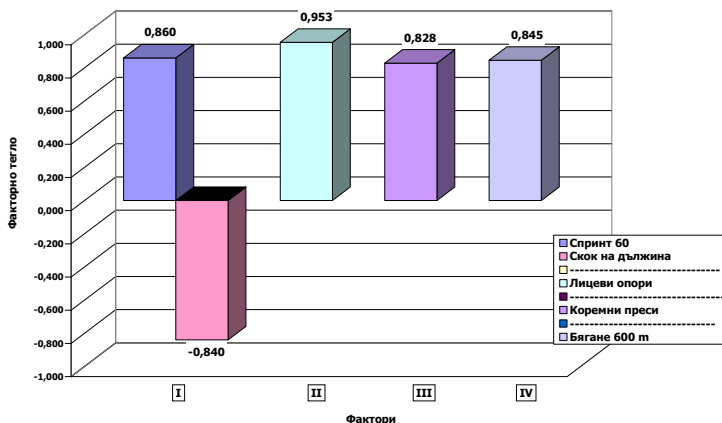
№	I	II	III	IV	$h^2$	$1 - h^2$
1.	<b>0,860</b>	-0,042	-0,424	0,105	0,93	0,07
2.	<b>-0,840</b>	0,186	-0,062	-0,403	0,91	0,09
3.	-0,174	0,328	<b>0,828</b>	-0,320	0,93	0,07
4.	-0,116	<b>0,953</b>	0,227	-0,116	0,99	0,01
5.	0,329	-0,137	-0,344	<b>0,845</b>	0,96	0,04
$\Sigma\alpha$	<b>31,93%</b>	<b>21,43%</b>	<b>20,78%</b>	<b>20,08%</b>	<b>94,22%</b>	



**Figure 5. Relative shares of baseline variance explained by each factor in 12-14 year old female biathletes**

The first factor (31.93% - Figure 5) is completely identical to the first factor of the factor structure of the male biathletes presented above, and it can be reasonably argued that speed and sprinting ability, and the associated explosive power of the lower limbs, are the most important components of the special physical preparation of 12-14-year-old biathletes, regardless of their gender.

The second factor (Figure 5) for girls explains a much lower (almost 10%) percentage of the baseline variance (21.43%). It is identical to the third factor of the boys' factor structure and can be defined as "explosive power of the upper limbs".



**Figure 6. Factor structure of physical fitness of 12-14 year old female biathletes**

The third factor (20.78 %) is determined by only one indicator (indicator 4), which has a factor weight (0.828) and is identical to the second factor of boys (figure 6). It can be identified as "abdominal explosive power".

The fourth factor (20.08%), as in boys, reveals the importance of general endurance (indicator 5, factor weight 0.845), as an important element of the special physical fitness of 12-14-year-old biathletes (figure 6).

### **III.3.3. Unified system (program) of sports training in Biathlon sports schools**

#### **III.3.3.1. General presentation of the program**

The biathlon curriculum in sports schools provides students with the necessary theoretical and subject-practical commitment in the conditions of gradual and systematic formation of knowledge, skills and habits. It is aimed at building a high level of theoretical, technical-tactical, conditioning, physical and mental preparation in the process of multi-year sports training. The educational content is structured in such a way as to follow and build on interrelated knowledge, skills and habits of biathlon acquired in the educational and training process from the V to the XII grade.

### **III.3.3.2. Learning objectives**

Biathlon training is an organized sports-pedagogical process that includes a system of specialized knowledge aimed at mastering specific motor skills and actions with a view to their appropriate application in training and competition activities.

Taking into account the biological development of athletes in the age range from 12 to 19 years (from V to XII grade), as well as the changing goals, tasks and content of sports training, we can divide the multi-year development of sports achievement into three stages:

- **Stage of initial (basic) sports training - from 12 to 15 years of age;**
- **Stage of sports specialization (developing) – 16-17 years of age;**



- **Stage of sports improvement (increase in sportsmanship) - 18-19 years of age;**

The division of sports training into three stages is justified by the effectiveness of adaptation changes in the process of multi-year training depending on the sensitive periods in terms of motor functions, which are considered as phases of the highest realization of the organism's capabilities in ontogenesis, as well as the periods , in which specific impacts lead to more pronounced adaptive responses. A particular challenge is the programming of training loads with different directionality of impact during the first period due to the entry of students into puberty, a period characterized by a sharp change in the physique of athletes. The sports pedagogue must take into account the individual biological development at this age is more difficult.

**Stage of initial (basic) sports training - from 12 to 15 years of age**

Accordingly, the content is a multifaceted, biathlon-oriented initial training. Its main task is, with the help of a variety of general and special training tools, to arouse interest in participating in regular training activities. Multifaceted (with a general focus of training impact) training should help novice biathletes develop tolerance to training loads. In the period of intensive growth of the body and internal organs (at puberty) to contribute to the establishment of joint-muscular balance,

to avoid trauma to the connective and supporting tissues. As the age of the students increases, the percentage ratio of general and specific training effects also changes. The multifaceted training impact is expressed in the application of various training tools from sports such as athletics, cycling, swimming, gymnastics, sports games, etc. Emphasis is placed on athletic training and also on the development of coordination abilities and speed in relation to basic conditioning abilities. The share of training effects for the development of strength and power endurance in this stage gradually increases. The conditioning and coordination-technical abilities, which are of great importance to biathlon as general prerequisites for achievement, must be developed to such an extent that they represent a solid basis for learning biathlon-specific shooting and running habits.

### **Stage of sports specialization (developing) – 16-17 years of age**

The developmental focus of the training effects at this stage is a logical, purposeful continuation of the multifaceted basic training, tailored to the specifics of biathlon as a sport. Complex, stable further development of the general and specific prerequisites for achievement in running and shooting, as well as in their growing complex manifestation of achievement, are a characteristic sign of this stage. The training work done during the preceding stage, as well as the exit from

puberty, are prerequisites for greater tolerance to training loads. During the stage, the volume and intensity of training impacts continues to increase. The growth of special versus general physical training also continues.

The ever-widening use of semi-specific and specific means (rollers and skis) allows, during the year-round training, to focus on developing: 1. Basic endurance. 2. General and special strength endurance. 3. Specific competitive endurance. 4. Development of explosive power.

The growing use of complex training should ensure a significant qualitative development of the main components of sports performance. The complex achievement in biathlon competitions is an expression of the optimal synthesis of the result of cross-country skiing, the accuracy of shooting and the rapidity of fire. The higher conditioning and coordination prerequisites for sports achievement, the more pronounced technique of running and shooting, tactical abilities and psychological qualities during the training process build abilities in the athlete to more effectively conduct competitions in any external conditions.

### **Stage of sports improvement (increasing sportsmanship) - 18-19 years of age**

The main task at this stage is the continuation of the multifaceted development of the general and specific prerequisites for achievement, the improvement of the

complex achievement through the wider use of specific training tools.

Main goals in the training process are:

1. Further development of the general and specific prerequisites for achievement:

- Aerobic endurance as a basic indicator of the level of work ability.
- Competitive endurance (for relevant discipline).
- Specific strength endurance (anaerobic).
- Specific speed qualities.

The components of the total annual volume of training impacts, as well as their development dynamics, take into account the individual level of development of the competitors.

2. Technical preparation:

Improving the specific technical and coordination abilities and habits in the application of the skating style of running in order to achieve the predicted running speed.

The focus of technical shooting training should be on achieving the optimum between accuracy and rate of fire. Along with the precise and coordinated performance of the technical elements – shooting position, aiming, lowering and breathing, it is necessary to improve motor actions when approaching the shooting corridor. Also, "...the formation of an optimal shooting rhythm in the process of shooting training of biathletes should be carried out systematically at each stage of the annual

cycle" (Klechorov, 2018), as well as the actions after the shooting is completed.

## **CONCLUSIONS AND RECOMMENDATIONS**

The analysis of the results obtained from the conducted research and the summaries made in the text give us reason to formulate the following conclusions:

1. The established average values and variability of the signs of physical fitness of the candidates for admission to the sports schools of Bulgaria with the "Biathlon" profile are proof that:

- the group of 12-14-year-old biathletes (boys) studied by us is relatively homogeneous in terms of the level of development of speed and speed capabilities, the explosive power of the lower limbs during muscular efforts in the horizontal plane, the explosive power of the abdominal muscles and general endurance;
- the only motor quality on which homogeneity is observed is the speed and sprint capabilities of the biathletes, and this applies only to the group of girls;
- in both sexes, there is inhomogeneity in terms of the level of development of the explosive power of the upper limbs;
- in both groups, a relative homogeneity is observed, but it is noticeable that the group of girls is much more compact in terms of the level of development of general endurance.

2. The comparative analysis of physical fitness shows that the null hypothesis is valid here, according to which the differences we found between the levels of development of the observed signs of physical fitness in the 12-14-year-old biathletes of both sexes are insignificant.

3. The general view of the factor structure of the physical development and the specific working capacity of the students of the sports schools in Bulgaria shows that speed and sprinting capabilities, as well as the related explosive power of the lower limbs, are the most important components of the special physical preparedness of 12 -14-year-old biathletes, regardless of their gender.

4. Normative tables for assessing the special physical fitness of 12-14 year old biathletes will allow effective ongoing control over the specific working capacity of biathletes from sports schools in Bulgaria.

### **Recommendations:**

1. An external specialist in biathlon (member of the expert council at BF Biathlon) must attend the entrance exam.

2. USS and ODK to prepare and submit for admission a larger number of children.

3. To restore the practice of conducting training camps (2 camps per year), as well as regular meals (5

times), according to the requirements of the respective sport;

4. To increase the quality of teaching in general education subjects, as well as the enrichment of the curriculum with new specialties, to attract talented children to sports schools.

5. The Normative system for assessing physical fitness developed by us should be used for ongoing control (at the beginning of each academic year and at the end of each academic term) and on this basis, the emphasis in the future educational and training process should be determined.

6. To implement the Unified System for Sports Training, developed by us, in sports schools with the "Biathlon" profile.

## **SCIENTIFIC PUBLICATIONS ON THE TOPIC OF THE DISSERTATION**

1. Vukov, V. (2022). Sequence (coordination) of the elements of biathlon shooting technique. Yearbook of the National Sports Academy. Volume 2, NSA PRESS, Sofia, ISSN 2682-9908, pp. 246-252.
2. Management of the training process in the annual cycle for young biathletes (18-19) years old - „Sports and Science", ISSN 1310-3393, issue 3-4 for 2022.