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Theory & Practice of Physical Culture

Athletic training | Sport psychology | Academic physical education | Sport physiology

Key issues of the modern sports science for discussion

Olympic Games-2022 as a factor in the development of winter sports in Russia

The XXIV Winter Olympic Games are held from February 4 to 20, 2022 in Beijing (China). More than 4,000 athletes from 95 countries take part in this major sporting event. They compete in seven sports, including 15 disciplines, in which 109 sets of medals are awarded.

The 2022 Chinese Olympic Games are held in three clusters: Beijing, Yanqing and Zhangjiakou. The capital hosts tournaments in figure skating, short track, hockey, curling and speed skating, and also includes the opening and closing ceremonies of the Olympic Games. Yanqing is a venue for bobsleigh, alpine skiing, luge and skeleton competitions. Zhangjiakou – biathlon, cross-country skiing, ski jumping, freestyle and snowboarding.

Competitions in the following disciplines were announced for the first time at the Games in China: men's and women's freestyle competitions in the Big Air discipline, women's single bobsleigh (monobob) competitions; mixed freestyle team competitions in acrobatics; mixed relay in short track, mixed tournaments in ski jumping and snowboard cross.

For the Olympic Games-2022, in addition to those structures that were built for the Summer Games-2008, the Chinese have built and re-equipped a number of new complexes, stadiums, trampolines, parks and sports centers.

To date, the history of the Winter Olympic Games is approaching the 100-year milestone. For almost a century, the Winter Olympic Games have been held 16 times in Europe, six times on the North American continent and three times in Asia.

The program of the previous XXIII Winter Olympic Games in Korea included seven winter sports, including 15 sports disciplines. Six ski disciplines (alpine skiing, skiing, cross-country skiing, ski jumping, snowboarding and freestyle), three skating disciplines (speed skating, figure skating, short track), two bobsleigh sports (bobsleigh, skeleton), as well as biathlon, curling, luge and ice hockey.

Winter sports are not limited to Olympic sports. Among the recognized types of winter sports can be noted the northern all-around, polyathlon, triathlon, sports tourism, fishing, orienteering. National sports include: hunting skiing, reindeer and dog sledding races, and drilling sports. Motorcycle and auto racing on ice have become widespread. It should be noted that the trend of development of extreme directions has become relevant for winter sports. In recent years, new "exotic" species have appeared: downhill skating, speedskating, snowkiting, snow kayaking, snowmobile freestyle, heli-skiing and many others.

In a separate segment, it is possible to distinguish military-applied and service-applied sports, including combinations, which include winter subspecies: military-applied sports, military-sports all-around, service-applied sports of the FSO of Russia, service biathlon, service biathlon. These sports belong to recognized sports disciplines and are included in the All-Russian Register of Sports.

With the development of scientific and technological progress, winter sports have become year-round. The construction of modern sports facilities, the invention of artificial turf, the appearance of artificial snow and ice make it possible to hold competitions at any time of the year.

The structure of competitions held in winter sports is represented by the following levels: the Olympic Games are the most prestigious complex international competitions; championships, cups and championships are competitions held at the world, continental and national levels; commercial competitions, for example, the Grand Prix, the Christmas race of biathlon stars; tournaments - official and friendly, professional and amateur, student, veteran, youth, junior, youth, children's, men's and women's; demonstration competitions; competitions of divisions and leagues.

We invite scientists to publish articles that are aimed at finding new approaches in the development of the Olympic movement and large-scale sports events.

Editor-in-Chief, Honored Worker of Physical Culture of the Russian Federation, Ph.D., Professor L.I. Lubysheva

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Contents

Footwork training model as basis for progress in martial arts techniques and tactics

UDC 796.012)

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Abstract

Objective of the study was to analyze the relevant theoretical and practical study reports and survey practical footwork training experiences in the martial arts coaching community to offer an efficient martial arts footwork mastering and excellence model.

Methods and structure of the study. We analyzed, for the purposes of the study, the relevant theoretical and practical literature including scientific articles, monographs and dissertations; plus surveyed the martial arts coaches (n=17) to study their practical footwork mastering and excelling experiences classifiable by the technical and tactical skill training stages.

Results and conclusion. Modern martial arts theoreticians and practitioners commonly interpret footwork as the continuous movement with the reasonably versatile footwork style, skills and combinations. A successful and efficient footwork style is known to facilitate the individual technical and tactical skill set being used in a most cost-efficient and resultant manner. Footwork may be also referred to as maneuvering that means the purposeful and rational individual movement control and style as a basis for success in tactical goals. Maneuvering will be basically designed to control distance and facilitate positioning for attacks and defenses.

Our analysis of the theoretical and practical study reports and survey of the practical footwork training experiences of the martial arts coaches found the existing footwork training methods dominated by the traditional physical fitness, special conditioning and special fitness practices. The survey found that martial arts coaches striving to apply a wide range of traditional footwork mastering and excelling tools albeit still tend to underestimate and underuse modern patterned/ modular footwork training methods and special martial arts games.

Keywords: *technical and tactical training, footwork, patterned workout, modular workout, coordination ladder, special martial arts games.*

Background. Modern martial arts training systems give a high priority to the technical and tactical training elements for competitive progress since an individual technical and tactical skill set needs to be as versatile, perfect, efficient and effective as possible for success [4], with a special emphasis on the footwork viewed as a key success factor in every attack and defense technique and tactic. It was back in the 1980s that the boxing analysts found about 60% of the fight time being contactless [6] i.e. dominated by footwork/ tactical maneuvers for better positions. Modern martial artists are expected to develop an easy, natural and energy efficient footwork style for success. Practical experiences, however, show that the traditional footwork training and excellence elements in the modern martial arts training systems are still rather standard, monotonous, dull, emotionless and, therefore, seldom effective enough; whilst many coaches still tend to underestimate and underuse efficient footwork training tools – often at detriment for the future competitive technical and tactical skills, performance and progress [5, 7].

Objective of the study was to analyze the relevant theoretical and practical study reports and survey practical footwork training experiences in the martial arts coaching community to offer an efficient martial arts footwork mastering and excellence model.

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Results and discussion. Modern martial arts theoreticians and practitioners commonly interpret footwork as the continuous movement with the reasonably versatile footwork style, skills and combinations [5, 7]. A successful and efficient footwork style is known to facilitate the individual technical and tactical skill set being used in a most cost-efficient and resultant manner. Footwork may be also referred to as maneuvering that means the purposeful and rational individual movement control and style as a basis for success in tactical goals. Maneuvering will be basically designed to control distance and facilitate positioning for attacks and defenses [5, 7].

The martial arts expert community at this juncture commonly classifies the footwork training elements as follows:

- General physical fitness practices including running, jumping/ rope jumping and combined workouts, couple/ sparring practices, team sports, active games, etc.;

- Special conditioning workouts including warm-ups, fight simulations with/ without partners, footwork trainings with weights, shadow fights, practices with apparatuses, boxing paws, etc.; and

- Special sparring practices with conditional/ free-style fights [7].

V.A. Oskolkov and V.V. Lisitsyn recommend the so-called patterned workout among the most effective training tools, with V.A. Oskolkov showing in his special case studies benefits of the square/ triangle patterned workouts among the other patterned footwork training options [1, 2, 5]. V.V. Lisitsyn demonstrates benefits of the patterned workouts for the footwork excellence purposes as they facilitate the individual movement control, reflections and analyses. He recommends complicating such practices with progress by combined patterns including a square in circle, triangle in square, etc. [1, 2]. Such practices will be designed to excel the individual footwork by the movement programming, monitoring and perfection elements in every technical and tactical skill training process, conditional on every patterned practice being launched and finished on the same spot. The practices may be further complicated by the time pressure and difficulty stepping elements.

Let us take a square footwork workout as a case in point. Its prime goal is to master and excel straight low kicks to front/ back leg. Task 1 is to kick under the same leg on the square move to either side. The workout will start up in the lower left corner of the square; and, when the athlete comes back to the starting point, his Task 2 is to move in the counter direction of the square with kicks under the other leg, and so on [1].

V.V. Lisitsyn also analyzes benefits of a modular footwork workout viewed as highly beneficial for the technical and tactical progress in sparring bouts. The partners in modular footwork workout will harmonize their movements so that every move of one athlete is countered by the other, with no limitations for the movement sets, and with a special attention to the cyclical execution and movement structure control. For example, a close fight module may include the following actions:

(1) Single-strike attack;

(2) Defense, cut the distance, three-strike attack;

(1) Defense (three), three-strike attack;

(2) Defense (three), three-strike combo, breakaway, single-strike attack;

(1) Defense, cut the distance, three-strike attack;

(2) Defense (three), three-strike attack;

(1) Defense (three), three-strike combo, and breakaway [1].

A range of untraditional technical accessories and training machines/ equipment has been increasingly popular in the global martial arts community for the last decade. One of them is a coordination ladder [8] that is widely used to excel the movement coordination skills plus the relevant physical qualities, and particularly in the footwork mastering and excellence trainings. Such coordination ladder training may include, e.g., the following tasks: (1) Run upstairs alternating steps on every cell; (2) Run into and out the cell with the left-right side; (3) Alternate two-leg jumps in and out; (4) Alternate one- and two-leg jumps; (5) Train footwork in a frontal stance with straight punches on every step; and (6) Train shuttle footwork. Such footwork trainings are recommended in the special warm-up part of every training session to include five-seven 1-2-minute exercises [3].

We would also recommend special martial arts games among the most beneficial footwork training tools. Such games help excel the footwork techniques in highly emotional settings and are known to facilitate progress in the active fight techniques and tactics, distance control and management, maneuvering versatility, and situational technical and tactical decision making. Popular SWAG may be basically classified into the touch, pressure and positioning games.

Touch games imply very short (10-15-second) bouts in a limited space. The winner should touch the target body part and avoid being touched. Touch game options may be as follows (1) Touch targets are the same for the both; (2) Touch targets are different; 3) Different targets should be touched by two limbs simultaneously; etc. Pressure games help master the pressure techniques and tactics to paralyze the opponent and force his retreat. And the positioning games will train the individual positioning skills to efficiently (1) touch the target body part; (2) press the opponent out of the fight space; (3) take a specific position relative to the opponent; (4) facilitate some technical action; etc. Generally difficulty of every special martial arts game will be stepped by the fight space limitations, special rules and requirements, opponents' force equalizing methods and tools, etc.

Our survey of the coaching sample found the martial arts coaches giving preference to the following traditional footwork training methods and tools:

– Mirror footwork trainings on spot and on the move (100%);

– Couple (tag game) footwork workouts on the coach's instructions and signals (100%);

– Footwork trainings with tennis ball (76.5%);

– Coordination ladder workouts (76,5%);

– Trainings with punching bags (82.4%);

– Footwork training with paws (82.4%);

– Footwork trainings with weights, training bands, etc. (76.5%); and

– Difficulty stepping footwork trainings with space/ ground contact/ surface and other limitations (70.5%).

Conclusion. Our analysis of the theoretical and practical study reports and survey of the practical footwork training experiences of the martial arts coaches found the existing footwork training methods dominated by the traditional physical fitness, special conditioning and special fitness practices. The survey found that martial arts coaches striving to apply a wide range of traditional footwork mastering and excelling tools albeit still tend to underestimate and underuse modern patterned/ modular footwork training methods and special martial arts games.

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Physical fitness tests for ski jumpers

UDC 796.925

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Abstract

Objective of the study was to analyze benefits of a physical fitness test model for the ski jumping sport versus the valid Federal Sports Training Standards for training progress stages.

Methods and structure of the study. Benefits of the new physical fitness test model were tested on a sample representing two federal regions and three sports organizations that provide modern ski jumping training services including:

(1)"Stork" Olympic Reserve Sports School (ORSS), Nizhny Tagil city; (2) "Start" ORSS, Perm city; and (3) “Flying skier" ORSS, Perm city. The ski jumpers sample (n= 269, 157 boys and 112 girls) was grouped by the training/ progress stages as follows:

- Beginner group: 79 boys and 60 girls;
- Specializing group: 55 boys and 33 girls,
- Excellence group: 16 boys and 13 girls; and
- Elite group: 7 boys and 6 girls.

The group test data were benchmarked versus the Federal Sports Training Standards for the relevant ski jumping progress groups.

Results and conclusion. The group test data and analysis showed that the valid Federal Sports Training Standards being irrelevant, uninformative and inefficient for the progress tests in the modern ski jumping sport training and competitive fitness rating systems. The physical fitness tests in the Federal Sports Training Standards need to be revised to provide a sound basis for competitive progress analysis in the ski jumping sport groups. The Federal Sports Training Standards tests need to be also harmonized with the valid GTO Test system to ensure the group test standards being practical and efficient for the progress tests at every training stage.

Keywords: *physical fitness tests, ski jumping, test standards, Federal Sports Training Standards.*

Background. It was on June 30, 2021 that the Ministry of Sports endorsed an updated version of the Federal Sports Training Standards for ski jumping sport [4] with special requirements for the physical fitness tests of the ski jumping trainees classified by the training/ skill progress stages.

Objective of the study was to analyze benefits of a physical fitness test model for the ski jumping sport versus the valid Federal Sports Training Standards for training progress stages.

Methods and structure of the study. Benefits of the new physical fitness test model were tested on a sample representing two federal regions and three sports organizations that provide modern ski jumping training services including:

(1) "Stork" Olympic Reserve Sports School (ORSS), Nizhny Tagil; (2) "Start" ORSS, Perm; and (3) “Flying skier" ORSS, Perm. The ski jumpers sample (n= 269, 157 boys and 112 girls) was grouped by the training/ progress stages as follows:

- Beginner group: 79 boys and 60 girls;
- Specializing group: 55 boys and 33 girls,
- Excellence group: 16 boys and 13 girls; and
- Elite group: 7 boys and 6 girls.

The group test data were benchmarked versus

the Federal Sports Training Standards for the relevant ski jumping progress groups.

Results and discussion. The beginner group (79 boys and 60 girls) progress analysis versus the Federal Sports Training Standards found the following (see Table. 1):

- Group averages in the 30m sprint, 3x10m shuttle sprint, 150g ball through and sit-ups tests were compliant with the Federal Sports Training Standards;
- Group averages in the other four tests were significantly above the Federal Sports Training Standards: about 1min faster in the 1000m race test; 30-40cm higher in the standing long jump test; 2-3 times higher (for the boys and girls, respectively) in the prone push-ups test; and 3-4 times higher (for the boys and girls, respectively) in the bench standing leans test.

The specializing group (55 boys and 33 girls) test data analysis versus the Federal Sports Training Standards found virtually the same picture:

- Group averages in the 30m sprint, 3x10m shuttle sprint, and sit-ups tests were compliant with the Federal Sports Training Standards;
- Group averages in the other five tests were meaningfully above the Federal Sports Training Standards, namely: about 1-2min faster (for the boys and girls, respectively) in the 2000m race tests; 40-55cm further in the standing long jump test; 60cm further in the 150g ball through test; and 2 times higher in the prone push-ups test and bench standing leans test.

As for the excellence and elite groups, we found the valid Federal Sports Training Standards misleading and contradictory in fact since the standards are actually the same for these two training progress stages – as demonstrated by the practical test data arrays that are not free of a few collisions.

Thus in the 30m sprint and sit-ups tests both groups were within the Federal Sports Training Standards limits – albeit the excellence group test data were virtually within the standards, whilst the elite group was tested comfortably beyond the Federal Sports Training Standards, with the actual group physical fitness averages in the tests found significantly above the Federal Sports Training Standards limits due to the special trainings. Furthermore, both groups were tested significantly above the Federal Sports Training Standards limits in the standing long jump and 150g ball throw tests, with the elite group, e.g., tested 40-50cm and 20-25m above the Federal Sports Training Standards test limits, respectively.

As for the push-ups test, the excellence and elite boys' subgroups were close and within the Federal Sports Training Standards limit, whilst the girls were tested meaningfully above the latter – 2 times higher for the elite group girls in fact. The excellence group boys were tested within the Federal Sports Training Standards in the bench standing leans tests, whilst their peers from the elite group were tested comfortably beyond the Federal Sports Training Standards limit. Girls in both groups were tested comfortably above (5cm higher on average) the Federal Sports Training Standards limit.

Furthermore, the excellence group boys and girls were tested under the Federal Sports Training Standards benchmark in the 3x10m shuttle sprint test – versus their elite group peers that were tested comfortably within the Federal Sports Training Standards. This means that the Federal Sports Training Standards for the excellence training stage are irrelevant and need to be revised. The same holds true for the 2000m race test since the excellence and elite group boys failed to meet the Federal Sports Training Standards; whilst the girls of both groups showed the test results falling within the Federal Sports Training Standards limits.

Conclusion. The group test data and analysis showed that the valid Federal Sports Training Standards being irrelevant, uninformative and inefficient for the progress tests in the modern ski jumping sport training and competitive fitness rating systems. The physical fitness tests in the Federal Sports Training Standards need to be revised to provide a sound basis for competitive progress analysis in the ski jumping sport groups. The Federal Sports Training Standards tests need to be also harmonized with the valid GTO Test system to ensure the group test standards being practical and efficient for the progress tests at every training stage.

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Functional state monitoring for sambo wrestlers in annual training cycle

UDC 796.015

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Abstract

Objective of the study was to analyze benefits of the traditional and modular training systems using the sambo wrestlers' functional fitness testing and management toolkit.

Methods and structure of the study. We used the following methods and instrumental test systems in the study: analysis of the relevant theoretical and practical literature; training experiment; mathematical statistical data processing toolkit; and functional fitness tests by computerized Simona 111 Integrated Test and Monitoring (ITM) System. The study was run at Znezhinka Winter Sports Training Center and Judo and Sambo Sports Club in Tchaikovsky in March 2019 through February 2020 (annual training cycle). We sampled for the study the 18-23 year-old sambo elite (n=30) with CMS and MS qualifications and split them up into Control and Experimental Group of 15 people each.

Results and Conclusion. The functionality progress profiles obtained using Simona 111 ITM System showed meaningful benefits of the Experimental Group training system scheduled on a modular basis versus the traditional Control Group system to make the Experimental Group highly fit for the major event – as verified by the actual competitive accomplishments of the Experimental Group in the top-ranking event of the season. This evidence gives us the grounds to recommend the modular training schedule for the junior elite athletes' training systems.

Keywords: *functional fitness, diagnostics, modular training schedule, sambo, annual training cycle, Simona 111, junior sambo wrestlers.*

Background. As things now stand, the junior elite sambo wrestlers required to compete 6 to 10 times a year as dictated by the traditional calendar of competitions with 3-4 qualifiers, 2-3 ranking events and 1-3 major tournaments. This is the reason why the sambo wrestlers need to effectively manage the functional fitness in annual training cycle for competitive success [4, 5]. A special role in this context is played by the training system periodicity/ scheduling that should secure due competitive fitness by specific time points. Therefore, the training periods and cycles should be designed to effectively customize the training times and intensities to the specific cycle goals to effectively manage the individual functional fitness [3, 4, 6].

Objective of the study was to analyze benefits of the traditional and modular training systems using the sambo wrestlers' functional fitness testing and management toolkit.

Methods and structure of the study. We used the following methods and instrumental test systems in the study: analysis of the relevant theoretical and practical literature; training experiment; mathematical statistical data processing toolkit; and functional fitness tests by computerized Simona 111 Integrated Test and Monitoring (ITM) System. The study was run at Znezhinka Winter Sports Training Center and Judo and Sambo Sports Club in Tchaikovsky in March 2019 through February 2020 (annual training cycle). We sampled for the study the 18-23 year-old sambo elite (n=30) with CMS and MS qualifications and split them up into Control and Experimental Group of 15 people each.

Results and discussion. The Experimental Group (EG) training system was scheduled on a modular basis (see Figure 2); and Control Group (CG) training system was traditional (classical) – see Figure 1.

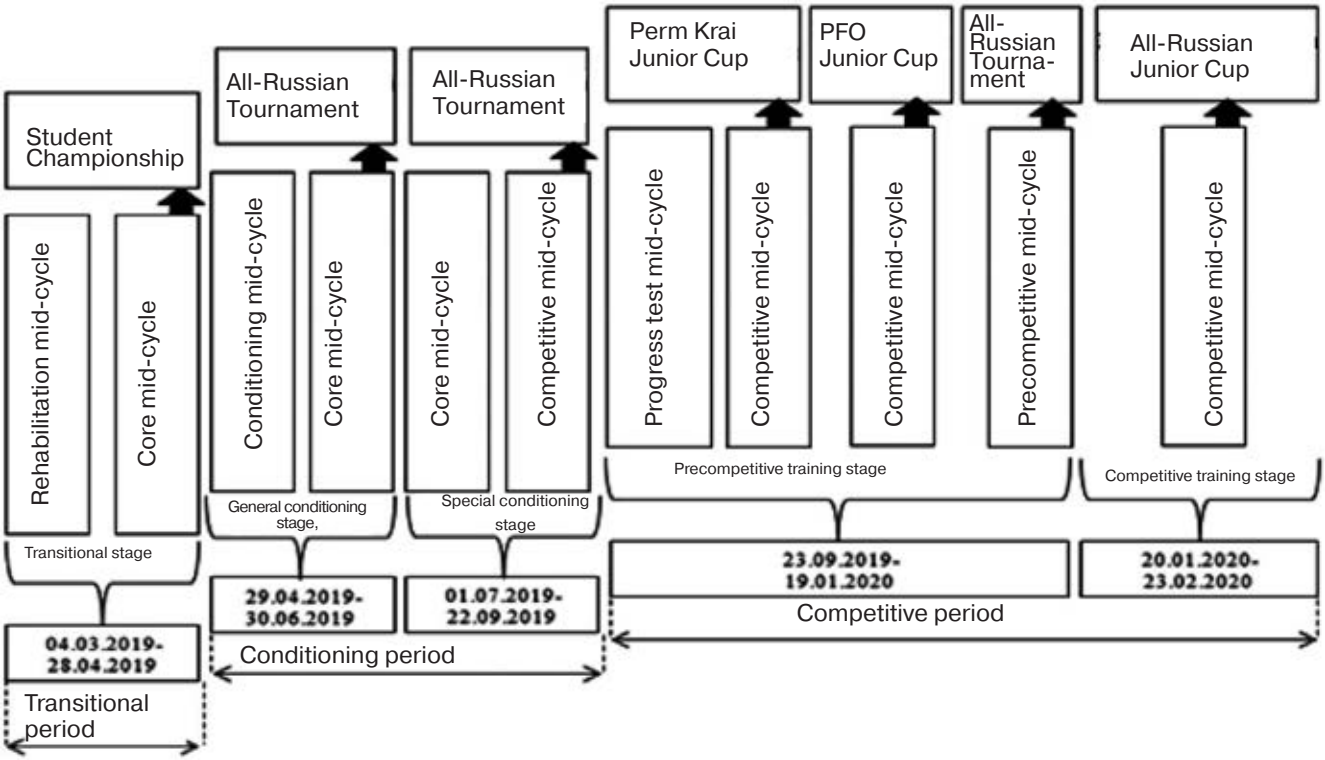

Figure 1. *Control Group training system (traditional)*

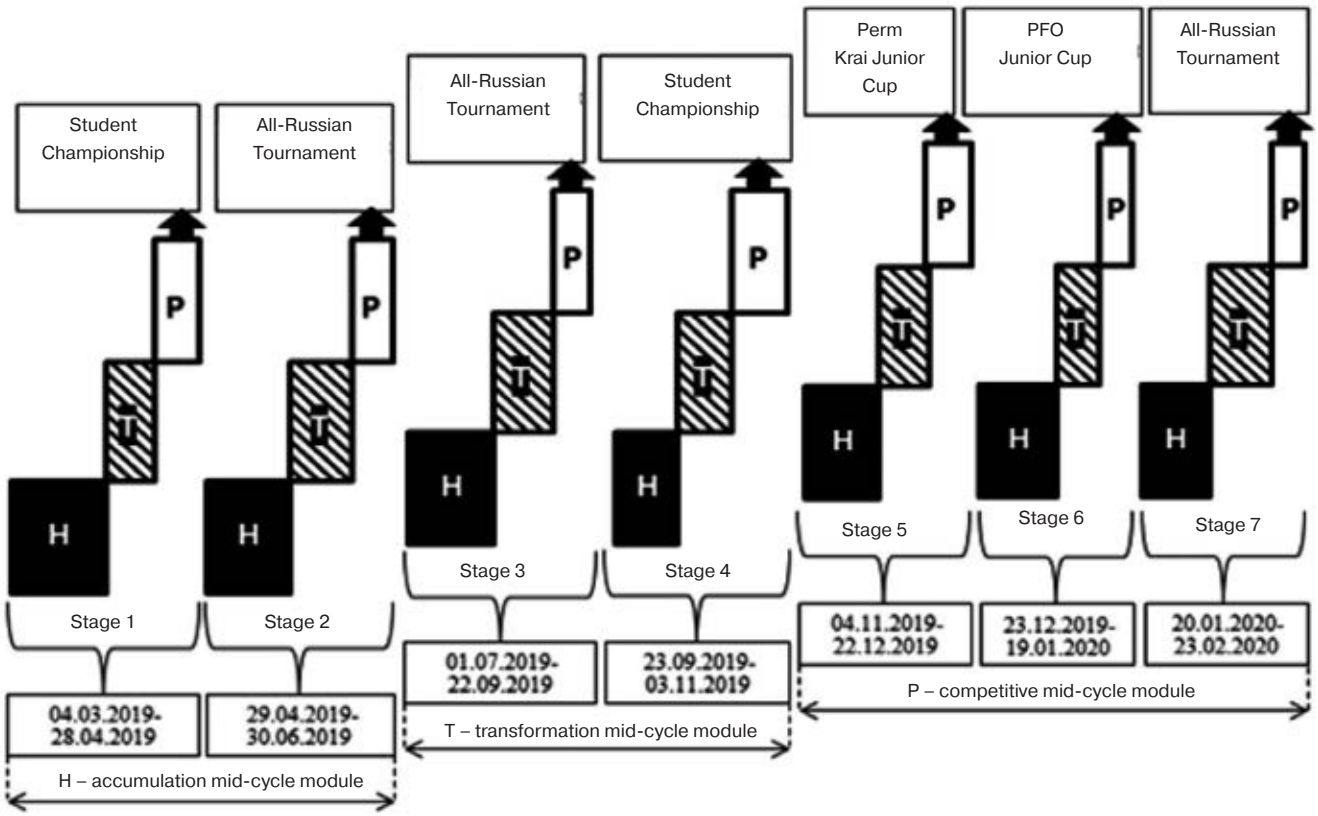

Figure 2. *EG training system (modular)*

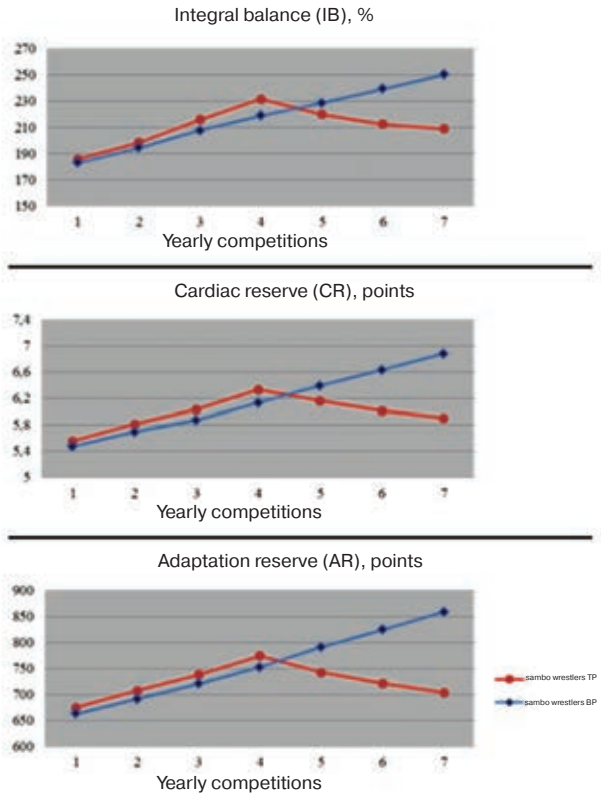

Figure 3. *Functionality variations in the CG and EG over the annual training cycle*

The sambo wrestlers' functional fitness was tested by Simona 111 ITM System prior to every of the above seven yearly competitions, a week prior to the event after a rest day, with every athlete tested for about 10 minutes in a quiescent relaxed recumbent position to produce 60 cardiovascular function test rates versus the body length, mass, temperature, age and gender – to timely track variations in every function [1].

The sambo wrestlers' functional fitness test data was grouped into the following integrated test data arrays:

• Integral balance with a variation range from -100% to +100% that rates total deviations (%) of the cardiovascular functions from the norms including DO2I, SI and UI. Negative and positive deviations are indicative of the function fall and growth, respectively, with the highly skilled athletes often tested with IB of 300% to 700%;

• Cardiac reserve varying within 4 to 6 points, indicative of the cardiac cycle phases and correlated with overall endurance. Cardiac reserve may drop to 1 point as a result of hard workloads and reach as much as 11 points in well-trained athletes after a rest day; and

• Adaptation Reserve varying from 400 to 600 points – that is the integral balance and cardiac reserve aggregating indicator that may reach 1500 points in highly fit athletes, drop to 200 points after top competitive/ training workloads and come back to the same level in a few hours or days. The Adaptation Reserve variability – when analyzed versus the integral balance and cardiac reserve variations – is indicative of the physiological costs of workloads and rehabilitation process efficiency [2].

Analysis of the pre-experimental sambo wrestlers' functional fitness test data (Fig. 3) found the intergroup differences meaningless: CG (trained traditionally) was tested with the average integral balance = 186.1%, cardiac reserve = 5.47 points and Adaptation Reserve = 669 points – versus the EG test rates of integral balance =184.9%, cardiac reserve = 5.39 points and Adaptation Reserve = 665 points.

The CG was tested with significant growth in the integral functionality at the transitional and conditioning stages prior to the ranking events – that peaked by the first qualifier of the competitive period (Perm Krai Junior Cup) at IB =229.6%, CR = 6.29 points, Adaptation Reserve = 769 points. By the end of the competitive period (Russian Championship), however, the group averages were tested to fall down to IB = 209.2%, CR = 5.87 points and Adaptation Reserve = 704.1 points.

The EG was tested with gradual functionality growth at the transitional and conditioning stages, albeit at slower paces than in the CG – to reach the IB = 217.3%, CR = 6.04 points and Adaptation Reserve = 751 points prior to the Perm Krai Junior Cup (end of stage 4). Later on (stages 5-7), however, the EG functionality was still persistently growing to peak by the major event of the season (Russian Championship) at IR = 251.1%, CR = 6.91 points and Adaptation Reserve = 861.1 points.

The functionality test data and analyses showed that the EG (trained on a modular schedule) was better fit for the Russian Championship that the traditionally trained CG due, due the CG fitness tested to peak by the start of the competitive period (qualifiers for the Perm Krai Cup) and drop thereafter – versus the steady growth in the EG.

Conclusion. The functionality progress profiles obtained using Simona 111 ITM System showed meaningful benefits of the EG training system scheduled on a modular basis versus the traditional CG training system to make the EG highly fit for the major event – as verified by the actual competitive accom-

plishments of the EG in the top-ranking event of the season. This evidence gives us the grounds to recommend the modular training schedule for the junior elite athletes' training systems.

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Elite biathletes' shooting skills kinematics analysis

UDC 796.92.093.642

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Abstract

Objective of the study was to analyze the biathlon elite's shooting skills kinematics and give progress recommendations.

Methods and structure of the study. We sampled for the study the 16-23-year-old elite biathletes (n=16) qualified Masters of Sports (n=8) and Class I Athletes (n=8). Their shooting skills kinematics were tested at laboratory of the Federal Medical Research and Training Center with "Snezhinka" Winter Sports Arena of the A.A. Danilov Tchaikovsky State Academy of Physical Culture and Sports using Qualisys optoelectronic/ dynamometric digital test system plus the AMTI strain gauge platform equipped with 12 high-rate video cams. For the test purposes, we fixed markers on the front sights of the rifles, and the sample made five prone and five standing shots with no time limitations.

Results and conclusion. The elite biathletes' shooting skills kinematics tests and analysis using modern Qualisys optoelectronic/ dynamometric digital test system with the AMTI strain gauge platform made it possible to find the typical errors in the shooting skills including too high frontal pressure on the butt, rifle stoppage disorders; and deviations from the optimal aiming speeds and barrel movement amplitudes in the aiming sequence. Further studies to optimize the shooting skills kinematics are recommended for application in the elite biathletes' training systems for technical and competitive progress.

Keywords: *elite biathletes, shooting skills, kinematic characteristics, Qualysis.*

Background. Modern biathlon training systems give a special priority to the shooting skills perfection and correction elements critical for competitive progress. This progress is known to depend on the technical performance and mental fitness plus the shooting accuracy largely secured by the weapon control skills [1, 3, 4]. Presently the sport community demonstrates a special interest in the rifle movement amplitude profiling studies viewed among the key shooting skills success factors, with a special emphasis on the key muscle group stresses and the small-caliber rifle control impulses in the shooting process. Many national biathlon elite experts appreciate benefits of Qualisys optoelectronic/ dynamometric digital test system with the AMTI strain gauge platform that generates reasonably objective and dependable test data [2].

Objective of the study was to analyze the biathlon elite's shooting skills kinematics and give progress recommendations.

Methods and structure of the study. We sampled for the study the 16-23 year-old elite biathletes (n=16) qualified Masters of Sports (n=8) and Class I Athletes (n=8). Their shooting skills kinematics were tested at laboratory of the Federal Medical Research and Training Center with "Snezhinka" Winter Sports Arena of the A.A. Danilov Tchaikovsky State Academy of Physical Culture and Sports using Qualisys optoelectronic/ dynamometric digital test system plus the AMTI strain gauge platform equipped with 12 high-rate video cams. For the test purposes, we fixed markers on the front sights of the rifles, and the sample made five prone and five standing shots with no time limitations.

Results and discussion. Most successful in the tests were the biathletes that controlled above 70% and less than 30% of the rifle weight by the left and right (lead) hands, respectively. It should be emphasized that this logic was found only for the shooting technique with widely set hands. As for the prone shooting position, its success was found dependent on the position efficiency with the gravity center and rifle projection effectively controlled within a trapeze formed by the elbows and pelvis.

Our analysis of the standing shooting skills kinematics found a gravity center shift in the shooter-rifle system to the margin of the support area indicative of a certain imbalance; plus some extra compensatory muscular efforts to keep the rifle on the target. The study found that an optimal standing position implies 60% and 40% of the system weight controlled by the left and right legs, respectively. Such position will secure good accuracy of the shooting skills due to the shooter-rifle system gravity center being controlled by moves in the hip joint with a minimal stress on the key muscles. This weight control proportion may be interpreted as indicative of a stable shooting position, with the key bodily elements and links well harmonized to compensate stresses in the system.

Furthermore, our analysis of the prone shooting skills kinematics found the weapon control efforts and amplitudes significantly variable in the sample – apparently due to the differences in the individual muscular stress control and bodily elements harmonizing/ compensating skills ($p<0.05$). It should be also mentioned that the group differences in the prone and standing shooting skills kinematics were also meaningful ($p< 0.05$). However, the aiming speed, support control and rifle movement tests of the standing shooting sequence kinematics found no significant differences in the sample ($p>0.05$).

The multidimensional analysis of the elite biathletes' shooting skills kinematics using modern instrumental methods found the sample in the prone shooting sequence prone to push the weapon forward in the sagittal plane by pressing the butt; although this move mobilizes a few non-key muscles at detriment to the key muscle group performance with negative consequences for the shooting accuracy. The prone shooting skills kinematics analysis showed the best results achieved when the front sight moves within at most 2 mm in the sagittal plane. The standing shooting skills kinematics analysis showed a higher optimal movement amplitude range with the front sight allowed to travel within the 6 mm range in the sagittal plane.

The prone shooting skills kinematics analysis with a focus on the rifle movement in the horizontal plane with the front sight base moving up 0.2-0.4 seconds before the shot – found the shooting being most successful when the barrel movement amplitude is kept within the 5 mm range. The standing shooting skills kinematics analysis, however, found the best barrel movement amplitude varying in a wider range of 7 mm at most. This travel range may be interpreted as characteristic of the individual rifle control and shooting skills, i.e. technical mastery on the whole.

Analysis of the front sight movement in the frontal plane found a significant difference between the high and low shooting skills in the following aspect: the higher are the individual shooting skills, the lower is the front sight travel amplitude. Generally the high movement compensation skills at the rifle stopping moment are indicative of the high body balancing abilities. In more specific terms, we found that the movement amplitude in the frontal plane 0.2-0.4 seconds before the shot should be kept within the 8 mm and 18 mm ranges in the prone and standing shooting positions, respectively. We also found beneficial the ability to fast mobilize muscles after pulling the trigger to fast reload the rifle so as to prevent the front sight traveling too far from the shooting line.

We also found the front sight virtually never stopping firm on the target as it keeps floating in the aiming sequence. This is the reason for us to recommend the aiming speed being kept under 0.13 mm/s and 0.17 mm/s in the prone and standing shooting positions, respectively; with a special attention to the compensatory movements geared to effectively balance the shooter-weapon system for accuracy.

Correlation analysis of the shooting skills kinematics found correlations between the left/ right arm control and competitive shooting accuracy in the prone position ($r_s=0.58$). As for the standing shooting position, we found a lower correlation between the left/ right leg control and competitive shooting accuracy ($r_s= 0.31$). The analysis also showed a clear correlation between the rifle movement amplitude in the frontal plane in the aiming sequence and the competitive shooting accuracy in the prone position ($r_s= 0.51$).

Conclusion. The elite biathletes' shooting skills kinematics tests and analysis using modern Qualisys optoelectronic/ dynamometric digital test system with the AMTI strain gauge platform made it possible to

find the typical errors in the shooting skills including too high frontal pressure on the butt, rifle stoppage disorders; and deviations from the optimal aiming speeds and barrel movement amplitudes in the aiming sequence. Further studies to optimize the shooting skills kinematics are recommended for application in the elite biathletes' training systems for technical and competitive progress.

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Fast physical progress periods in youth women's tennis

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Abstract

Objective of the study was to find the sensitive physical progress periods in the 6-14-year-old female players trained in the beginner and basic training groups.

Methods and structure of the study. The physical fitness test set we used in the present study was developed based on the prior research findings implemented in practice as a basis for the age-, gender- and skills-specific training systems, with a high priority to the competitive progress securing physical fitness tests. We sampled for the study the 6-14 year-old girls (n=228) from seven tennis schools, academies and clubs in Moscow, Moscow Oblast and Tatarstan and split them up into nine age groups of 20-plus people each.

Results and conclusion. The tests showed the physical fitness growth with age with the only exclusion for the shoulder girdle flexibility rating stick twist test. It should be emphasized, however, that the 14-year-olds were not the best in every test. The test data are indicative of the 6-14-year-old girls reaching the physical fitness peak points in the tests at different times and in different physical fitness qualities. Moreover, the peak reaching inconsistency was found in every test rating the same physical quality.

Growth in some test is indicative of the age-specific sensitivity to trainings of the physical fitness quality rated by the test

The study data and findings give grounds to recommend the 6-14 year-old women's tennis training systems being customized for the sensitive ages due to the physical progress differences to secure high progress in every key physical quality by the prudently designed, individualized and managed training service.

Keywords: *physical qualities, 6-14 year-old females, fast progress age, sensitive age.*

Background. It has been demonstrated by many studies [1, 2, 5, 7] that physical progress in trainings is normally accelerated in a few sensitive age periods need to be respected by the training systems.

Objective of the study was to find the sensitive physical progress periods in the 6-14-year-old female players trained in the beginner and basic training groups.

Methods and structure of the study. The physical fitness test set we used in the present study was developed based on the prior research findings implemented in practice as a basis for the age-, gender- and skills-specific training systems [4, 8, 9], with a high priority to the competitive progress securing physical fitness tests. We sampled for the study the 6-14 year-old girls (n=228) from seven tennis schools, academies and clubs in Moscow, Moscow Oblast and Tatarstan and split them up into nine age groups of 20-plus people each.

Results and discussion. The tests were designed to rate the speed-strength, coordination, flexibility and endurance: see Table 1.

The tests showed the physical fitness growth with age with the only exclusion for the shoulder girdle flexibility rating stick twist test. It should be emphasized, however, that the 14-year-olds were not the best in every test – see the best results bolded in Table. 1. The test data are indicative of the 6-14-year-old girls reaching the physical fitness peak points in the tests at different times and in different physical fitness quali-

Table 1. *Physical fitness tests of the 6-14 years old sample*

Tests		Age groups								
		6 n=29	7 n=21	8 n=21	9 n=21	10 n=33	11 n=23	12 n=27	13 n=33	14 n=20
Speed	5m sprint, s	1,52± 0,17	1,48± 0,19	1,57± 0,15	1,34± 0,17	1,28± 0,14	1,42± 0,22	1,36± 0,28	**1,23**± 0,12	1,24± 0,15
	10m sprint, s	2,71± 0,28	2,64± 0,26	2,61± 0,29	2,36± 0,29	2,18± 0,12	2,32± 0,18	2,12± 0,12	2,06± 0,18	**2,01**± 0,30
	Response rate, s	0,78± 0,15	0,61± 0,12	**0,51**± 0,17	0,62± 0,19	0,84± 0,32	0,58± 0,23	0,83± 0,45	0,80± 0,22	0,64± 0,24
Strength	Right carpal strength, kg	9,43± 2,77	13,25± 2,34	14,84± 2,81	15,30± 2,95	19,81± 3,68	21,72± 3,58	19,56± 4,63	22,80± 4,98	**25,66**± 6,10
	Left carpal strength, kg	8,55± 2,46	11,80± 1,93	13,58± 2,55	13,64± 2,47	17,99± 2,78	19,62± 3,18	18,60± 4,53	21,98± 5,15	**24,24**± 6,22
speed-strength	Long jump, cm	123,50± 19,18	136,67± 17,06	147,40± 14,00	159,38± 16,34	166,22± 13,25	177,48± 16,61	177,10± 32,84	190,97± 15,46	**194,05**± 18,77
	High jump, cm	16,56± 3,65	18,58± 3,50	20,44± 3,67	23,81± 3,99	25,11± 3,57	24,36± 5,15	28,24± 2,97	**28,68**± 4,00	27,63± 5,46
	Ball throw, m*	8,74± 2,96	11,88± 2,66	**12,14**± 4,30	7,86± 1,85	8,58± 1,81	9,76± 2,98	11,71± 2,00	14,38± 2,72	**14,65**± 2,07
Coordination	15-s stick crossing jumps, reps	12,45± 3,25	15,38± 5,04	17,19± 5,11	19,00± 5,58	16,89± 9,36	**22,48**± 7,31	15,87± 9,66	16,45± 12,05	20,00± 11,89
	6 length-plus jumps, cm	17,12± 5,35	18,89± 7,94	14,63± 6,27	8,11± 5,83	8,39± 8,85	11,52± 6,62	6,40± 6,62	**4,62**± 3,22	5,64± 3,50
	Ball juggling on racket, reps**	41,34± 25,72	**59,86**± 34,83	50,43± 40,92	5,85± 3,66	6,19± 4,37	10,39± 8,04	9,08± 5,28	13,58± 10,27	**22,90**± 19,05
	High jumps with/ without arm swing ratio, %	116,68± 12,31	119,05± 13,52	117,73± 11,68	117,04± 8,53	114,41± 8,19	**120,13**± 10,83	114,29± 8,62	119,19± 10,51	115,90± 6,98
Flexibility	Lean, cm	2,57± 5,95	5,86± 5,16	7,33± 3,72	7,36± 4,85	4,61± 6,40	5,13± 6,40	7,15± 7,27	**9,52**± 5,99	7,58± 9,07
	Stick twist, cm	53,54± 14,54	**52,75**± 10,74	53,90± 13,30	54,26± 14,67	62,10± 15,91	63,15± 13,00	58,45± 16,40	63,91± 17,23	66,85± 18,81
	Right-hand-up lock, cm	3,24± 3,07	4,07± 8,04	7,02± 4,95	6,33± 5,51	9,25± 4,06	10,74± 5,89	**11,52**± 5,54	10,95± 3,71	10,05± 6,29
	Left-hand-up lock, cm	1,91± 3,65	2,83± 4,26	5,12± 5,09	4,24± 5,42	6,48± 4,45	7,83± 6,81	7,78± 5,57	**8,50**± 4,67	7,60± 6,11
Endurance	6x8m shuttle sprint, s	17,30± 4,30	18,69± 2,59	17,24± 1,57	15,57± 1,23	14,86± 0,88	14,62± 0,98	14,16± 0,60	**13,84**± 0,79	13,97± 0,97
	10 high jumps, cm	136,17± 39,35	152,21± 28,28	171,26± 40,78	193,60± 29,31	228,06± 45,98	231,91± 49,51	269,23± 46,14	**295,57**± 51,01	264,11± 59,24
	Push-up time in the above test, s	0,58± 0,72	0,83± 1,05	**0,47**± 0,58	1,07± 0,85	1,57± 0,97	0,71± 0,81	1,39± 0,97	1,87± 0,83	1,38± 1,13

*Note: *tennis/ 1kg ball throws by the 6-8/ 9-plus year-olds, respectively; **ball juggling off the ground for the 6-7 year-olds and by the racket frame for the 8-plus year-olds*

ties. Moreover, the peak reaching inconsistency was found in every test rating the same physical quality. For example, the speed test data was found age-specific, with the elder groups showing better results in the longer-time tests. Thus the 8-year-olds were the fastest in the response test and high jump push-off time test. The 13 and 14 year-olds were the best in the 5m and 10m sprint tests, respectively. Furthermore, the physical fitness test data showed the actual progress being uneven with age. We found the intergroup growths in every test to find the most sensitive periods when the test results grow fast versus the prior age group: see Table 2.

Growth in some test is indicative of the age-specific sensitivity to trainings of the physical fitness quality rated by the test [1-3, 6, 10-13]. Since the growth is different, the sensitivity is also different, and that is why the sports community strives to find the most sensitive periods that promise the highest progress in every physical quality / test (Tables 2-4). Therefore,

Table 2. *Sensitive/ fast physical fitness growth periods found by the speed, speed-strength and strength tests*

Physical qualities	Speed			Speed-strength			Strength
Test	5m sprint, s	10m sprint, s	Re-sponse, s	Long jump, cm	High jump, cm	Tennis/ 1kg (T/ K) ball throw, m	Right/ left (R/L) carpal strength, kg
Age	9	9 12	11	7	9 12	T: 7 K 13	R: 7 L: 7
Growth, %	14,0	9 9	31	10,7	17,0 16,8	T: 35,4 K: 23,0	R: 41,0 L: 38,0
p	0,01	0,01 0,01	0,01	0,01	0,01	0,01	0,01

Table 3. *Sensitive/ fast physical fitness growth periods found by the coordination tests*

Physical qualities	Coordination			
Test	15-s over-stick jumps, reps	6 length-adding jumps, cm	15s ball juggling with racket off the ground/ by frame (O/ F)	High jump with/ without arm swing (1/2), %
Age	11	9 12	O: 7 F: 11 и 14	11 13
Growth, %	33	45 44	O: 45 F: 68 and 69	5 4
p	0,05	0,01 0,01	O: 0,01 F: 0,01 insignificant	0,05 insignificant

Table 4. *Sensitive/ fast physical fitness growth periods found by the flexibility and endurance tests*

Physical qualities	Flexibility			Endurance		
Test	Lean, cm	Stick twist, cm	Right/ left-hand-up (R/L) lock, cm	6x8m shut-tle sprint, s	10 high jumps total, cm	10 high jump push-off time, s
Age	7	12	R: 8 L: 8	9	10	11
Growth, %	128	7	R: 73 L: 81	10,3	17,8	55
p	insignifi-cant	insignificant	R: L: insignificant	0,01	0,01	0,01

age periods showing the highest growth in the key physical qualities of special priority may be considered sensitive and most beneficial for the training service in the target physical quality domain. This means that every training system should be customized to the age-specific sensitivities to the physical progress aspects. We summarized in Table 5 the age-specific sensitive physical qualities that the training service needs to be focused on.

Conclusion. The study data and findings give grounds to recommend the 6-14 year-old women's tennis training systems being customized for the sensitive ages due to the physical progress differences to

Table 5. *Age-specific sensitive physical qualities need to be prioritized by the training service for the 6-14-year-old female tennis players*

Age	Physical qualities
7	Strength, including the carpal one; lower limbs and shoudler girdle speed-strength rated by the ball throw test in the 6-8 year-olds; spinal flexibility; coordination rated by the spatial movement control test
8	Shoulder girdle flexibility rated by the arm lock test
9	Short/ longer acceleration rated by the 5m/10m sprint tests, respectively; lower-limbs speed-strength; endurance rated by the 6x8m shuttle sprint tests; coordination rated by the muscle strength control test
10	Speed-strength endurance rated by the 10 high jump total test
11	Response speed; SS endurance rated by the 10 high jump push-up time test; coordinationn rated by the movement redirection, spatial accuracy and movement control/ harmony tests
12	Longer acceleration rated by the 10m sprint test; lower-limbs speed-strength; coordination rated by the muscle strength control test; shoulder girdle flexiblity rated by stick twist test
13	Shoulder girdle speed-strength; coordination rated by movement control/ harmony tests
14	Coordination rated by the spatial movement accuracy test

secure high progress in every key physical quality by the prudently designed, individualized and managed training service.

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Primary selection model for sports gifted children

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Abstract

Objective of the study was to theoretically substantiate and analyze benefits of a combined general/ special sports gifts test system for children that factors in every genetic, anthropometric, functional, psychological and motor factor of importance for the sports selection, promotion and progress.

Methods and structure of the study. The study was run at the Sports Gifted Children Test, Selection and Follow-up Center of Lesgaft National State University of Physical Education, Sports and Health in St. Petersburg. The combined general/ special sports gifts test system for children was designed to test and analyze every genetic, anthropometric, functional, psychological and motor factor of importance for the sports selection and progress in the Primary Selection Model implementation Project. The Primary Selection Model gives a special priority to potential competitive gifts in 86 sports, with the physical fitness / gifts analyzed by experts within the structure and logics of the Coordination Fitness Model by O.A. Dveirina (2019) applied to rate every physical fitness element.

Results and conclusion. For the further Primary Selection Model scaling and application purposes, we would recommend the tests that not necessarily require high technical skills for success in the tests albeit still produce dependable physical fitness test data. We selected the most objective, reliable, representing and theoretically grounded tests easily accessible for the individuals with modest or beginner motor experiences. Later on it may be beneficial to build up the test set to form a test battery compliant with the mission, goals and technical standards of the 'Become a Champion' Federal Experimental Innovative Project.

Keywords: *model, physical abilities, testing, gift manifestations, competitive exercise.*

Background. The national sports talents selection/ qualification system presently gives a high priority to the physical fitness tests and gifts qualification methods to effectively group children at the beginner and special training stages. The underage/ youth sports theory and practice of reports only a small proportion of the would-be athletes being successful in every physical fitness test and, hence, other special methods and tools are needed to fairly rate and rank the individual physical fitness on a more accurate and multisided basis.

Objective of the study was to theoretically substantiate and analyze benefits of a combined general/ special sports gifts test system for children that factors in every genetic, anthropometric, functional, psychological and motor factor of importance for the sports selection, promotion and progress.

Methods and structure of the study. The study was run at the Sports Gifted Children Test, Selection and Follow-up Center of Lesgaft National State University of Physical Education, Sports and Health in St. Petersburg. The combined general/ special sports gifts test system for children was designed to test and analyze every genetic, anthropometric, functional, psychological and motor factor of importance for the sports selection and

Competitive physical fitness test system

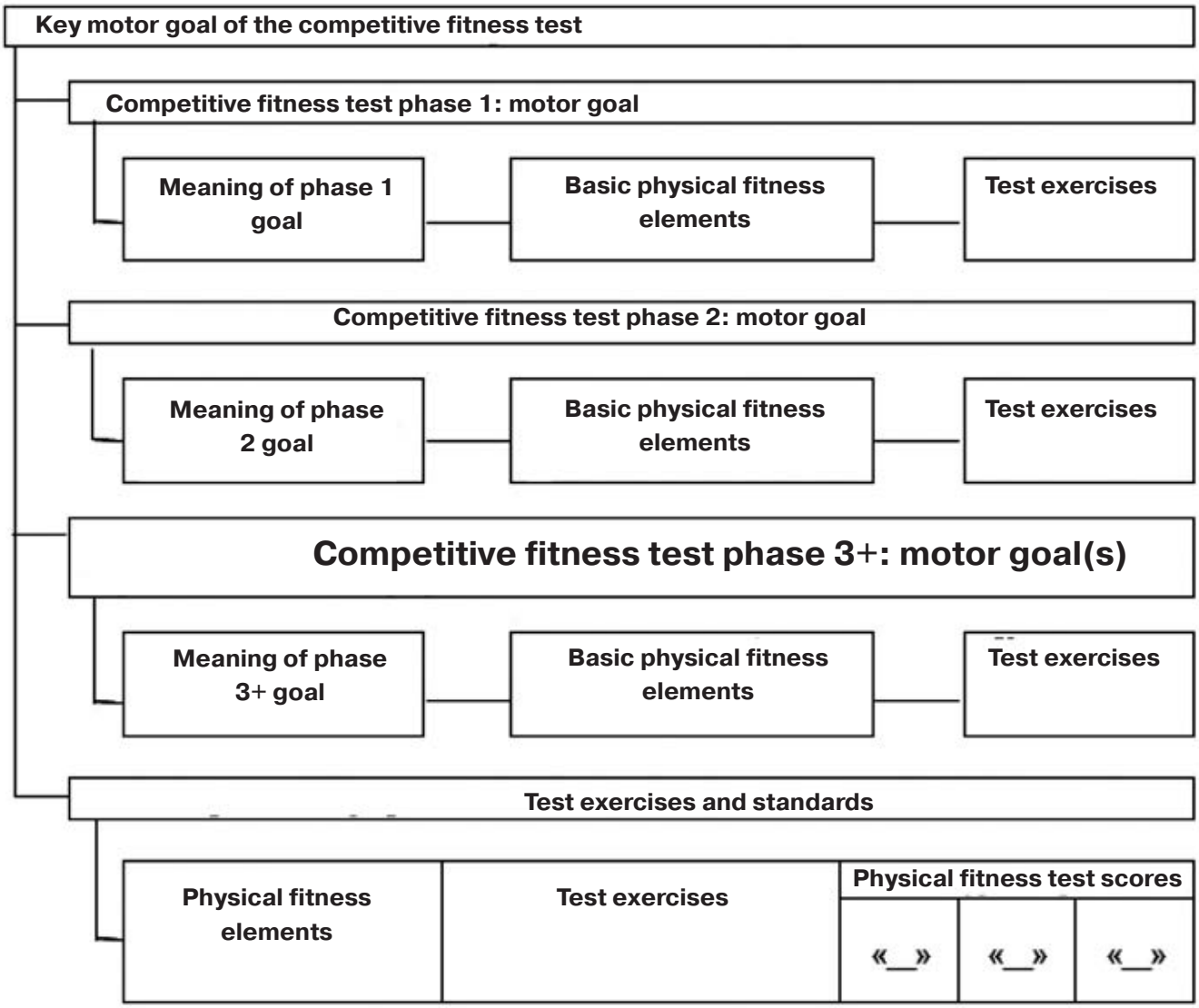

Figure 1. *Competitive physical fitness rating model: design and logics*

progress in the Primary Selection Model implementation Project. The Primary Selection Model gives a special priority to potential competitive gifts in 86 sports, with the physical fitness / gifts analyzed by experts within the structure and logics of the Coordination Fitness Model by O.A. Dveirina (2019) applied to rate every physical fitness element: see Figure hereunder.

Results and discussion. Having analyzed the modern physical fitness classifications (with their strength, speed, endurance, flexibility and other elements), we decided to give a special priority to the motor goals of the physical fitness test system. We also analyzed the sport-specific competitive fitness standards to develop a set of competitive physical fitness test exercises for every sport discipline.

Furthermore, we used a 'high/ low' leveling code in the sport-specific physical fitness standards/ test benchmarks for the listed sports disciplines where one or few physical fitness elements are known being critical for the competitive progress – conditional on special focused trainings to increase or decrease the physical fitness element.

Modern physical education and sports theory and practice offers multiple test systems developed by the national and foreign sports science and pedagogy – to rate the technical/ physical fitness in many aspects including the injury-prevention ones.

Thus a range of strength tests is applied to rate anthropometric characteristics of the skeletal muscles and composition of their muscle fibers by instrumental dynamometric methods.

It is common for the modern physical education and sports practice to analyze absolute and relative muscle strengths, with the absolute one determined by environmental factors (training, self-reliant workouts, etc.) and the relative basically dependent on the genotype. The study was designed to select the sports gifted children and offer them most promising sports career for progress based on the combined screenings of their genetic, anthropometric, functional, psychological and motor qualities/ skills. The tests were governed by a set of universal criteria to allow the physical fitness being tested versus the actual body mass to arrive at relative (per kilo) muscle strength rates. We recommend such tests being designed to produce relative muscle strength rates for every muscle group and/or generalized poly-dynamometric test data to arrive at the relative strength totals. We analyzed more than 100 test methods to rate the individual strength, speed coordination, endurance, flexibility and other physical fitness elements.

Conclusion. For the further Primary Selection Model scaling and application purposes, we would recommend the tests that not necessarily require high technical skills for success in the tests albeit still produce dependable physical fitness test data. We selected the most objective, reliable, representing and theoretically grounded tests easily accessible for the individuals with modest or beginner motor experiences. Later on it may be beneficial to build up the test set to form a test battery compliant with the mission, goals and technical standards of the 'Become a Champion' Federal Experimental Innovative Project.

The study was designed to contribute to the ongoing Genetic Testing Services initiative and theoretical and practical research under the 'Become a Champion' Federal Experimental Innovative Project – based on Contract No. CT-01/19 of May 14, 2019 reached by and between the "Become a Champion" ANCO (Moscow) and Lesgaft National State University (St. Petersburg).

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Power snatch execution asymmetry capturing method

UDC 796.886

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Abstract

Objective of the study was to develop and test benefits of a power snatch execution asymmetry capturing method applicable in the weightlifting elite training systems.

Methods and structure of the study. We used in the study detailed power snatch video captures produced by three high-speed cameras shooting from different angles. Cameras 1 and 2 were fixed 7m from the shaft butt on the right and left sides (respectively) of the weightlifting platform with the shooting axes parallel to the bar shaft. Camera 3 was fixed 10m far from the shaft perpendicular to the shaft center for the full-face shooting. We sampled for the power snatch kinematics analysis an elite female Master of Sport in weightlifting competing in the 59kg weight class.

Results and conclusion. We analyzed an individual asymmetry of the power snatch execution by elite weightlifter L to compute the horizontal/ vertical tilts and detect the tilt/ imbalance startup moment – and find reasons for the power snatch asymmetry. We also found that the vertical tilt/ imbalance starts up and grows after the shaft-hips contact. Despite the contact points and movement times of the right and left plates being even, the horizontal acceleration peaks and forces on the both plates were found to differ. In the analyzed power snatch sequence, the right plate was found to move faster with higher acceleration than the left one to force a vertical tilt on the weight. Horizontal tilt of the weight was found to start in the depreciation (pre-dip-under) phase, with a positive acceleration peak on the left butt. As a result, the vertical speeds of the right and left plates were different to result in the weight control asymmetry. This power snatch execution tilt/ asymmetry is may be explained by the individual anthropometrics-specific speed-strength imbalances plus a compensatory grip asymmetry.

Keywords: *weightlifting, power snatch, high-speed video captures, kinematics, dynamics, asymmetry.*

Background. Presently the weightlifting research community in its efforts to excel the training and competitive fitness systems gives a special priority to the weight control pacing and timing (spatial-temporal test rates), kinematics, dynamics, tilts and asymmetries/ imbalances in the weightlifting moves including the power snatch sequence, with a special role in the studies played by the high-speed videos to capture every movement detail in a contactless manner with high accuracy.

Objective of the study was to develop and test benefits of a power snatch execution asymmetry capturing method applicable in the weightlifting elite training systems.

Methods and structure of the study. We used in the study detailed power snatch video captures produced by three high-speed cameras shooting from different angles. Cameras 1 and 2 were fixed 7m from the shaft butt on the right and left sides (respectively) of the weightlifting platform with the shooting axes parallel to the bar shaft. Camera 3 was fixed 10m far from the shaft perpendicular to the shaft center for the full-face shooting.

We sampled for the power snatch kinematics analysis an elite women's weightlifting Master of Sport competing in the 59kg weight class and coached by S.A. Syrtsov. We captured the 60kg power snatch sequence (every phase from startup to squat and

standup) at 250 fps, with the weight rated at 95% of the personal best. Targets for Cameras 1 and 2 on the shaft butts were marked in digitalized in a coordinate system. Targets for Camera 3 were marked and digitalized at the shaft ends, shaft center and hand centers. Coordinates of every marked target were processed by a digital filter of our own design (State Registration Certificate No. 2017613826) to track the target movement speeds and accelerations. We also computed the vertical and horizontal power snatch force components on the weight as described in the prior study reports [1, 2].

Results and discussion. We obtained the right/ left shaft butt video captures with digitized coordinates of every right/ left shaft butt point in every frame on the sagittal plane, with the frames scaled for the plate centers – knowing that the plate shift effect on the scale never exceeds one percent. We then used the digital filter to compute, within these coordinates, the vertical and horizontal speed and acceleration coordinates of the targets. This means that every frame fixed coordinates, speeds and accelerations of the shaft butts.

A comparative analysis of the right/ left shaft butt vertical coordinate variations with time made it possible to find the right/ left shaft butt travel maximums (peaks) versus the starting point (weight on the platform). In this case the right and left butt travel maximums were 1.062 m and 1.11 m, respectively, with the right/ left shaft butt travel difference of 0.048 m with an average scaling error of 0.007 m – that means the shaft tilted to the right. The right/ left shaft butt difference was maximized at 0.063 m in the final weight fixing/ standup point. The right/ left shaft butt travel speed maximums were estimated at 2.038 m/s and 1.965 m/s on the left and right butts, respectively – that means the left butt being pushed up faster, as additionally verified by a visual examination of the full face frame in the squat/ standup starting position: see Fig. 1.

The vertical right/ left shaft butt coordinates were found to little vary (<0.006 m) till the 0.616s time point since the startup – to grow thereafter. Note that this time point refers to the depreciation (pre-dip-under) phase: see Figure 2. The growth may be due to a changed balance of forces on the right and lift plates plus a grip asymmetry. The athlete's right and left hand distances to the shaft ends were estimated at 0.196m and 0.186m, respectively, with a 0.032m grip shift from the shaft center indicative of the individual anthropometric strength application imbalances/ asymmetry. The vertical strength maximums on the right and left plates were estimated at 371 N and 438 N, respectively, with this difference explaining the extra acceleration of the right butt.

Figure 1. *Squat phase*

Figure 2. *Pre-dip-under (depreciation) phase*

The horizontal right/ left shaft butt coordinates were found to differ much wider. For the horizontal coordinates tracking purposes, we took the either butt coordinates of the weight on the platform as a zero point – and found the horizontal coordinates different by 0.122m in the squat phase. To find causes for the difference, we visualized the horizontal coordinates difference variation with time – see Fig. 3.

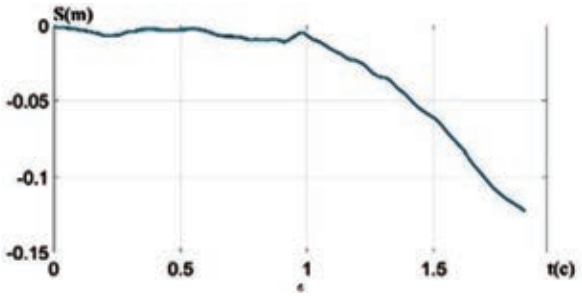

Figure 3. *RLB horizontal coordinates: difference variation with time*

Note that till the 0.98s time point, the right/ left shaft butt horizontal coordinates differ within 0.01 m only, with the difference growing thereafter to peak at

0.122 m in the final phase, with a tilt of 3.12 degrees. Our video analysis found this time point referring to the moment of the shaft-hips contact (pre-dip-under) point when the horizontal speed vector changes, with the shaft moved off the body: see Fig. 4. This hip contact point on diagrams (see Figure 5) is represented by peaks. It should be mentioned that the horizontal accelerations of the left and right butts are positive and negative at 36.22 m/s2 and 38.22 m/s2, respectively; whilst the butt acceleration times are the same at 0.076s. The right and left butt travel distances for this phase were estimated at 0.036m and 0.029m, respectively. On the whole, the above acceleration and travel profiles are indicative of the shaft-hips contact asymmetry – that results in the shaft tilting thereafter particularly visible at the end of the movement sequence: see Fig. 2.

Figure 4. *Shaft-hips contact point prior to the dip-under phase*

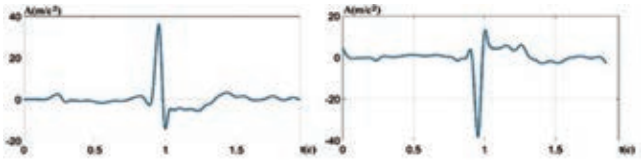

Figure 5. *Horizontal accelerations of the left (positive peak) and right (negative peak) butts of the shaft*

As was done in the barbell tilt analysis, we may analyze the horizontal forces in the weight control process by the right/ left shaft butt travel and acceleration profiles using the mathematical model described in our prior study [2]. The maximal shaft-hips contact forces on the right and left plates were estimated at 780 N and 654 N, respectively – see the shaft-hips contact point prior to the dip-under phase on Figure 4.

Conclusion. We analyzed an individual asymmetry of the power snatch execution by elite weightlifter L to compute the horizontal/ vertical tilts and detect the tilt/ imbalance startup moment – and find reasons for the power snatch asymmetry. We also found that the vertical tilt/ imbalance starts up and grows after the shaft-hips contact. Despite the contact points and movement times of the right and left plates being even, the horizontal acceleration peaks and forces on the both plates were found to differ. In the analyzed power snatch sequence, the right plate was found to move faster with higher acceleration than the left one to force a vertical tilt on the weight. Horizontal tilt of the weight was found to start in the depreciation (pre-dip-under) phase, with a positive acceleration peak on the left butt. As a result, the vertical speeds of the right and left plates were different to result in the weight control asymmetry. This power snatch execution tilt/ asymmetry is may be explained by the individual anthropometrics-specific speed-strength imbalances plus a compensatory grip asymmetry.

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Programmable basketball shooting machine: training benefits

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Abstract

Objective of the study was to theoretically analyze and practically test benefits of a programmable basketball shooting machine for technical skills training in basketball groups.

Methods and structure of the study. The study included a basketball-shooting-machine-assisted training experiment on a sample of the 17-23-year-old basketball players (n=28) of different skill levels. We split them up into Experimental and Control Groups (EG, CG) of 14 people each. The skill levels in the groups were as follows: unskilled non-competing athletes (n=2 in each group); athletes with basic skill sets but no experience in school/ Youth Sports School competitions (n=4 in each group); fairly skilled athletes trained at the Youth Sports School (n=4 in each group); and highly-skilled experienced Student Basketball Association competitors (n=4 in each group).

Results and conclusion. The training experiment with the pre-versus post-experimental physical fitness/ technical fitness / special endurance tests and analyses showed the basketball-shooting-machine-assisted training model being highly beneficial as it facilitates individual progress in many aspects with a special emphasis on the individual weaknesses and technical skills improvement barriers, opportunities and creative resource mobilizing emphases – both in the pre-seasonal training and competitive periods. The basketball shooting machine application was also found to facilitate the coach-trainee cooperation and concentration on the individual key training missions – to improve the athlete's self-control and management skills and speed up the physical and technical progresses in every aspect.

Keywords: *hardware-software complex, basketball shooting machine, progress assessment in training process, Student Basketball Association Tournament.*

Background. Modern basketball training systems demonstrate a growing need for new training models, technologies and tools to facilitate technical progress of every athlete.

Objective of the study was to theoretically analyze and practically test benefits of a programmable basketball shooting machine for technical skills training in basketball groups.

Methods and structure of the study. The study included a basketball-shooting-machine-assisted training experiment on a sample of the 17-23-year-old basketball players (n=28) of different skill levels. We split them up into Experimental and Control Groups (EG, CG) of 14 people each. The skill levels in the groups were as follows: unskilled non-competing athletes (n=2 in each group); athletes with basic skill sets but no experience in school/ Youth Sports School competitions (n=4 in each group); fairly skilled athletes trained at the Youth Sports School (n=4 in each group); and highly-skilled experienced Student Basketball Association competitors (n=4 in each group).

Physical fitness of the sample was tested by the 3km cross-country race, 100/ 60/ 30m sprint, standing high jump and prone push-ups tests. The pre-experimental physical fitness tests found the intergroup differences insignificant. Technical fitness of the sample was tested by the combined shot time test; dribbling skills tests (with a special priority to combined skills); individual defense/ footwork skills tests; and space control skills test.

Special endurance was tested in the game situation models (last seconds in attack; quick breakthrough; defense-to-attack transition etc.). Individual technical fitness was rated on a 10-point scale and analyzed by a group of highly skilled and vastly experienced coaches (n=5). The pre-experimental tests found the intergroup physical fitness / technical fitness / special endurance test data differences insignificant.

The CG trainings were traditional, i.e. designed in compliance with the valid standards, without basketball shooting machine; whilst the EG training system was complemented by the basketball-shooting-machine-assisted physical fitness / technical fitness / special endurance training elements. The training process intensity in the both groups was controlled using fitness bracelets for the coach to efficiently manage the individual workouts on a real-time basis keeping track of the heart rate, average pace, activity and footwork.

The basketball-shooting-machine-assisted training model included a range of special tasks – e.g., to find the most efficient shooting rate and speed in a new technical skills mastering workout to secure fast progress, ease and freedom of execution. These tasks encouraged creativity in the technical skills mastering process to help the athlete and coach jointly and effectively find the most successful individual basketball-shooting-machine-assisted training program for fast technical skills progress. The basketball shooting machine applied in the trainings may be defined as the electronic shooting machine charged with 10 balls and programmed to shoot them at 2-plus-second intervals within a full horizontal (0-180-degree) semicircle, with the balls shot 2-16m far to a catching basket. Given in the Table hereunder is the basketball-shooting-machine-assisted technical skills training algorithm.

Results and discussion. The CG and EG progress tests found improvements in both groups

Table 1. *Basketball-shooting-machine-assisted technical skills training algorithm used in the EG training system*

Coach's actions and control	Athlete's mission and execution
Show the basketball-shooting-machine-assisted technical skills execution sequence with an emphasis on emotional aspects; manage the individual technical skills execution	Analyze and memorize the technical skills execution sequence to develop own technical skills execution model customized to own anthropometric characteristics and other specifics
Set the technical skills workout goals with account of the individual resource to help master in on a game-situation-specific basis	Find and perfect the best startup and execution phases; and focus, on the coach's advice, on the basketball-shooting-machine-assisted execution and movement coordination excelling aspects and tools
Set goals in the technical skills perfection process with variations in the execution speeds, amplitudes and jump levels	Realize and maximize the basketball shooting machine benefits in the technical skills excellence process with a special attention to the coach's instructions for the technical progress in every technical skills element
Set the technical skills perfection goals as required rather by the game situations than the opponent's mastery and resistance	Center own training efforts on the individual technical skills set (dribbling, jump shots, footwork etc.) to find the most effective technical skills combinations like dribbling plus shot, dribbling plus pass, wrong-footing (off-balancing) move plus shot, etc.
Focus the athlete's attention on the key technical elements to harmonize the startup, execution and emotional controls in every technical skills execution sequence	Feel every detail in the technical skills execution for perfection: pre-jump foot setting, first-step amplitude after the ball is received; heal-to-tip rolls in the dribbling actions, etc.
Control the individual technical skills execution heart rate, pace variations and amplitudes	Make multiple technical skills repetitions with basketball shooting machine to step-up the execution speed, streamline the technical skills execution style and develop the feel of progress and mastery level

albeit the EG showed significantly better progress in the tests. Thus in the 100/ 60/ 30m pre-versus post-experimental sprint tests, the CG made average progress from 13.53+-1.08s to 13.07+-1.35s ($p>0.05$); versus the EG progress from 13.57+-1.23s to 12.81+-1.29s ($p>0.05$), respectively. In the pre-versus post-experimental standing high jump tests, the CG made progress from 58.43+-2.60cm to 59.89+-2.75cm ($p>0.05$) versus the EG progress from 58.27+-3.04cm to 62.31+-2.39cm ($p<0.05$), respectively.

The same intergroup physical fitness progress patterns were found by the other tests – apparently due to the basketball shooting machine-assisted trainings in the EG being better centered on the individual resources, skills, drawbacks and progress needs and opportunities, particularly in the movement coordination and control aspects; with every technical skills trained by much higher repetitions in the basketball-shooting-machine-assisted formats reasonably customized to the individual progress needs in every technical aspect.

The technical fitness tests also found progress in both groups albeit the EG showed significantly better progress due to the basketball shooting machine technology with special benefits for the coach and the athletes to allow them concentrate on the individual drawbacks in every technical skills mastering and excelling process, with the progress facilitated and guaranteed by multiple repetitions in different combinations, sequences, execution versions and other technicalities to develop a sound groundwork for every technical skill and mastery on the whole.

Conclusion. The training experiment with the pre-versus post-experimental physical fitness/ technical fitness / special endurance tests and analyses showed the basketball-shooting-machine-assisted training model being highly beneficial as it facilitates individual progress in many aspects with a special emphasis on the individual weaknesses and technical skills improvement barriers, opportunities and creative resource mobilizing emphases – both in the pre-seasonal training and competitive periods. The basketball shooting machine application was also found to facilitate the coach-trainee cooperation and concentration on the individual key training missions – to improve the athlete's self-control and management skills and speed up the physical and technical progress in every aspect.

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Competitive/ technical progress forecasting in ski jumping sport

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Abstract

Objective of the study was to analyze the key training elements critical for competitive/ technical progress in modern ski jumping sport.

Methods and structure of the study. We analyzed for the study purposes statistics of the 2017-2018/ 2018-2019/ 2019-2020 World Ski Jumping Cup Women's events to find, using the Spearman's rank correlation test, correlations between the style score (competitive/ technical result) and distance score within the landing zone or construction point (K-point) on the hill size line.

Results and conclusion. The national ski jumping training service should give a higher priority to quality and safety of the landing techniques and styles within and behind the K-point on the hill size line. Our study found a strong direct statistical correlation (r=0.78) between the competitive style score and distance score within and behind the K-point on the hill size. The national ski jumping team leaders need to achieve and stabilize the 90% and 95% hill size jumps to enter the top-10 and top-3 (respectively) in the World Cup standard hill events. In the Large Hill World Cup events, the top-3 and top-10 distance score averages should vary at around 95% and 92% the hill size, respectively. The high-distance landings are particularly demanding to the individual musculoskeletal system fitness, and athletes should be well trained for such large hill jumps with a special focus on the high in-run speeds.

Keywords: *ski jumping sport, hill size line, standard hill, large hill, jump distance.*

Background. Prudently designed multiannual training service is expected to secure high competitive fitness standards, although it is not unusual in practice that the competitive fitness of equally trained and qualified athletes widely differs in some aspects [1, 2]. Such disproportions may be due to both subjective and objective reasons. The subjective ones are normally dominated by the training service mismanagement and omissions when the coach tends to work intuitively with heavy reliance on the own feels. It should be confessed, however, that some experienced coaches are highly accurate in setting and tracking the individual professional progress vectors, although such coaches are always rare, whilst every athlete needs a well-designed individualized training system for success. Generally a multiannual training system will be designed using a set of training stage specific benchmarks. Regretfully this particular part of the training design and management is presently fraught with contradictions between the following training elements:

– Need for a well-designed individual progress profile – and deficiencies in the actual training design and management;

– Training plan with the actual training effects – and failures in respecting every factor of influence on the competitive/ technical progress [2-4].

These contradictions need to be well addressed to effectively design and manage every training stage with account of its contribution to the ski jumping technique, style and distance.

Objective of the study was to analyze the key training elements critical for competitive/ technical progress in modern ski jumping sport.

Table 1. *Distance score averages of the top-20 competitors in the 2020-2021 World Ski Jumping Cup Women's events, hill size %*

Competitor	Nation	Event 1	Event 2	Event 3	Event 5	Event 5	Hill size % average
Kramer, Marita	AUT	104,64	96,83	95,07	92,61	95,07	96,84
Opseth, Silje	NOR	95,71	96,48	93,66	89,79	97,54	94,64
Kvandal, Eirin Maria	NOR	93,57	93,31	96,13	91,20	93,66	93,57
Kriznar, Nika	SLO	93,93	91,20	92,25	87,32	92,96	91,53
Takanashi, Sara	JPN	90,00	96,13	94,72	87,32	89,44	91,52
Klinec, Ema	SLO	88,93	91,20	93,31	88,73	91,55	90,74
Lundby, Maren	NOR	88,76	92,96	88,73	87,68	91,20	90,14
Iraschko-Stolz, Daniela	AUT	93,93	93,31	90,85	84,15	86,27	89,70
Sorschag, Sophie	AUT	86,43	94,01	91,20	77,11	87,32	87,22
Brecl, Jerneja	SLO	84,56	92,25	90,49	82,39	82,75	86,97
Avvakumova, Irina	RUS	87,14	91,20	89,08	81,69	84,86	86,79
Ito, Yuki	JPN	81,07	89,44	90,85	83,80	88,73	86,78
Hoelzl, Chiara	AUT	91,43	86,27	86,27	82,04	85,56	86,31
Althaus, Katharina	GER	83,93	90,14	89,08	81,34	86,97	86,29
Bogataj, Ursa	SLO	80,71	91,55	88,73	79,93	82,75	84,73
Bjoerseth, Thea Minyan	NOR	86,07	82,75	86,62	80,28	81,69	83,48
Maruyama, Nozomi	JPN	86,02	84,86	86,27	78,87	81,69	82,92
Clair, Julia	FRA	82,86	83,10	84,86	78,87	84,51	82,84
Iwabuchi, Kaori	JPN	85,36	80,28	83,80	80,63	83,80	82,78
Pagnier, Josephine	FRA	90,71	79,23	84,86	77,11	80,63	82,51

Methods and structure of the study. We analyzed for the study purposes statistics of the 2017-2018/ 2018-2019/ 2019-2020 World Ski Jumping Cup Women's events to find, using the Spearman's rank correlation test, correlations between the style score (competitive/ technical result) and distance score within the landing zone or construction point (K-point) on the hill size line.

Results and discussion. For competitive success in ski jumping, athletes need to collect high distance scores with landings within or behind the K-point on the hill size [3-5] – with such landing being the key goal of every athlete. Table 1 hereunder gives the individual distance averages in the five 2020-2021 World Ski Jumping Cup Women's events as the hill size percentages (% of the hill size). The Spearman's rank correlation test found a strong direct statistical correlation (r=0.78) between the competitive style score and distance score within and behind the K-point on the hill size. Note that the top-three competitors scored around 95% of the hill size.

The hill size % averages of the top-10 competitors were lower at around 90% of the hill size.

Regretfully, the Russian team was relatively low on the distance scoreboard that may be interpreted as an indirect evidence of the training inefficiency (Table 2). We believe that this failure may be due to the following reasons. First, the national ski jumping coaches tend to excessively prioritize the first-phase technicalities in trainings i.e. the in-run and takeoff techniques – at sacrifice of the other jump phases.

Second, only a few athletes are well trained to land within or behind the K-point on the hill size line – due to deficiencies in the mental conditioning and technical/

Table 2. *Distance score averages of the Russian team in the 2020-2021 World Ski Jumping Cup Women's events, hill size %*

Competitor	Rank	Event 1	Event 2	Event 3	Event 5	Event 5	Hill size % average
Avvakumova, Irina	11	87,14	91,20	89,08	81,69	84,86	86,79
Scpyneva, Anna	28	80,29	79,58	79,93	75,35	76,29	78,29
Prokopieva, Kristina	36	75	-	-	-	-	75
Tikhonova, Sofia	39	75	-	-	-	72,54	73,77
Makhinia, Irma	43	71,79	-	-	-	67,96	69,87

tactical skills for such competitive landings. And third, landings behind the K-point on the hill size are always highly stressful for the musculoskeletal system, and not every athlete is fit for them, particularly in the Telemark landing style [1, 5, 6].

The above deficiencies need to be addressed by special training with a higher emphasis on the long jumps from larger ramps and with higher in-run speeds to make the athletes fit for such distances and prepared to land behind the K-point on the hill size line. Our analysis of the distance score averages for the last three seasons showed the distance growth trend: see Tables 3 and 4.

Table 3. *Distance score averages of the top-10 and top-20 competitors in the last three World Ski Jumping Cup Women's standard hill (standard hill) events, hill size %*

Rank	2017-2018	2018-2019	2020-2021
Top-20	88,0	90,05	90,13
Top-10	90,7	91,9	92,24

The standard hill evens (Table 3) showed both the distance average growth and average score nearing trends. Thus only one competitor scored 95% hill size in the 2017-2018 events – versus three athletes in the 2018-2019 events; whilst the top-3 In the 2017-2018/ 2018-2019 events scored on average 92-93% hill size – followed by the 95%-plus hill size scores by the top-3 in the 2020-2021 events. Furthermore, from season to season we find the numbers of the 100%-plus hill size jumps growing. Prior to the 2020-2021, such jumps could guarantee wins, whilst in 2020-2021 they were demonstrated by a few competitors at a time.

Table 4. *Distance score averages of the top-10 and top-20 competitors in the last three World Ski Jumping Cup Women's large hill events, hill size %*

Rank	2017-2018	2018-2019	2020-2021
Top-20	87,12	84,93	87,92
Top-10	91,21	88,56	91,29

In the large hill events (Table 4) the distance scores were wider different, particularly in the first seasons of the Large Hill Women's World Cup events. The top-10 standard hill competitors showed a good adaptation to the large hill events by 2020-2021 – as verified by the distance scores coming close to 100% hill size. Modern training should prioritize such high-distance jump trainings to help the athletes adapt to the K-point-plus landings by self-adjustments of the individual landing techniques – to secure technically safe landings with minimal injury risks.

Conclusion. The national ski jumping training service should give a higher priority to quality and safety of the landing techniques and styles within and behind the K-point on the hill size line. Our study found a strong direct statistical correlation (r=0.78) between the competitive style score and distance score within and behind the K-point on the hill size. The national ski jumping team leaders need to achieve and stabilize the 90% and 95% hill size jumps to enter the top-10 and top-3 (respectively) in the World Cup standard hill events. In the Large Hill World Cup events, the top-3 and top-10 distance score averages should vary at around 95% and 92% the hill size, respectively. The high-distance landings are particularly demanding to the individual musculoskeletal system fitness, and athletes should be well trained for such large hill jumps with a special focus on the high in-run speeds.

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Normobaric hypoxic training model for youth bench shooting sport: effects on intellectual efficiency verified by psycho-physiological functionality tests

UDC

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Abstract

Objective of the study was to analyze benefits of normobaric hypoxic training model for intellectual efficiency in youth bench shooting sport using psycho-physiological functionality tests.

Methods and structure of the study. The study was run at the N.I. Volkov Sports Biochemistry and Bioenergetics Department Laboratory of Russian State University of Physical Education, Sports, Youth and Tourism (SCOLIPE). We sampled junior bench shooters (n=40) on their informed written consent and split them up into RG (trained traditionally) and EG (trained using hypoxic training method). The normobaric hypoxic training model implied a 30-minute inhaling of a gas mixture in a quiescent state using Everest-1 (model 7) Hypoxic Trainer system that generates 10-plus l/min of the gas mixture with 10-16% of oxygen. The sample was tested by computerized Sports Psycho-physiologist Test System to generate a range of psycho-physiological test rates including intellectual efficiency.

The Sports Psycho-physiologist Test set included: the angular speed valuation; segments valuation; segments metering; angle valuation; and angle perception tests; plus the following sensorimotor response tests: right hand: response to light time; response to sound time; choice reaction; right leg response to light time; response to sound time; and right hand / right leg tapping test; and the left hand response to light time; response to sound time; choice reaction; left leg response to light time; response to sound time; and left hand / left leg tapping test. The tests were designed to prevent the monotony-related fatigue.

Results and conclusion. The tests and analysis found the key variations in the psycho-physiological test rates with hypoxic training in the junior bench shooting sample. We found that the hypoxic training tends to speed up some sensorimotor responses and slow down a few motor functions. The test data arrays showed both positive and negative aspects of hypoxic training on the psycho-physiological functionality. The study findings may be recommended for consideration in the initiatives to use hypoxic training as an ergogenic tool in the bench shooting training systems.

Keywords: *normobaric hypoxia, intellectual efficiency, bench shooting.*

Background. Hypoxic trainings are increasingly popular in the modern sports training systems. A wide variety of the hypoxic training protocols rank such trainings with ergogenic tools [1, 2] recommended on a prudently selective and controlled basis, with most of the relevant study reports analyzing their benefits for cyclic sports [5]. As for the highly coordinated sports, hypoxic training benefits still need to be tested and analyzed [3]. The ongoing theoretical and practical research in bench shooting tends to underestimate potential benefits of hypoxic training for working capacity [4] – largely due to a shortage of the relevant study reports.

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Results and discussion. The RG and EG showed the same test pattern with the test errors basically reduced with the tests repetitions. Thus the EG showed statistically significant progress in the angular speed valuation, angle perception and segments valuation tests

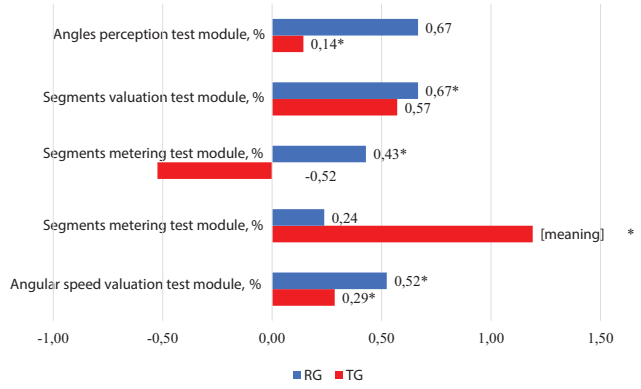

Figure 1. *EG versus RG test rates in the valuation and perception tests: *statistically significant difference at p<0.05*

The EG trained using hypoxic training method showed generally positive growth trend in every test, with the only exception for the error rate in the segments metering test – that grew after the hypoxic training sessions, although the growth was statistically insignificant. The RG was also tested with reductions in the valuation and perception test errors with repetitions of the tests. Given in Table hereunder are the group averages in the right hand/ right leg tapping test (RHTT, RLTT) – that show statistically significant intergroup differences in virtually every pre- versus post-experimental test.

Table 1. *Group averages in the right hand/ leg tapping tests (RHTT, RLTT)*

Test	RHTT		RLTT	
	EG, X±σ	RG, X±σ	EG, X±σ	RG, X±σ
TT1	3,19±2,20*†	0,71±1,23*	2,66±2,88*†	-6,80±2,67*
TT2	4,47±4,46*	3,71±5,22*	3,57±3,94*†	-6,00±3,93*
TT3	4,42±8,14*	2,95±6,61*	2,85±6,17*†	-6,66±4,77*
TT4	3,95±10,61	2,61±6,32*	3,00±7,12*†	-6,19±6,64*
TT5	4,42±10,81*	2,47±7,10	3,09±6,67*†	-6,09±6,92*
TT6	5,09±11,02*	2,66±7,43	2,95±8,01†	-5,61±7,69*

**pre- versus post-experimental test difference statistically significant at p<0.05;*

† unrelated group test difference statistically significant at p<0.05

The above RHTT and RLTT data showed statistically significant sags in the tapping frequency in the both groups, with the drop in the EG more expressed than in the RG which even showed some growth versus the startup tests in some cases. The RHTT tapping test data comparisons showed an expressed drop in the further tests in the EG due to the hypoxic training. Furthermore, we found no differences between the RHTT4 and RLTT6 in the EG; RHTT5 and RHTT6 in the RG; and LHTT5 and LHTT6 in the EG. The same intra-group test data difference logics were found in the left hand and left leg tapping test data arrays.

The LHTT and LLTT test data showed statistically significant progress in the tapping frequency with repetitions – versus the EG that showed a regress in the tapping frequency with repetitions due to the hypoxic training. The intergroup LHTT and LLTT test data was found statistically significantly different.

This expressed effect of hypoxic training – that tends to slow down the tapping test frequency – may be used in the training process to intensify the complex coordination movement sequences typical for bench shooting sport. We also found statistically significant intergroup differences in the left leg response to light and choice reaction; and in the right hand / left hand response to sound and light tests.

The EG intra-group test data showed statistically significant differences in the RG choice reaction, left leg response to light and right hand / left leg response

to sound tests. It should be noted that in the RG choice reaction test the test data difference was negative. In addition we would mention the first and final test data differences. The intergroup test data in the right hand / left hand / left leg response to sound test were found statistically significantly different – that may be interpreted as influence of the hypoxic training that tends to slow down the response times versus the hypoxic-training-free RG training system.

The test data generally showed positive effects of normobaric hypoxic training as an ergogenic training tool for bench shooting sport. It may be recommended to attain some specific goals in the bench shooting training systems classified by the training stages traditions for this sport discipline.

Conclusion. The tests and analysis found the key variations in the psycho-physiological test rates with hypoxic training in the junior bench shooting sample. We found that the hypoxic training tends to speed up some sensorimotor responses and slow down a few motor functions. The test data arrays showed both positive and negative aspects of hypoxic training on the psycho-physiological functionality. The study findings may be recommended for consideration in the initiatives to use hypoxic training as an ergogenic tool in the bench shooting training systems.

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Extracurricular service mastering model for school physical education teachers

UDC 37.02

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Abstract

Objective of the study was to analyze and prioritize the key institutional and pedagogical provisions for the extracurricular service competency formation in future school physical education teachers.

Methods and structure of the study. The extracurricular service mastering model testing experiment was run at Institute of Physical Education, Sports and Life Safety of the Bunin Yelets State University in 2019-2021. We sampled the 2-4-year students (n=162) majoring in the Physical Education and Life Safety specialties under 44.03.05 Pedagogical Education discipline; and split them up into EG (n=80) and RG (n=82).

Results and conclusion. The extracurricular service mastering model testing experiment found its benefits for the future school physical education teachers in the following components:

– Motivations and values in the extracurricular service providing domain;

– Practical learning and training to form due extracurricular service knowledge and skills;

– Experience in complementing the regular physical education curricula by interactive technologies (case studies, business games, brainstorming, focused training) to facilitate progress of schoolchildren in the extracurricular service formats;

– Establishing social partnerships with the relevant educational organizations for internships, and with the relevant municipal agencies; and

– Stimulating reflection to analyze own and students' progress in the extracurricular service process versus the past and present benchmarks and practical experiences to fairly rate, analyze and find solutions for every new situation in the extracurricular service process.

Success of an extracurricular service heavily depends on the actual professional motivations and values, didactic provisions, students' and teachers' personal progress agendas, teaching staff, applied interactive technologies, and generally on a progress facilitating climate that should be friendly and cooperative to effectively address every issue and mission in the extracurricular training process.

Keywords: *extracurricular service, extracurricular service competences, teaching service, educational process.*

Background. Modern school education system gives a special priority to the extracurricular service design and management issues. These issues are ranked high on the list of priorities of the governmental educational policies including the school physical education teacher training for the extracurricular service with the relevant valeological aspects of the training and mentoring policies and practices. National and foreign research communities are increasingly sensitive to the issues of the extracurricular service competency formation in the future school physical education teachers [1].

Objective of the study was to analyze and prioritize the key institutional and pedagogical provisions for the extracurricular service competency formation in future school physical education teachers.

Methods and structure of the study. Extracurricular service fitness of the school physical education teachers may be interpreted as the set of relevant competences and practical skills to facilitate personality progress and reflection driven by the relevant motivations, values, cognitive agendas, operational and practical service domains.

The extracurricular-service-related motivations and values of the future school physical education teacher include the following components: pedagogical professional motivations and values; personality progress spearheading professional motivations and values; and the professional service assessment and reflective abilities.

The extracurricular service-specific cognitive component includes: sound extracurricular service knowledge to effectively set its key missions and develop the sports-facilitated service programs; extracurricular service organizing knowledge and skills to effectively develop the linear, modular and combined extracurricular service formats; and the extracurricular service knowledge and practical skills.

Operational component of the extracurricular service includes: extracurricular service analyzing skills to customize the service to ages and individual/ physiological traits of the trainees, with adaptive extracurricular service elements for disabled and disadvantaged trainees; ability to develop sporting/ wellness extracurricular service programs including special adapted versions for disabled and disadvantaged trainees.

And the practical service component includes: knowledge and skills in the relevant didactic technologies; interactive methods and technologies application experience; health protection and improvement technologies applicable in school extracurricular service; and the physical/ sports progress/ competency tests versus the progress benchmarks.

We used the following tests to rate the extracurricular service competences of the future school physical education teacher: K. Zamfir Professional Service Motivation test adapted by A. Rean [4] with a cognitive component rating capacity; and operational and practical service competences testing exercises.

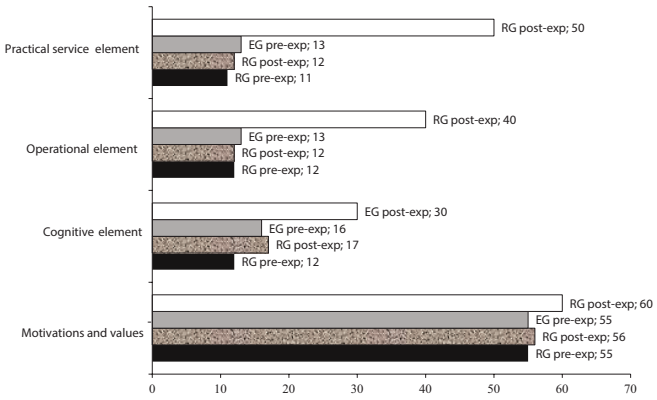

Figure 1. *Progress of the school physical education teachers sample in the extracurricular service mastering experiment: pre- versus post-experimental test data of the EG and RG, %*

In practical terms, the extracurricular service competences were mastered by self-reliant projects and research missions by the trainees; plus special case studies including coaching, mentoring, and lesson analyzing elements. The trainees produced study reports, presented them on at scientific and practical conferences, and used the developments in their academic courses and undergraduate qualification articles. The trainees also had internship tests with practical extracurricular service organizing cases including extracurricular service progress tests and analyses; compilations of three-tier tasks; individual extracurricular education modeling, etc.

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Results and discussion. Figure 1 hereunder visualizes progress of the school physical education teachers sample in the extracurricular service mastering experiment as verified by the pre- versus post-experimental tests of the EG and RG.

The study found meaningless progress in the RG – indicative of deficiencies in the traditional academic training service in this domain. Statistical meaning of differences in the test data was rated by x-square test using the following formula:

$$\chi^2_{\text{эмп}} = \frac{N\times(|A\times D-B\times C|-N/2)^2}{(A+B)\times(A+C)\times(C+D)\times(B+D)},$$

where A and B mean the numbers of EG/ RG students tested fit for the extracurricular service, C, D – tested unfit for the extracurricular service; and N – total sample. In case of practical service element, e.g., $\chi^2_{\text{эмп}}$ = 56,8. As per the Table, $\chi^2_{\text{эмп}}$ = 6,635 is critical for p≤ 0.01. Since is within the meaningful zone (equal or above the critical value), we have grounds to conclude that the intergroup (EG versus RG) difference on the progress scale is statistically significant.

Conclusion. The extracurricular service mastering model testing experiment found its benefits for the future school physical education teachers in the following components:

– Motivations and values in the extracurricular service providing domain;

– Practical learning and training to form due extracurricular service knowledge and skills;

– Experience in complementing the regular physical education curricula by interactive technologies (case studies, business games, brainstorming, focused training) to facilitate progress of schoolchildren in the extracurricular service formats;

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Success of an extracurricular service heavily depends on the actual professional motivations and values, didactic provisions, students' and teachers' personal progress agendas, teaching staff, applied interactive technologies, and generally on a progress facilitating climate that should be friendly and cooperative to effectively address every issue and mission in the extracurricular training process.

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Safe behavior as basis for stress tolerance in athletes

UDC 796:035

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Abstract

Objective of the study was to analyze the engineering students' attitudes to physical education and safe behavior with their competitive spirit and stress tolerance building benefits.

Methods and structure of the study. The study of youth safe behavior and the relevant addiction control competences was run in Yekaterinburg in 2021. We sampled for the study the 1-2-year Ural Federal University bachelor sporting students of different specialties. First we run a questionnaire survey of the group safe behavior with the safe behavior analysis and classification to find the key socio-didactic problems of the safe behavior styling service (February 2021, n=146). The survey was followed by a viability rating psychological tests of a vulnerable subsample (n=60) that reported high-risk experiences they failed to effectively address. The subsample was tested by a test set of our own design including the following three modules: (1) Heim stress coping strategies test; (2) S. Muddy viability test; and (3) emotionality rating unfinished phrase test. The tests were designed to rate the following key safe behavior elements: risk prediction (with the risk analyzing and rating skills); risk avoidance (with the risk knowledge component); and risk coping (the situation-specific behaviors and skills) elements.

In our prior study report we analyzed the psychological and didactic provisions to facilitate the individual safe behavior style formation efforts, with the safe behavior viewed as an integral individual characteristic and mindset of a young person. Stress tolerance should be analyzed in the safe behavior context as a fundamental personal safety resource to mitigate stress, anxiety and tension.

Results and conclusion. The study tested the sporting students sample low on the viability/ stress tolerance resource scales, with the stress coping strategies dominated by confrontational coping styles. The safe behavior style in the sporting students' perceptions was found centered on the personality component and operational component. Such primary safe behavior style provides a basis for an integrated proactive safe behavior style and safe-behavior-based stress tolerance building service for young people. The study has contributed to the Stress Tolerance Building Project with its Viability Laboratory that offers special mental conditioning games to help trainees master the safe behavior style formation basics by the high-risk situations and stress coping behavior modeling and testing role games.

Keywords: *health protection technologies, sporting students, health, sport, stress tolerance, safe behavior.*

Background. The growing economic, political and epidemiological crises urge the sports communities pay a special attention to stress tolerance of young people on the whole and sporting students in particular – since the latter, unlike the adult professional athletes, are more exposed to dangers due to their impulsive, emotional and ambitious agendas with special risks of anxiety, aggressiveness, spontaneity and mental volatility [3]. It should be mentioned that the national research community traditionally associates the youth safe behavior with the concept of stress tolerance/ viability (by Y.G. Volman) [3] viewed as a quality of special importance in challenging life situations (N. M. Volobueva, T.A. Serezhko) [4].

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In our prior study report we analyzed the psychological and didactic provisions to facilitate the individual safe behavior style formation efforts [2], with the safe behavior viewed as an integral individual characteristic and mindset of a young person. Stress tolerance should be analyzed in the safe behavior context as a fundamental personal safety resource to mitigate stress, anxiety and tension.

Results and discussion. The sporting students questionnaire survey data showed everyone in the sample well understanding risks and crisis situations of potential threats for life, health, freedom and other key human values, with only 10% underestimating risks of extreme sports, unprotected sexual contacts and unhealthy habits/ lifestyles. Generally the sample interprets safe behavior style as free of risks for the others, and believes that their peers are prone to unsafe behavior when they have specific personality issues including mental volatility, whilst the safe behavior are facilitated by personal responsibility, sound decision-making capacity; sociability; and risk prediction ability.

Most of the sample (90%) tends to realize the risks for safety only when faces dangerous situations "under alcohol intoxication", "when I am provocative", "in strange places with strange company" etc. Around 87% of the sample reported feeling and predicting the risks; whilst 70% free themselves of responsibility for unsafe behaviors of their friends and see no point in interfering. The remaining 30% take efforts to explain abnormalities in their friends' behaviors but confess they are seldom successful being unable to convince.

Furthermore, most of the sample interprets unsafe situations as both their personal and environmental problem and believes that some unsafe situations cannot be predicted. Almost everyone (98%) in the sporting students sample reports a need for practice, experience and effective skills to cope with challenging life situations. About one of three (30%) believes that the safe behavior style formation is a socio-pedagogical goal to develop a healthy and well-socialized young individual. The other 70% tend to consider safe behavior as an innate skill set that cannot be developed or trained and, hence, there is no point in attending, for example, personal safety courses since "they rather train you to cope with dangers that predict and avoid dangerous situations".

The stress-coping strategy tests of the vulnerable subsample having past unsafe experiences (n=60) found their stress coping strategies 13.2% better than in the whole sample. This means that the stress coping experiences help the young people find the most constructive safe behavior strategies. Most stress coping strategies in the subsample were rated relatively adaptive; whilst 77% and 90% were tested low and confrontation-driven (aggression and hostility when facing a risk) coping skills, respectively; followed by the "self-control" group (84%) prone to restrain feelings, hide them and never discuss the problems faced.

It is traditional for the modern psychology to qualify the "taking responsibility" and "social support mobilizing" skills as pivotal for the stress coping strategies efficiency and risk prevention styles [1]. Our study found only 23% of the sample prone to these adaptive stress coping strategies. The emotionality test found 80% of sporting students sample prone to emotional inefficiency in the risk situations as they tend to suppress emotions, blame themselves or vent their aggression. Relatively adaptive emotionality control stress coping models (emotional discharge, taking responsibility) were reported by 10% of the sample. About half of the sample (46%) reported coping with negative emotions on their own. Of the 20% of the sample who fairly analyze their emotions, only 5% know how to control emotions by living them through. Therefore, the sample was found dominated (95%) by the individuals unable to cope with destructive experiences.

The stress coping tests supported the above findings, as 90% of the sample was tested low on the stress tolerance scale (26-30 points versus the provisional norm of 37); with the lowest test rates on the "risk acceptance" and "control" scales. Therefore, the study tested the safe behavior styles and stress tolerance mostly low in the sporting students sample.

Conclusion. The study tested the sporting students sample low on the viability/ stress tolerance resource scales, with the stress coping strategies dominated by confrontational coping styles. The safe behavior style in the sporting students' perceptions was found centered on the personality component (including values and psychological qualities) and operational component – i.e. knowledge and skills application abilities in practical situations. Such primary safe behavior style provides a basis for an integrated proactive safe behavior style and safe-behavior-based stress tolerance building service for young people. The study has contributed to the Stress Tolerance Building Project with its Viability Laboratory that offers special mental conditioning games to help trainees master the safe behavior style formation basics by the high-risk situations and stress coping behavior modeling and testing role games.

Therefore, the sporting students' safe behavior style formation efforts will be designed to form healthy living agendas, good stress tolerance and endurance for competitive and social progress facilitated by special training curricula need to be developed and implemented by the relevant social institutions. Findings of this study are recommended for application in the academic bachelor and master curricula in every specialty; and particularly in the Preventive Service for Young Communities and Youth Guidance Service master courses.

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Peculiarities of psychophysiological adaptation of students to conditions of enforced self-isolation during distance learning

UDC 796.011.3

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Abstract

Objective of the study was to determine the influence of the academic day in terms of distance learning during self-isolation on the psychophysiological state of students attributed to the preparatory health group.

Methods and structure of the study. Sampled for the study were the 1st-year students (17-19 years old) studying at the Faculty of Humanities and Social Sciences at People's Friendship University of Russia, majoring in "Philosophy" and "Sociology". The students were split into 2 groups: Group I - boys (37 subjects) and Group II - girls (46 subjects). The study was conducted at the beginning of the academic year in the autumn and spring periods, that is, under the stressful impact the enforced self-isolation.

The girls' cardiovascular system functionality was assessed by measuring the main hemodynamic parameters at rest (heart rate per minute (HR), blood pressure (BP) - using the auscultatory method according to N.S. Korotkov) and by recording an electrocardiogram in the second standard lead at rest and in orthostasis.

Hypoxic-hypercapnic tolerance was evaluated based on the results of the Stange's and Genchi's tests. The anxiety level was determined using C.D. Spielberger State-Trait Anxiety Inventory tests, Y.L. Khanin Anxiety Scale, V.A. Doskin Well-being, Activity, Mood Scale. H. Eysenck Personality Inventory was applied to test self-assessment of mental conditions. Physical working capacity was determined using the Ruffier test.

The academic distance physical education classes were organized in view of the students' medical indicators, which implied the division of students into the study groups: basic, preparatory, and special. The classes for the students from the preparatory health group were conducted using videos and presentation materials prepared by the Department of Physical Education and Sports for posting on the MS TEAMS platform. Semester class attendance was mandatory.

Results and conclusion. The study enabled to identify a "critical period" in mastering the university curriculum: the initial period of adaptation, as a response to new learning conditions for students and the proposed curricular and extra-curricular workload in a non-standard format.

Keywords: *distance learning, self-isolation, pandemic, psychological adaptation, adaptation, physical health, female students.*

Background. Today, a systematic comprehensive study of students' state during their educational activities occupies a key place among the theoretical and practical problems solved by psychologists and physiologists. It is mandatory to assess students' health as a result of a complex interaction of demographic, biomedical, social, economic, environmental, and other factors.

Due to the Decree No. 34-UM of the Mayor of Moscow dated 29 March 2020, resolutions of the Government, the President, the Ministry of Education of the Russian Federation related to the measures to prevent the spread of the novel coronavirus infection (COVID-19) [3-6], all full-time students of Peoples' Friendship University of Russia were moved to distance learning.

The atypical way of life that arose due to the enforced self-isolation contributed to the formation of protective mechanisms and the launch of adaptation processes. The human body is a dynamic combination

of stability and variability, where variability serves its adaptive reactions and, consequently, the protection of its inherited fixed constants [7].

Objective of the study was to determine the influence of the academic day in terms of distance learning during self-isolation on the psychophysiological state of students attributed to the preparatory health group.

Methods and structure of the study. Sampled for the study were the 1st-year students (17-19 years old) studying at the Faculty of Humanities and Social Sciences at People's Friendship University of Russia, majoring in "Philosophy" and "Sociology". The students were divided into groups: Group I - boys (37 subjects) and Group II - girls (46 subjects). The study was conducted at the beginning of the academic year in the autumn and spring periods, that is, under the stressful impact the enforced self-isolation.

The functional state of the cardiovascular system of the girls was assessed by measuring the main hemodynamic parameters at rest (heart rate per minute (HR), blood pressure (BP) - using the auscultatory method according to N.S. Korotkov) and by recording an electrocardiogram in the second standard lead at rest and in orthostasis. First, an integral indicator - the adaptive potential of the cardiovascular system (G.L. Apanasenko, 1988) - was calculated.

Hypoxic-hypercapnic tolerance was evaluated based on the results of the Stange's and Genchi's tests. The anxiety level was determined using C.D. Spielberger State-Trait Anxiety Inventory tests, Y.L. Khanin Anxiety Scale, V.A. Doskin Well-being, Activity, Mood Scale. H. Eysenck Personality Inventory was applied to test self-assessment of mental conditions. Physical working capacity was determined using the Ruffier test (30 squats for 45 sec).

The distance physical education classes at the university were organized taking into account the students' medical indicators, which implied the division of students into the study groups: basic, preparatory, and special. The classes for the students from the preparatory health group were conducted using videos and presentation materials prepared by the Department of Physical Education and Sports for posting on the MS TEAMS platform. Semester class attendance was mandatory.

Results and discussion. The analysis of the subjects' anthropometric parameters revealed that in 89% of the students, the body weight rates changed upwards during the self-isolation period. The data obtained indicated that the body length and weight of the girls were significantly higher in the spring ($p<0.05$). The boys' height (175.1 0.3 cm) and weight (73.8 0.06 kg) indices were also significantly higher than in the autumn period. A comparative analysis of the data obtained showed that the students did not have any significant differences depending on their age.

Under conditions of relative rest, the hemodynamic parameters in the students complied with the age standards. The margin of fluctuations of the studied indicators did not go beyond the normal limits in this case. At the same time, the difference in the heart rate and blood pressure rates was primarily due to the cyclicity of the functions, which is based on the genetically programmed ability of the body to switch its molecular mechanisms from one biosynthesis to another in accordance with the internal biological clock [2, 7].

The assessment of the students' physical condition showed that their indicators corresponded to a high level. At the same time, the adaptive potential in the groups was characterized as "satisfactory" and ranged within 1.50-2.59. However, it should be noted that the lowest rates were registered in the boys, regardless of the study period.

The analysis of the deviations from the value characterizing the state of satisfactory adaptation (up to 2.1 points and below) towards the tension of its mechanisms revealed that the maximum number of the subjects, whose adaptive potential was assessed as satisfactory, was found in the group of healthy students (88.6%), in Group I – less by 12.8% (75.8%) and in Group II - significantly less than in Control Group - by 20% ($p<0.05$). Thus, the tension of the adaptation mechanisms increases with the increase in the degree of violations in the usual academic day mode due to the enforced self-isolation.

The assessment of the physical development level should be primarily based on the evaluation of the reserves of the bodily systems, identified by the response of the physiological systems of a person to physical loads of different intensity and functional tests. The degree and dynamics of changes in the physiological parameters during testing, as well as the speed and completeness of recovery, reflect the adaptive abilities of a person and the reserve capabilities of his body [4].

The analysis of the Stange's test results [1, 5] showed that a longer breath holding time was typical for the male students in the autumn period, which indicated their higher tolerance to hypoxia and hypercapnia.

At the same time, the breath holding time in the female students from Group I in the second semester decreased as opposed to the first semester by 9.7% and in those from Group II - by 12.8%, respectively. This indicated a greater degree of stability of the respiratory system regulation among the female students in the autumn period.

Based on the results of testing the psychophysiological state of the subjects in different periods of the academic year, it should be noted that there were significant changes in the indicators of self-assessment of their mental condition. In terms of self-isolation, there was a decrease in the indicators of well-being in Group I. The girls were found to have changes similar to those in the boys - self-esteem, well-being, and mood. At the same time, in Group II, there was a sharp downward trend in the indicators of well-being, while the activity level was lower in the boys compared to the girls, and their mood was higher in the enforced self-isolation period. In terms of the level of state anxiety, the girls were found to have higher values as opposed to the boys, and this indicator was higher in the spring period. In addition, during this period, the highest levels of trait anxiety were revealed, which indicated an increase in the subjects' degree of anxiety, concern, and nervousness.

When determining the physical working capacity of the IRD in the students of both groups, a satisfactory result (6.0-8.00) was obtained. However, in the spring period, this indicator in the boys was characterized as "bad" and amounted to 8.2 c.u.

Conclusion. The study enabled to identify a "critical period" in mastering the university curriculum: the initial period of adaptation, as a response to new learning conditions for students and the proposed curricular and extracurricular workload in a non-standard format.

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Academic physical education benefits for competitive positioning: engineering students' survey

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Abstract

Objective of the study was to survey attitudes of engineering students to academic physical education service versus its benefits for their future competitive positioning.

Methods and structure of the study. We run a questionnaire survey using Google template in June 2021 on a sample of the Yeltsin Federal University (Ufa) students (n= 352) from the following institutes and departments: new materials and technologies, radio electronics and information technology, construction and architecture, energy, physics and technology and chemical technology. The sample included specialty course students (9.1%), bachelors (86.6%) and masters (4.3%), with a gender split of 50.6%/ 49.4% (men/ women). The sample was 10.5% 19-minus years old, 87.2% 20-24 years old, and 1.3% 25-35 years old.

Results and conclusion. Academic studies are the period most beneficial for formation of the qualities and skills needed for excellent health, high working capacity and, hence, professional success and longevity in an engineering service. Physical education heavily contributes to competitiveness of an engineering university graduate, since universities play the key role in the professional formation and personality progress agenda formation of a future specialist. The survey found most of the students determined for progress in their academic specialty upon graduation and believing that physical education contributes to their competitiveness. Absolute majority reported 'more or less' habitual physical education as they rank health among the key life values. The survey also found barriers for the physical education and physical activity including time limitations, indiscipline, laziness, unsporting family lifestyles and traditions – versus the students' opinions on the potential solutions for these problems with physical activation. The survey data and analyses may be beneficial for the physical education / wellness service improvement initiatives at Russian universities, and for the Youth Service Design discipline.

Keywords: *physical education, students, engineering specialization, competitiveness, healthy lifestyle.*

Background. Actual demand of the labor market for graduates of engineering universities is commonly perceived as indicative of their competitive positioning. Modern engineering service requires both excellent theoretical knowledge and good culture with high mental and physical fitness and sound social, communication and business qualities including high determination, diligence, efficiency, confidence, stress tolerance, etc. It is the universities that should lead the efforts to form such personality qualities critical for professional success and, hence, welcomed by the labor markets. A special role in these efforts is played by academic physical education service with its healthy lifestyle and physical progress benefits – which are regretfully often underestimated by students. Their attitudes to the physical education / health service need to be surveyed, analyzed and addressed on a persistent basis.

Objective of the study was to survey attitudes of engineering students to academic physical education service versus its benefits for their future competitive positioning.

Methods and structure of the study. We run a questionnaire survey using Google template in June

2021 on a sample of the Yeltsin Federal University (Ufa) students (n= 352) from the following institutes and departments: new materials and technologies (30.0%), radio electronics and information technology (11.4%), construction and architecture (17.3%), energy (20.2%), physics and technology (13.6%), and chemical technology (12.5%). The sample included specialty course students (9.1%), bachelors (86.6%) and masters (4.3%), with a gender split of 50.6%/ 49.4% (men/ women). The sample was 10.5% 19-minus years old, 87.2% 20-24 years old, and 1.3% 25-35 years old. The questionnaire survey data were processed by Vortex sociological information processing and analytical toolkit. The survey was designed to poll opinions on the vocational competitiveness; physical education benefits for the key personality qualities critical for professional progress; and the actual physical activity, health standards and healthy lifestyle commitments.

Results and discussion. The questionnaire survey data made it possible to prioritize the life values of the sample as follows: health (67.9%), self-fulfillment opportunities (61.6%), independence and freedom (48.3%), friendship (47.7%), money, wealth (39.5%), family and children (38.6%), education and professional progress (30.1%), beauty and physical perfection (26.1%), own business with commercial success (24.1%), and competitiveness (12.5%).

Furthermore, 43.8% reported combining studies with jobs, with 61.1% looking forward to vocational progress. Competitiveness means for most of the sample: good skills, creative thinking capacity, cognitive versatility, negotiating skills, emotional intelligence (61.4%), good adaptation to reality (56.5%), sensitivity to the labor market demands secured by high professional competence and sound experience (56.3%).

The personality qualities critical for professional progress and success in an engineering service were ranked as follows: due diligence (63.9%), determination (60.5%), responsibility (58.3%), and stress tolerance (54.8%). It should be noted that healthy lifestyle was ranked low on this list (11.1%) – that means that special healthy lifestyle promotion efforts need to be taken in the student communities.

The survey also found 65.6% of sample believing that physical education and competitiveness are closely correlated, and 56.8% knowing the physical education benefits for competitiveness of a future engineer. Absolute majority (88.4%) reported 'more or less' regular physical education, with 17.3% and 33.5% estimating their training times at 1-minus and 1-3 hours per week, respectively. Around half (53.4%) of the sample mentioned time limitations as a barrier for physical education, and 40.3% acknowledged personal indiscipline and laziness. The 'more or less' regular physical education was classified as follows: home workouts (77.0%), academic physical education classes (58.2%), and morning exercises (55.7%). Motivations for the physical education were ranked as follows: health improvement (67.9%), body shaping (55.7%), relaxation and switchover to a different activity (54.8%). Note that only 9.8% of the sample believes that employers prefer sporting and physically trained applicants, provided other credentials are equal.

Physical education service is reportedly believed to improve health (67.9%), shape up the body (47.7%) and contribute to healthy lifestyle (40.4%). It should be emphasized that only 53.1% rate their own health excellent, and 57.1% believe that they keep within healthy standards. One of five reportedly smokes and one of two (55.2%) drinks alcohol 1-2 times a week or month. Only one of ten reported an alcohol-free lifestyle; and a vast majority (93.5) reported no psychoactive drugs testing experiences. It should be underlined that the sample recognized the physical education benefits for such personality qualities as discipline, responsibility and self-perfection (32.4%), lifestyle, self-fulfillment and progress agenda (30.7%), and goal-setting and time management (16.8%).

Furthermore, we found some of the physical education attitudes survey data being gender-, age-, specialty- and curricula-specific. Thus men were more likely to attend residential sports grounds than women (56.2% and 39.1%), sports clubs (36.5% and 28.2%), and gyms (50.0% and 35.6%, respectively). The men's physical education motivations were dominated by the need to relax and switchover to another activity versus the women's motivations mostly driven by the body shaping needs. Competitive positioning was reported among the physical education motivations by 14.6% and 11.5% of the men and women, respectively; and about the same proportion was found to share the opinions that competitiveness is a key life goal (14.0 and 10.9%, respectively).

One of four 30-plus year-olds (25.0%) believes that employers tend to prefer sporting and physically trained applicants, provided the other credentials are equal. The opinion appears based on their own experience, since half of the age group (50.0%) com-

bines studies with jobs. The same proportion believes that physical health and physical fitness contribute to competitiveness of an engineering university graduate. One of four 25-30 and 30-plus year-olds mentioned competitiveness among the key life values. At the same time, competitiveness was reported as an important personality quality critical for professional progress in engineering service by 40.0% of the 19-year-olds, though this belief tends to fade out with age being shared by 33.6% of the 22-24 year-olds, 25.0% of the 25-30 year-olds and 25.0% of the 30-plus year-olds.

Conclusion. Academic studies are the period most beneficial for formation of the qualities and skills needed for excellent health, high working capacity and, hence, professional success and longevity in an engineering service. Physical education heavily contributes to competitiveness of an engineering university graduate, since universities play the key role in the professional formation and personality progress agenda formation of a future specialist. The survey found most of the students determined for progress in their academic specialty upon graduation and believing that physical education contributes to their competitiveness. Absolute majority reported 'more or less' habitual physical education as they rank health among the key life values. The survey also found barriers for the physical education and physical activity including time limitations, indiscipline, laziness, unsporting family lifestyles and traditions – versus the students' opinions on the potential solutions for these problems with physical activation. The survey data and analyses may be beneficial for the physical education / wellness service improvement initiatives at Russian universities, and for the Youth Service Design discipline.

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Functional and motor abilities of children diagnosed with cerebral palsy

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Abstract

Objective of the study was to integrate the baseline characteristics of the functional and motor abilities of disabled children and their deviations from the norm for use in planning physical loads during a rehabilitation process.

Methods and structure of the study. To systematize the characteristics determining the functional and motor fitness of disabled children and assess the degree of its compliance with the indices in healthy children, we consolidated the data obtained in the studies of 2017-2020. The studies were carried out before the start of the rehabilitation course and involved 3-16 year-old disabled children, both males and females, (n=95) of all five levels of development of the gross motor functions on the GMFCS scale. The following methods were applied: anthropometry, pulsometry, heart rate variability, stabilometry, podometry, pedagogical testing of motor abilities. The subjects' movements were assessed over 54 parameters from the following initial positions: lying on the back and stomach, sitting on the floor and chair, standing and in motion (crawling and walking).

Results and conclusion. Children diagnosed with cerebral palsy, who lead a sedentary lifestyle, lag behind healthy children in terms of all the studied parameters, which necessitates increasing the effectiveness of the rehabilitation process by increasing the overall motor activity.

The heart rate variability rates in the initial state indicated that the body of children with cerebral palsy is characterized by the state of detraining and impaired functional abilities.

The baseline characteristics of the functional and motor abilities can be used as guidelines in assessing the dynamics of changes during the rehabilitation process.

Keywords: *disabled children diagnosed with cerebral palsy, functional indicators, motor disturbances, physical exercises, level of development of motor functions on GMFCS scale.*

Background. One of the most common central nervous system diseases in children is cerebral palsy, a characteristic clinical symptom of which is a locomotor disturbance due to the loss of muscle tone. This leads to a decrease in the children's motor activity, which entails a change in the cardiovascular and respiratory systems, a violation of the metabolic processes, speech abilities, and a change in the psyche. Disabled children have difficulties with special body awareness and can hardly perform age-appropriate movements, due to which they lead a sedentary lifestyle. Long-term akinesia complicates children's social adaptation, which negatively affects their quality of life [2, 3, 5].

If a disabled child does not perform age-appropriate physical loads, the process of physical development will be disrupted. The mechanisms of formation of children's motor skills are improved from earliest infancy, are associated with overcoming the forces of gravity, and are aimed at adapting the body to maintaining an upright position when performing voluntary movements. The lack of the capacity to maintain the upright posture limits disabled children in the development of natural movements at the earliest stages of development [6].

The skill to maintain the upright position is not congenital but is acquired from the moment of birth as a result of a child's motor activity. With a decrease or

absence of physical loads (for example, a long stay in a horizontal position) antigravity mechanisms may either not develop or be lost with a corresponding loss of motor skills, first of all, the skills to maintain the upright position and walk. A complex of negative manifestations acquired by such children makes them lag in their physical and functional development behind healthy children [4].

When designing a rehabilitation process for children with cerebral palsy, it is properly organized training sessions that are important, in which the decisive role belongs to the active, not passive physical exercises [1]. In this case, knowledge of the characteristics of the state of the body of disabled children and their difference from healthy ones helps to choose the right direction in increasing the effectiveness of the rehabilitation process.

Objective of the study was to integrate the baseline characteristics of the functional and motor abilities of disabled children and their deviations from the norm for use in planning physical loads during a rehabilitation process.

Methods and structure of the study. To systematize the characteristics determining the functional and motor fitness of disabled children and assess the degree of its compliance with the indices in healthy children, we consolidated the data obtained in the studies of 2017-2020. The studies were carried out before the start of the rehabilitation course and involved 3-16 year-old disabled children, both males and females, (n=95) of all five levels of development of the gross motor functions on the GMFCS scale. The following methods were applied: anthropometry, pulsometry, heart rate variability, stabilometry, podometry, pedagogical testing of motor abilities. The subjects' movements were assessed over 54 parameters from the following initial positions: lying on the back and stomach, sitting on the floor and chair, standing and in motion (crawling and walking).

Results and discussion. The studies showed that the heart rate and blood pressure rate in the majority of the disabled children at rest were above the norm, and within the age norm - only in 25% of children. The overwhelming majority of the subjects (70%) had hypertension, which may have been due to the high muscle tone typical of cerebral palsy. The analysis of the functionality of the cardiovascular system in terms of heart rate variability on the "Varicard" diagnostic device revealed that disabled children are characterized by vegetative dysfunction and detraining of the bodily systems in different age periods from 3 to 16 years. It was found that 56% of the children had a low level of physical working capacity. Conversely, they had a rather high level of development of adaptive potential, which probably indicated the internal readiness of the body to develop motor abilities.

It is noteworthy that in terms of the body length rates, 58% to 65% of the children reached the normal level, in terms of the body weight rates - from 51% to 67% of the children. Only one-third of the children (31%) had no deviations in the age norm in terms of head circumference, which may indicate complex neurological disorders. In terms of chest circumference, 48-53% of the children met the average standards. A strong asymmetry in the children was also observed in terms of thigh and shin circumferences.

There were significant differences from healthy children in the indicators of vertical stability and support ability in the stabilometric tests. The average pressure center movement speed rate in the disabled children was three times lower than in healthy ones, the ellipse area rate was ten times worse. The ability to stand steadily on two legs was observed in 0.6% of the children only.

The results of the motor skills tests, including exercises that a healthy child should be able to perform from the initial positions "lying", "sitting", "standing" (54 parameters in total), showed that only one-third of the children could move independently and maintain the upright position. A fairly high percentage obtained in different groups during the exercises performed from the initial positions "lying" and "sitting" indicated that they spent most of their lives in these positions, and limited motor activity or ineffective exercises did not allow them to completely master the necessary motor skills that a healthy child possesses.

The motor test results of the children, distributed according to the levels of development of their gross motor functions on the GMFCS scale, showed that the children attributed to the 1st level, who were able to move independently without limitations, were able to fulfill only 87.7% of the maximum possible 106 points. The children in Level 2, who moved independently with limitations, could gain only 85.1% of the maximum. The children in Level 3 who walked using a hand-held mobility device (walking sticks, walkers) - 61.6% of points. The children in Level 4, who could sit on their own, but could not walk, were able to score only 44.0% of points. The children in Level 5, who were unable to

change their body position without assistance, were able to score 26.8% of points.

Therefore, in the initial state, the disabled children's ability to perform movements ranged from 26.8 to 87.8%. Even the children in Level 1 on the GMFCS scale, who were able to move independently, could not correctly perform all the proposed exercises that a healthy child can. The minimum lag behind healthy children was 12.2%.

Consequently, insufficient physical activity, especially during the first year of life, leads to various disturbances in the development of the physiological processes of the body, the formation of a limited range of movements. The variety of inconsistencies with the physiological norms of the body development of a disabled child complicates the improvement of life activity, reduces the level of motivation, and contributes to the preservation of the disabled status [4].

The data obtained are quite informative for the formation of an idea of the general characteristics of the state of the body of disabled children and can be used as benchmarks in assessing the dynamics of changes during the rehabilitation process.

Conclusion. Children diagnosed with cerebral palsy, who lead a sedentary lifestyle, lag behind healthy children in terms of all the studied parameters, which necessitates increasing the effectiveness of the rehabilitation process by increasing the overall motor activity.

The heart rate variability rates in the initial state indicated that the body of children with cerebral palsy is characterized by the state of detraining and impaired functional abilities.

The baseline characteristics of the functional and motor abilities can be used as guidelines in assessing the dynamics of changes during the rehabilitation process.

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Physical education and health initiatives for handicapped young people

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Abstract

Objective of the study was to analyze benefits of adaptive physical education and sport service for the hearing-impaired young people.

Methods and structure of the study. The two-stage survey was run at the Sverdlovsk and Kamensk-Uralsky Hearing-Impaired Service Offices of the All-Russian Hearing-impaired People's Society in the Sverdlovsk Oblast. Stage 1 (2020) included a questionnaire survey of the 18-35 year-old (n=32) hearing-impaired youth to analyze their self-fulfillment needs, options and opportunities. The sample was surveyed on the opportunities for their initiatives in youth organizations, at places of residence and education establishments, and their adaptation and socialization problems and potential solutions. Youth initiatives in this context were understood as the social activities to find and promote new ideas and activity forms including tourism, healthy lifestyle, physical education and sports practices, etc. Stage 2 (2021) of the survey was designed to analyze the situation with the adaptive physical education and sport service to the hearing-impaired youth, with the Kamensk-Uralsky Hearing-Impaired Service Office (Sverdlovsk Oblast) taken for the case study. The questionnaire survey of the local hearing-impaired youth (n=31) was designed to analyze the physical education and sport service accessibility for deaf/ hearing-impaired young people, including the mass physical education and sport / health events and healthy lifestyle promotion initiatives.

Results and conclusion. The survey found a range of problems in the practical opportunities for the hearing-impaired youth initiatives. Most of the sample reported disbeliefs in the real opportunities to implement their leisure-time and physical education-and-sport / health-related ideas and initiatives via the formal youth organizations. This is the reason for us to recommend special efforts to facilitate joint activities of hearing-impaired youth with their healthy peers.

Keywords: *physical education, initiatives, youth, handicapped people, hearing-impaired people.*

Background. The key problems of services to handicapped people, in addition to their common communication and space accessibility issues, include their socialization challenges i.e. socio-psychological integration, career guidance and inclusive education services. For practitioners involved in the handicapped youth servicing, these problems are even higher since this age group psyche is still unformed. Their age-specific physical problems are aggravated by the psychological ones that tend to worsen with time when left unaddressed. The HP training services need to be well designed to harmonically improve their physical and mental/ emotional health [4, p.4]. It is important to emphasize that the leisure-time activity is seriously different from that of their healthy peers due to the age-specific spiritual, physical and socio-psychological needs dictated by high emotionality, physical activity, volatile moods, visual and intellectual sensitivity, etc. [1, p. 114].

Physical education and sports/ health services in modern Russia are ranked both with the health-protection and self-fulfillment methods, particularly important for social integration of handicapped

people. The key goals of the physical education and sport service for handicapped youth are the following: reestablish lost contacts with the community; offer good provisions for their socializing agendas; and improve their health. In addition, the adaptive physical education and sport service should improve the mental and physical health standards of these vulnerable groups and facilitate their social integration and physical rehabilitation. It is also important that the needs-sensitive adaptive physical education and sport service to HP brings multiple social benefits, particularly in the social climate humanization domain [5, 38].

Objective of the study was to analyze benefits of adaptive physical education and sport service for the hearing-impaired young people.

Methods and structure of the study. The two-stage survey was run at the Sverdlovsk and Kamensk-Uralsky Hearing-Impaired Service Offices of the All-Russian Hearing-impaired People's Society in the Sverdlovsk Oblast. Stage 1 (2020) included a questionnaire survey of the 18-35 year-old (n=32) hearing-impaired youth to analyze their self-fulfillment needs, options and opportunities. The sample was surveyed on the opportunities for their initiatives in youth organizations, at places of residence and education establishments, and their adaptation and socialization problems and potential solutions. Youth initiatives in this context were understood as the social activities to find and promote new ideas and activity forms including tourism, healthy lifestyle, physical education and sports practices, etc. Stage 2 (2021) of the survey was designed to analyze the situation with the adaptive physical education and sport service to the hearing-impaired youth, with the Kamensk-Uralsky Hearing-Impaired Service Office (Sverdlovsk Oblast) taken for the case study. The questionnaire survey of the local hearing-impaired youth (n=31) was designed to analyze the physical education and sport service accessibility for deaf/ hearing-impaired young people, including the mass physical education and sport / health events and healthy lifestyle promotion initiatives.

Results and discussion. The survey found the hearing-impaired youth values and priorities dominated by good and justice (51.3%); health, creativity and self-fulfillment (43.0% each); and money, power and career (37.5%). Most of the sample believes that they need local handicapped youth organizations (71.0%) responsible for the mass physical education and sport / health and accessible socializing events (59.4% each) and social projects (40.0%). It should be mentioned that 62.5% of the sample reported being prepared to contribute to the HP servicing by such local organizations.

To further explore the actual accessibility of the adaptive physical education and sport service and physical education and sport / health events for the hearing-impaired youth, we surveyed practical experience of the Kamensk-Uralsky Hearing-Impaired Service Office (hereinafter referred to as the KUO). The KUO takes efforts to promote the adaptive physical education and sport service as the most important healthy lifestyle component and engage the hearing-impaired youth in the physical education and sport service. The KUO staff and volunteers have organized special events for the hearing-impaired youth including a bowling tournament on the Fatherland Defender's Day; 60m speed skating competition; local hearing-impaired team participation in the 2021 Ski Race of Russia, etc.

The KUO hearing-impaired youth survey found only one of two (59.0%) respondents attending mass physical education and sports events, with 17.0% reportedly indifferent, whilst the rest (83.0%) appreciated the events. Most of the sample (67.0%) reported being informed on such events via the social networks; 10% received individual invitations; 13.0% got such information from ads; and one in ten was non-informed. The leisure-time preferences were reported as follows: trekking tours in natural environments (52.0%), watching sports competitions (17.0%); and physical education-and-sport-unrelated activities (31.0%). The healthy-lifestyle-devoted subsample prioritized physical education and sports practices (23%), socializing (19.0%); and healthy diets (39.0%); whilst one of five (19.0%) believed that healthy lifestyle includes all these elements.

Furthermore, most of the sample reported occasional physical education and sport (77.0%), and unsporting lifestyles (23.0%); with 19.0% and 36.0% reporting daily and occasional morning gymnastics, respectively; and 45.0% non-exercising lifestyles. Most of the sample believed that physical education and sports practices help improve health and physical fitness (48%), contribute to the healthy lifestyle and career (42%); train for specific service (7.0%) and all of the above (3.0%).

Conclusion. The survey found a range of problems in the practical opportunities for the hearing-impaired youth initiatives. Most of the sample reported disbeliefs in the real opportunities to implement their leisure-time and physical education-and-sport / health-related ideas and initiatives via the formal youth organizations. This is the reason for us to recommend special efforts to facilitate joint activities of hearing-impaired youth with their healthy peers. Based on the survey data, for instance, we have developed and are implementing a Nordic Walking Project at the KUO since these outdoor popular physical leisure-time practices are rather popular nowadays due to their health benefits and accessibility for the handicapped people including the hearing-impaired ones. To address the problems found by the survey, we recommended to the KUO stuff to mobilize the available funding and encourage the young people's and Office staff interests in the KUO service improvement initiatives with potential contributions from the hearing-impaired service professionals prepared to take initiative and responsibility to effectively help the handicapped young people.

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Analysis of motor sphere of children of early age diagnosed with autism spectrum disorders

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Abstract

Objective of the study was to identify the specifics of the motor sphere of children of early age diagnosed with autism spectrum disorders.

Methods and structure of the study. The study of the motor functions of children of early age diagnosed with autism spectrum disorders was carried out at the "Logoped" Center (Pervouralsk, Sverdlovsk Region) and the Center for Continuing Education of Ural State Pedagogical University (Yekaterinburg) from 2018 through 2021. Sampled for the study were 9 children aged from 1 year 3 months to 2 years 8 months, all diagnosed with autism spectrum disorders by a child psychiatrist. The study was conducted prior to the start of the behavioral intervention.

The subjects' motor functions were analyzed using a program for assessing the level of motor development at early childhood (Peabody Developmental Motor Scales), including six subtests, which was supplemented by the corresponding sections from the Assessment of Basic Language and Learning Skills – Revised (ABLLS-R).

The following motor functions were analyzed: involuntary response to environmental changes; maintaining balance and control over own body within the center of gravity; the child's ability to move from one place to another; object manipulation; the child's hand skills; visual-motor coordination – to evaluate the child's ability to use visual-perceptual skills to perform complex eye-hand coordination tasks such as grasping objects, building with blocks, copying pictures.

Conclusion. Given the behavior patterns and sensory problems in the development of children with autism spectrum disorders, it can be reasonably argued that it is not only a specially organized process of formation of their motor sphere that is necessary but also the need to select special methods and techniques. Thus, considering the existing developments in the field of applied behavioral analysis, such teaching methods may include: NET (training in the natural environment), chain learning, functional communication training, discrete and mixed trials, etc. All these methods require special techniques that could be combined, for example, providing support for the error-free formation of motor skills and using a motivational environment. These directions seem promising for further research.

Keywords: *early childhood, autism, motor activity, behavior, motor skills.*

Background. Nowadays, studies of autism spectrum disorders in children of early age are taking on increasing importance all over the world. There is a growing interest of specialists and parents raising children with autism spectrum disorders in a reasonable and effective early intervention.

Early childhood (the first and second years of life) is a sensitive period for the development of all higher mental processes, the formation of which is carried out during various goal-oriented activities. A large number of studies show that children with autism spectrum disorders have difficulties in forming all vital functions. During ontogenesis, children with autism spectrum disorders master the entire behavior repertoire through motor activity, which contributes to the mastery of different ways to operate with objects and learn about the world. The studies also show that difficulties in information processing prevent children with autism spectrum disorders from mastering the entire mo-

tor repertoire, which naturally affects their entire development.

Therefore, it can be argued that, currently, it is important to study the peculiarities of mastering motor skills by children with autism spectrum disorders in the second and third years of life, and it is also necessary to select methods for shaping the children's motor behavior [9, 13, 14].

Objective of the study was to identify the specifics of the motor sphere of children of early age diagnosed with autism spectrum disorders.

Methods and structure of the study. The study of the motor functions of children of early age diagnosed with autism spectrum disorders was carried out at the "Logoped" Center (Pervouralsk, Sverdlovsk Region) and the Center for Continuing Education of Ural State Pedagogical University (Yekaterinburg) from 2018 through 2021. Sampled for the study were 9 children aged from 1 year 3 months to 2 years 8 months, all diagnosed with autism spectrum disorders by a child psychiatrist. The study was conducted prior to the start of the behavioral intervention.

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The following motor functions were analyzed: involuntary response to environmental changes; maintaining balance and control over own body within the center of gravity; the child's ability to move from one place to another; object manipulation; the child's hand skills; visual-motor coordination – to evaluate the child's ability to use visual-perceptual skills to perform complex eye-hand coordination tasks such as grasping objects, building with blocks, copying pictures.

All subtests were offered to the child in the form in which he/she could understand and perform them; most of the tasks were offered through the creation of special conditions for object manipulating or performing gross motor movements. The testing was conducted in the first half of the day, on an individual basis (in the presence of a significant adult or a specialist who was a positive stimulus for the child), using a reward system adjusted to each child. Prior to the testing, all the children participating in the study worked in cooperation with the adults and were given a positive emotional attitude to interact with them.

The test results were subjected to a qualitative assessment, which included an analysis of the compliance of the motor task performance with the ontogenetic indicators. In addition, when processing the test results, we selected methods for the formation of motor skills in children of early age with autism spectrum disorders.

Results and discussion. The analysis of the test results showed that all the examined children had difficulties in mastering the motor program and self-stimulating behavior. The findings were presented in a previously published article: A.V. Blazhevich, A.V. Kostyuk [1].

During the analysis of the data obtained, it was found that all the children had impaired coordination and proportionality of movements. They had a clumsy grasp of objects, and their movements were awkward and disymmetric. The revealed disorders of differentiated movements of the fingers and gross motor skills, as well as literature data, confirm the assumption that children with autism spectrum disorders have information processing disorders in the central nervous system, which makes it difficult for them to develop motor skills in the absence of a pathological factor.

Conclusion. Given the behavior patterns and sensory problems in the development of children with autism spectrum disorders, it can be reasonably argued that it is not only a specially organized process of formation of their motor sphere that is necessary but also the need to select special methods and techniques. Thus, considering the existing developments in the field of applied behavioral analysis, such teaching methods may include: NET (training in the natural environment), chain learning, functional communication training, discrete and mixed trials, etc. All these methods require special techniques that could be combined, for example, providing support for the error-free formation of motor skills and using a motivational environment. These directions seem promising for further research.

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Coordination training system for annual training cycle of elite blind biathletes

UDC 796.9

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Abstract

Objective of the study was to test and analyze benefits of a coordination training system for elite blind biathletes in an annual training cycle.

Methods and structure of the study. The coordination training system was tested at Snezhinka Winter Sports Federal Training Center in September 2020 to June 2021. We sampled for the study the elite blind biathletes (n=7, including 3, 2 and 2 Class B1, B2 and B3 biathletes, respectively). The blind biathlon sample training was complemented by the coordination training system in 2-week field trainings and other training and competitive periods within an annual training cycle.

Progress of the blind biathlon sample in the annual training cycle was tested in the following three periods: preparatory period; beginner coordination training (CT1) and final coordination training (CT2) ones. The coordination skills were tested by a computerized Stabilan 01-02 stabilometry test system that generates test data with a sampling frequency of 50 Hz per second. The test set included Qualification, Target Shooting and Stability tests that produced the following tests data: BMC (body mass center) total (mm); confidence ellipse size (mm2); equilibrium function quality (%); movement redirecting sharpness ratio (%); front/ back/ left/ right deviation (mm); and the total movement zone (mm2). The sample was tested in a relatively quiescent state, with the test data processed by a standard mathematical statistics toolkit. We used a nonparametric Wilcoxon test for related samples – since the sample was very limited.

Results and conclusion. The new coordination training system for elite blind biathletes in an annual training cycle was tested beneficial due to the practices centered on the integrated coordination skills in the preparatory period; followed by the skiing balance and coordination skills improvement practices in the beginner coordination training period (with the shooting skills given a lower priority in this period); and a special focus on the shooting accuracy improvement practices in the final coordination training period (with the skiing coordination skills given a lower priority in this period).

Keywords: *coordination training, annual training cycle, elite biathletes, blind sports.*

Background. The Russian Ministry of Sports Decree No. 31 of January 27, 2014 "On approved Federal Sports Training Standard for Blind Sports" has given an impetus to the adaptive sports community to further advance the Paralympic sports training theory and practice [6]. Biathlon is ranked among the most popular blind sports disciplines due to the sport-specific motor skills and standards needed for success in skiing and shooting laser rifles in prone positions. Presently the blind biathlon competitions are regulated by the International Blind Sports Association (IBSA) with the athletes classified by the actual visual impairments into: Class B1 of either blind or having very low visual acuity, unable to see day light; Class B2 able to see hands, with visual acuity up to 2/60 (0.03) or with a vision focusing field up to 5 degrees; and Class B3 with visual acuity ranging from 2/60 to 6/60 (0.03-0.01) and/or with a vision focusing field from 5 to 20 degrees [3, 4, 6].

Classical biathlon training methods and tools can hardly be applied in modern blind biathlon due to the blind biathletes' motor skills in the skier-ski and athlete-weapon systems being very specific in every detail, component and sequence as they need to be customized for the rifle type and weight; competitive distance; numbers of the firing lines; shooting positions, etc. [1]. A few analysts [2, 4, 6] emphasize that the competitive techniques in modern blind biathlon are coordination-skills-specific; although our practical experience of the blind biathlon elite's trainings in an

Table 1. *Stabilometric test data of the elite blind biathlon sample by classes*

Tests		Class B1 (n=3)			Class B2 (n=2)			Class B3 (n=2)		
		M±m	Δ, %	p	M±m	Δ,	p	M±m	Δ,	p
BMC total, mm	PP	4,4±0,2	0	*1-2	3,1±0,3	0	*1-2	3,7±0,6	0	*1-2
	CT1	3,68±0,3	17,8	*1-3	2,7±0,4	13,8	**1-3	2,8±1,0	27,7	*1-3
	CT2	2,8±0,2	27,2	*2-3	2,3±0,2	16,0	*2-3	2,0±0,2	33,3	*2-3
Confidence ellipse size, mm²	PP	171±84,2	0	*1-2	84±17,6	0	*1-2	89±4,2	0	*1-2
	CT1	127±47,8	29,5	*1-3	65±22,6	25,5	**1-3	52±16,9	52,5	**1-3
	CT2	82±18,5	39,6	*2-3	48,5±24,7	29,1	*2-3	30±11,3	53,7	*2-3
Equilibrium function quality, %	PP	76,6±31,1	0	*1-2	73±4,2	0	*1-2	52,8±21,2	0	*1-2
	CT1	76,9±24,6	0,4	**1-3	76,6±0,9	4,8	*1-3	76,1±4,5	36,2	*1-3
	CT2	82,6±17,1	7,1	*2-3	80,6±2,1	5,1	**2-3	83,7±4,6	9,5	*2-3
Movement redirecting sharpness ratio,%	PP	10,9±6,3	0	*1-2	14,2±11,8	0	*1-2	28,5±2,4	0	*1-2
	CT1	7,65±7,2	35,0	*1-3	12,9±1,6	9,6	*1-3	25,9±2,9	9,6	*1-3
	CT2	5,14±6,7	39,2	*2-3	9,3±2,1	32,4	*2-3	22,9±6,0	12,3	*2-3
Front deviation, mm	PP	39±25,1	0	*1-2	31,5±3,5	0	*1-2	62±49,4	0	*1-2
	CT1	67±12,6	52,8	*1-3	73±3,5	79,4	*1-3	71,5±55,8	14,2	*1-3
	CT2	128±18,4	62,6	*2-3	105±32,5	36	*2-3	107±29,6	39,8	*2-3
Back deviation, mm	PP	65±2,6	0	*1-2	64±1,4	0	*1-2	49,5±16,2	0	*1-2
	CT1	64±8,6	1,6	**1-3	61,5±7,7	4,0	**1-3	58±12,7	15,8	*1-3
	CT2	47±13,7	30,6	*2-3	54,5±19,0	12,1	*	59±11,3	1,7	**2-3
Right deviation, mm	PP	93±38,9	0	*1-2	80,5±67,1	0	*1-2	112,5±3,5	0	*1-2
	CT1	98±37,7	5,2	**1-3	81±66,4	0,6	*1-3	117,5±4,9	4,3	*1-3
	CT2	126±41,5	25,0	*2-3	114±62,2	33,8	*2-3	126,5±2,1	7,4	**
Left deviation, mm	PP	42±7,9	0	*1-2	72±52,3	0	*1-2	36,5±6,3	0	*1-2
	CT1	47±27,6	11,2	**1-3	87±57,9	18,9	*1-3	68±33,9	60,3	*1-3
	CT2	112±8,7	81,8	*2-3	98±36,7	11,9	*2-3	113±21,2	49,7	**2-3
Total movement zone, mm²	PP	6952±949,6	0	*1-2	7779±72,1	0	*1-2	8220±2789	0	*1-2
	CT1	11097±2525	45,9	*1-3	10193±48,0	26,9	*1-3	12324±5877	40,0	*1-3
	CT2	19516±4242,5	55,0	*2-3	14175±116,6	32,7	*2-3	19687±3320	46,0	*2-3

*Note: PP preparatory period; CT1 beginner CT period; CT2 final CT period; *p<0,05, **p>0,05, 1-2 intergroup PP versus CT1 difference, 1-3 intergroup PP versus CT2 difference, 2-3 intergroup CT1 versus CT2 difference*

annual training cycle has demonstrated that this issue is still underexplored and deserves a special systematic study.

Objective of the study was to test and analyze benefits of a coordination training system for elite blind biathletes in an annual training cycle.

Methods and structure of the study. The coordination training system was tested at Snezhinka Winter Sports Federal Training Center in September 2020 to June 2021. We sampled for the study the elite blind biathletes (n=7, including 3, 2 and 2 Class B1, B2 and B3 biathletes, respectively). The blind biathlon sample training was complemented by the coordination training system in 2-week field trainings and other training and competitive periods within an annual training cycle.

Progress of the blind biathlon sample in the annual training cycle was tested in the following three periods: preparatory period; beginner coordination training (CT1) and final coordination training (CT2) ones. The coordination skills were tested by a computerized Stabilan 01-02 stabilometry test system that generates test data with a sampling frequency of 50 Hz per second. The test set included Qualification, Target Shooting and Stability tests that produced the following tests data: BMC (body mass center) total (mm); confidence ellipse size (mm2); equilibrium function quality (%); movement redirecting sharpness ratio (%); front/ back/ left/ right deviation (mm); and total movement zone (mm2). The sample was tested in a relatively quiescent state, with the test data processed by a standard mathematical statistics toolkit. We used a nonparametric Wilcoxon test for related samples – since the sample was very limited.

Results and discussion. Based on our practical blind biathlon elite training experience, we developed the following three coordination training modules for the TYC. Module 1 was designed to facilitate progress of integrated coordination-skills for both of the blind biathlon events, with practices in gyms and on biathlon tracks using shooting and skiing simulators plus

special training tasks to excel the technical transitions from one blind biathlon event to the other. This training module was used in the preparatory period. Module 2 was designed for the beginner coordination training period (CT1) and centered on the skiing balance trainings, whilst the shooting skills were given a lower priority in the trainings. And Module 3 gave a top priority to the shooting coordination skills to excel the prone shooting techniques on the snow. This module was used in final (key) part of the coordination training service (CT2).

The 60-min coordination-skills-centered trainings were run once in a weekly microcycle, with the above coordination training modules integrated into the regular blind biathlon training system: see the coordination training progress test data in the Table hereunder. The test data analysis showed a persistent progress in stabilometric test rates since the preparatory period till the end of CT2 period – that may be interpreted as indicative of the coordination training model being beneficial for the traditional blind biathlon elite training system.

Furthermore, we found every blind biathlon class subsample demonstrating progress with the coordination training service as verified by the CT1/ CT2 tests in comparison with the preparatory period test data on a few test scales. Special progresses were verified by the test data growths in the following ranges: BMC total: 16-33.3%; confidence ellipse size: 29.1-53.7%; equilibrium function quality: 4.8-36.2%; movement redirecting sharpness ratio: 9.6-39.2%, front/ back/ right/ left deviations:14.2-79.4%, 12.1-47%, 0.6-33.8%, and 11.9-81.8%, respectively; and the total movement zone: 26.9-55% ($p<0.05$).

Conclusion. The new coordination training system for elite blind biathletes in an annual training cycle was tested beneficial due to the practices centered on the integrated coordination skills in the preparatory period; followed by the skiing balance and coordination skills improvement practices in the beginner coordination training period (with the shooting skills given a lower priority in this period); and a special focus on the shooting accuracy improvement practices in the final coordination training period (with the skiing coordination skills given a lower priority in this period).

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National physical education traditions: gender roles constructing priorities

UDC 304.2

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Abstract

Objective of the study was to analyze the National physical education history and traditions in the gender roles construction contexts of indigenous cultures.

Methods and structure of the study. We used, for the purposes of the study, the following methods: analysis of the relevant theoretical study reports (in psychology, pedagogy and social science); analysis of the relevant literature, particularly studies of the folk epics, ethnic physical practices, National physical education traditions; and made an analytical revision of the relevant sociological research findings.

Results and conclusion. We found the most challenging national physical education systems in the northern ethnic groups living in severe climates – including the Siberian, Far Northern and Far Eastern indigenous groups, plus the nations with long and hard history of military conflicts, such as those in the Caucasus, Central Asia and North America. It is quite typical for these indigenous groups to develop rather special and purposeful National physical education systems with authoritative physical education mentors nominated by the communities for the strictly controlled, comprehensive and systemic trainings. Studies of such traditional National physical education systems in different historical periods find the same physical education principle in every ethnic group.

Even a brief review of the national physical education traditions still alive in the indigenous communities finds them strictly prescribing gender roles since the early childhood. Basically every National physical education tradition implies a strict delimitation of gender roles within the powerful socialization domains. Due to the National physical education tradition being deeply and naturally rooted in the past and present of the indigenous groups, they are perceived as intrinsic for the national culture and spiritual heritage of ancestors, and prescriptive for the self-identification and socialization options, thereby taking the social role of a global regulator of the gender roles, priorities and missions in the traditional societies.

Keywords: *national physical education, gender roles, mothering style, gender socializing, traditions, physical activity, initiations.*

Background. National physical education refers to every direct unprofessional physical education tradition with the relevant physical, psychological, aesthetic and moral progress standards and benefits that help every individual get fit for labor and defense, effectively adapt to the natural and social environment, improve health, have fun, etc. [1]. The National physical education standards in traditional societies have been developed to meet the individual and collective survival needs since every individual was expected to be healthy and physically fit for the group protection, sustenance and wellbeing. Traditional physical education and sports are designed to encourage formation of such survival skills from the cradle. It was traditional for the northern ethnic communities, for example, to temper newborns in snow or cold water springs on the assumption that if the child dies it's a God's will. Moreover, many National physical education traditions are gender role specific as demonstrated, among other things, by the offerings to newborns. Some Nigerian tribes, for example, offer bows and arrows to the boys and toy millstones to the girls. Boys from Kubu tribe in

Africa, e.g., were hard trained to be able to hunt birds and steer a boat at 3-4 years of age.

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Gender roles are dictated as priorities for the physicality and mentality culturing National physical education methods. The future active social roles of boys and the domestic roles of girls with their private life protecting confines are differently addressed by the National physical education and physical activity traditions. They basically imply a physically inactive life for women and, hence, offer no special National physical education models for them – as opposed to the amazingly versatile physical training toolkits for the boys. Thus the National physical education traditions in the North Caucasus imply multiple compulsory physical practices for boys and juniors including running, wrestling, tug of war, stick throwing ("Girata"), vertical pole climbing, stilts walking, stick fencing, rowing, sailing and other practices. The Siberian indigenous National physical education systems for boys make a special emphasis on jumping exercises: thus the Gould tradition trains one-leg (monopodalic) pole jumps over a stone; Orochi tradition – double-pole rope jumps alternated with unsupported bent-legs jumps; Lapps tradition – pole jumps; Yakut tradition – one-leg jumps over a log; and the Chukchi tradition includes running, wrestling, weightlifting, javelin throwing, and walrus skin jumping contests [2].

The National physical education traditions for indigenous women are mostly limited by active outdoor games for physical activation and emotional relaxation/ health. It should be emphasized, however, that every national active game for girls is largely different from the highly sporting and challenging National physical education methods for the boys.

It should be also underlined that the National physical education traditions are still mostly the same nowadays. A few recent special studies have demonstrated that contents and priorities of the active games are still expressly gender-role-specific with the training paradigms implying 'the gender role prioritizing games designed within the social understanding of the men's and women's social missions and gender role standards, with the boys trained to construct, repair, work wood, compete, master the key technologies, martial arts, trekking – i.e. actions rather than words, with every boy expected to fast mature acting in the adult male roles.

"Boys' games are generally more active, focused and substantial - like "Locksmith Workshop", "Car Dealer", "Ministry of Emergency Situations", "Firefighters", "Taxi", "Construction Site", "Rescue Service", "Mobile Communication Station", "Home Appliance Store", "Journalists and Photographers", "Photo Center", etc.; i.e. the boy's role-playing games train mostly their technical and socializing skills; whilst the girls' games mostly train cooperation and social skills. For example, a Mother-Daughter or Doll games offer them competition-free domestic roles. Even the somewhat competitive games for girls – like Hopscotch, for instance, tend to train rather individual qualities and skills than the group communication and cooperation ones. Girls in the National physical education systems may also compete but basically in the interpersonal relations domain – in disputes or comparisons – with their games being normally free of must-win focuses since wins and individual superiorities for them are perceived of little importance unlike good relationships and cooperation" [3].

Some researchers tend to interpret the above gender roles emphases as the innate psychological gen-

der differences [4] by no means suggested by the gender socialization processes. If we fully accept this relatively common viewpoint, how then would we explain the facts of the women's special combat trainings in the historical National physical education to make them fit for warfare and men's competitions [5]? It may be pertinent to mention in this context the popular folk women's characters including horsewomen Altyn-Dustik ("Altai Buchai") [8]; enormously strong Chin-Hara ("Albynzhi"); Yuzut-Arch with her legendary whip fighting mastery [6] and many other folk heroines. If the girls physical activity were centered on the psychological conditioning only, we could unlikely expect such characters in the folk myths and legends. It is not improbable that causes and effects are reversed in this case, with the gender-specific socialization protested by the extreme mythological behavioral paradigms. If the National physical education tradition were not so discriminatory and prescriptive for women since the cradle, we could expect different manifestations of psychological differences.

The fact that the National physical education traditions effectively deprive women of subjective status and focus on objects is underlined by the still alive traditional folk wedding games and amusements – for example, the Uzbek "tortishmachok" ("tug-of-war") rite when the groom is allowed to take the bride home only after his family team defeats the bride's family team in the carpet tugging contest. The woman's role in this and other similar rites is rather passive and limited to an object or prize the men compete for. It is rather traditional for virtually every ethnic sport and competitive game that women are tolerated as spectators at most and in no case as competitors, with their attendance often forbidden.

Conclusion. Even a brief review of the National physical education traditions still alive in the indigenous communities finds them strictly prescribing gender roles since the early childhood. Basically, every National physical education tradition implies a strict delimitation of gender roles within the powerful socialization domains. Due to the National physical education tradition being deeply and naturally rooted in the past and present of the indigenous groups, they are perceived as intrinsic for the national culture and spiritual heritage of ancestors, and prescriptive for the self-identification and socialization options, thereby taking the social role of a global regulator of the gender roles, priorities and missions in the traditional societies.

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Technical and tactical training model for greco-roman wrestling

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Abstract

Objective of the study was to develop a technical and tactical training model for Greco-Roman wrestling sport based on the modern sports training theory.

Methods and structure of the study. Methodologically, the study was designed based on the P.K. Anokhin's functional systems theory; N.A. Bernstein's leveled movement construction concept; activity theory developed by psychologists L.S. Vygotsky, S.L. Rubinstein and A.N. Leontiev; the M.M. Bogen's planned/ staged motor actions formation theory, etc.

Results and conclusion. Technical and tactical training may be defined as the motor skill training and practical motor skill application tactics learning system for competitive progress. We developed, based on the sound theoretical provisions, the technical and tactical training model for Greco-Roman wrestling sport as a harmonized staged system designed to master motor skills on a situation-specific, proactive and creative basis – first in the eased modeled conditions; second in the focused motor skill trainings to effectively use the basic well-trained motor skill toolkit in competitive bouts; third, in the focused-creative motor skill trainings to make the athlete fit for finding best solutions under time pressure in every known motor situation; and fourth, in the creative motor skill / motor actions trainings to help find the best solutions of motor tasks in the unknown motor situations. The technical and tactical training model is recommended for practical application in wrestling sports as it was proved beneficial for the training service quality.

Keywords: *competitive wrestling, technical and tactical training, training methodology.*

Background. It was in the mid-XX century that A.V. Krestovnikov developed, based on the I.P. Pavlov theory of higher nervous activity, a motor skill physiology theory [3] with its methodological toolkit then used by V.D. Maznichenko to develop basics of the modern motor skills training theory and practice [9]. He believed [9, p. 138] that a special priority in the efforts to advance this theory and practice should be given to studies of the human behavioral mechanisms pioneered by P.K. Anokhin [1], N.A. Bernstein [2] and others.

Modern sports theory and practice acknowledges the modern motor skills training theory and practical basics developed by V.D. Maznichenko [9], along with the planned/ staged motor actions (MA) formation theory by M.M. Bogen [3] that was advanced based on the activity theory by L.S. Vygotsky, S.L. Rubinstein, A.N. Leontiev et al. – with these fundamentals still applied in the sport-specific motor actions / motor skill training systems, models and tools in every sport discipline.

Modern tactical training service is geared to develop the competitive performance management skills as required by the competitive fight plan with the situation-responding versions of the actions and counteractions. In real competitive bouts, however, techniques and tactics can hardly be separated, and this is the reason why the sports community traditionally applies the notion of technical and tactical trainings [8].

It was further found that the competitive performance management skills include some specific physiological decision-making patterns and logics that help find the best solutions in every competitive situation [6]. It should be emphasized that progress of the physical education and sports theory and practice has long been channeled by the I.P. Pavlov's con-

ditioned reflex theory – that was used, among other things, as a basis for technical and tactical trainings. However, some contradictions of the reflex theory that virtually neglects the physiological aspects of the decision-making mechanisms [1] have long hampered the efforts to develop sports tactics mastering theory and practice. It is also emphasized in our prior study [7] that the modern combat sports theory and practice actually fails to address correlations of the tactical and technical training elements in the multiannual training systems.

Objective of the study was to develop a technical and tactical training model for Greco-Roman wrestling sport based on the modern sports training theory.

Methods and structure of the study. Methodologically, the study was designed based on the P.K. Anokhin's functional systems theory; N.A. Bernstein's leveled movement construction concept; activity theory developed by psychologists L.S. Vygotsky, S.L. Rubinstein and A.N. Leontiev; the M.M. Bogen's planned/ staged motor actions formation theory, etc.

Results and discussion. Based on the functional systems theory [1], we found that the competitive decision-making – on what competitive action, motor skill / hold may be the most beneficial in a specific fight situation – always factors in the practical individual motor experience of the wrestler. We further classified the competitive motor tasks, different in the physiological decision-making mechanisms and driven by the athlete's motor experience, into the (1) Known and memorized motor tasks the athletes have faced before and has ready solutions for; and (2) Unknown and non-memorized motor tasks that have no ready solutions. Furthermore, the known and memorized motor tasks may be classified into the (1) successfully solved; and (2) unsuccessfully solved before.

The above motor tasks classification respecting the physiological decision-making mechanisms [3] implies the motor task solving/ motor skill training tools being differentiated correspondingly. Using the motor skill and abilities training theory and practice [9], plus basics of the competitive wrestling tactics [4] in the context of the physiological decision-making patterns [1] we developed the technical and tactical training model for Greco-Roman wrestling sport analyzed hereunder.

Stage 1 is the motor skill basics training phase generally geared to master motor skill in the eased modeled conditions, with every detail consulted by the coach and partners and worked on training machines etc., to train and excel the basic motor skill version.

Stage 2 is the focused motor skill training period intended to excel and effectively use the specific well-trained motor skill in competitive bouts.

Stage 3 is the focused-creative motor skill training phase designed to teach the athlete find the best solutions under time pressure in every motor situation – to effectively solve the known motor tasks by the best motor skill from the well-trained toolkit.

And Stage 4 is the creative motor skill / motor actions training period when the training is geared to make the athlete capable of finding the best solutions for motor tasks in the unknown competitive motor situations.

The above technical and tactical training model offers a harmonized staged training system design frame to help master the key motor skill / holds and effectively use them in competitive bouts. The Table hereunder presents the technical and tactical training model for the Greco-Roman wrestling sports as the motor skill / holds and motor skill groups training sequence with the relevant progress rates

Modern combat sports training systems recommend at most 1-3 motor skill trained in every session depending on the individual fitness level, training stage and some other factors. Every next motor skill / hold or motor skill group will be trained (see the Table) after the prior training stage is successfully completed. Numbers of the trained motor skill / holds are not limited by the known ones (n). The competitive motor

Table 1. *Staged technical and tactical training model with the motor tasks solving algorithms for competitive bouts*

Motor skill / holds/ groups	Technical and tactical training stages															
1	1	2	3	4												
2			1	2	3	4										
3					1	2	3	4								
-/-	-/-															
n									1	2	3	4				
n+											1	2	3	4		

Note: Stage 1, 2, 3, 4 definitions are given in the text; n – known competitive motor skill / holds; n+ – expanded competitive motor skill toolkit

skill toolkit will be persistently expanded with progress of the modern sports theory and practice to n+. We tested the technical and tactical training model analyzed herein in practical Greco-Roman wrestling trainings and found it beneficial [7].

Conclusion. Technical and tactical training may be defined as the motor skill training and practical motor skill application tactics learning system for competitive progress. We developed, based on the sound theoretical provisions, the technical and tactical training model for Greco-Roman wrestling sport as a harmonized staged system designed to master motor skills on a situation-specific, proactive and creative basis – first in the eased modeled conditions; second in the focused motor skill trainings to effectively use the basic well-trained motor skill toolkit in competitive bouts; third, in the focused-creative motor skill trainings to make the athlete fit for finding best solutions under time pressure in every known motor situation; and fourth, in the creative motor skill / motor actions trainings to help find the best solutions of motor tasks in the unknown motor situations. The technical and tactical training model is recommended for practical application in wrestling sports as it was proved beneficial for the training service quality.

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Legislative and practical initiatives to control extremism in sports: serbian experience

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Abstract

Objective of the study was to analyze practical experience, progress and benefits of the extremism in sports control system in Serbia.

Methods and structure of the study. We used the following criteria listed by the UN Office on Drugs and Crime to analyze the valid Serbian control system for extremism in sports: space security; social awareness; educational service; individual /group tolerance of extremism in sports; and youth empowerment service.

Results and conclusion. The space security concept implies an institutional security system for the event attendants, with the relevant physical specifications of the secured space plus psychological, socio-cultural and political aspects including a facilitating social climate with trust, friendliness, hospitality, intolerance to violence, discrimination, hostility, harassment, discord and alienation.

As things now stand in Serbia, the extremism in sports prevention initiatives and projects compliant with the five UN criteria are still underdeveloped and ineffective, whilst the extremism in sports is still controlled by the criminal and administrative codes. The efforts to implement the primary extremism in sports prevention projects focused on the school and young supporter communities are still non-systemic and inefficient. Most of such projects initiated by the Ministry of Education, municipal police departments, schools and non-governmental organizations are very limited in project areas and/or timeframes. The local football clubs appear still unprepared to decisively contribute to the extremism in sports prevention initiatives. The efforts to control violence in sports need to be leaded by the supporter communities in cooperation with the sports club management and supported by efficient legislative provisions to put the process on a clear and effective institutional basis.

Keywords: *extremism in sports, violence at sports events, football supporters.*

Background. Lately the extremism-in-sports-related problems in Serbia have spiraled far beyond the sports sector and are now rank among the high-priority national challenges. Efforts to build up an extremism in sports control system need to be sensitive to the local socio-cultural contexts. Sports hooliganism and violence prevention initiatives in Serbia have been analyzed by M. Joric [1], S. Milojevic, B. Simonovich, B. Otasevich, V. Turanyanin [5], and B. Yankovic [4, 5]; media coverage of the football supporters community in Serbia by I. Djordjevic [2]; and sports-events-related violence versus attendance statistics and progress of the sports-related insurance market by D.M. Shuput [6]. The sports research community and relevant government agencies recognize the growing need for a modern efficient extremism in sports control system.

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Methods and structure of the study. We used the following criteria listed by the UN Office on Drugs and Crime to analyze the valid Serbian con-

trol system for extremism in sports: space security; social awareness; educational service; individual / group tolerance of extremism in sports; and youth empowerment service [7].

Results and discussion. The space security concept implies an institutional security system for the event attendants, with the relevant physical specifications of the secured space plus psychological, socio-cultural and political aspects including a facilitating social climate with trust, friendliness, hospitality, intolerance to violence, discrimination, hostility, harassment, discord and alienation [7]. Having adopted its sports-events-related Violence and Inappropriate Behavior Prevention Law [3], Serbia demonstrated its compliance with the ratified European Convention on the Prevention of Violence and Hooliganism of Spectators during sports events on the whole and football sports events in particular. The national Criminal Code was amended to spell out responsibility for the sports-events-related violence: see the Criminal Code of Serbia Article 344-a.

Cases of violence at football matches in Serbia are dominated by verbal tort followed, in descending order, by pyrotechnics, throws of objects on the field, physical violence and property damage [4]. The special police and security service at the sports events gives a special priority to the actions geared to nip in bud every outburst of violence, visual and verbal offense, interethnic tension, intolerance and hostility at stadiums; although it should be mentioned that criminal offenses of the football supporters group leaders are still virtually unaddressed by definitions of the valid sports events Related Violence and Inappropriate Behavior Prevention Law (VIBP Law).

The above Law is commonly considered the most stringent in Europe, although its legislative provisions largely derived from the British model have proved less effective in the Balkan socio-political settings. The British model gives a top priority to repressive actions taken directly at stadium and stands. As provided by the VIBP Law Article 2, sports events related violence is defined as the offense committed at the sports events within two hours prior to and after the sports events, with this timeframe extendable in cases of severe (high-risk) offences to four hours prior to and after the sports events. We believe that the definition of the sports events offences is too closely tied to the sports events and, therefore, the provisions fail to efficiently curb the key manifestations of the supporter group extremism in Serbia – that is not always directly related to sports events. Some offenses committed by the sports extremists outside the sports venues and beyond the above responsibility timeframes (such as fights and murders on the way to stadiums, in transport vehicles, catering facilities, nightclubs and on the streets) are covered by other legislative provisions. The procedural limitations and inefficiencies of the prosecutor's and the judicial bodies may be demonstrated by the non-initiated or stalled criminal actions against football hooligans: see Tables 1 and 2 hereunder.

Table 1. *Sports events Related Violence Article application statistics (criminal charges versus convictions) in Serbia: underage offenders*

Year	Criminal charges	Convictions
2010	15	17
2011	87	26
2012	37	16
2013	19	8
2014	13	7
2015	9	5
2016	15	7
2017	8	2
2018	5	3
2019	8	3
2020	6	4

Source: Republican statistical reports: https://www.stat.gov.rs/oblasti/pravosudje/

The above statistics show that the VIBP Law has failed to curb growth of the sports events related violence so far. Prison sentences are relatively seldom, with the offences usually penalized by suspended sentences, monetary fines, bans from matches, etc. Such lenient judicial practices have been found more or less effective for the underage extremism in sports control initiatives and ineffective in the adult crime prevention domain where they even appear to develop a climate of impunity in fact. This is one of the key reasons why the insurance companies tend to show little if any interests in the football club property and football supporter health insurance contracts due to the too high probability of the insured events [6].

The growing violence at the sports events cannot but cut down the attendance of matches, and these losses further aggravated by the systematic prop-

Table 2. *Sports events Related Violence Article application statistics (criminal charges versus convictions) in Serbia: adult offenders*

Year	Criminal charges	Convictions							
		Total	Prison sentence	Monetary fine	Suspended sentence	Disciplining measures	Formal warning etc.	House arrest	Correctional work
2010	249	27	1	5	21				
2011	310	129	13	10	106				
2012	257	173	19	9	141	4			
2013	198	190	50	14	123	3			
2014	146	135	31	17	85	1	1		
2015	141	126	17	16	84			9	
2016	108	126	20	12	81			12	1
2017	102	65	10	9	41			5	
2018	138	94	12	8	53			20	
2019	75	50	8	4	32			6	
2020	77	26	1	7	14		1	3	

Source: Republican statistical reports: https://www.stat.gov.rs/oblasti/pravosudje/

erty damages discourage the sport infrastructure development/ rehabilitation initiatives and projects by the event organizers and shareholders. The Serbian police have made transition to the extremism in sports prevention model notably later than their peer agencies in many other nations with the similar levels of extremism in sports. It was in 2011 that the police established a Violence Monitoring and Prevention Department that largely mimics the British National Football Information Center.

The relevant social awareness programs required by the second criterion of the UN theoretical model are geared to build up the social capital and social integration by strengthening productive intra- and intergroup communication with a special focus on the extremism intolerance aspects. Social awareness is viewed as an alternative to marginalization and sociopathy/ social disconnection as prerequisites for violent extremism. The third criterion – educational service – implies actions to mitigate radicalism in youth communities by developing their critical thinking and abilities to effectively oppose extremist ideology. Such education will be sensitive to the youth cultures and subcultures with their experiences, perceptions and worldviews, to give a special priority to productive cooperation with the relevant institutions and professional networking system. The fourth criterion – individual /group tolerance of extremism in sports – is inextricably linked with the above educational service including special psychosocial support for vulnerable groups of young people sensitive to the local contexts and external factors of influence, and special programs to develop the peer pressure control abilities. And the last fifth criterion – youth empowerment – means the efforts to help the young people mature to effectively contribute to the relevant decision-making process [7].

The national Ministry of Youth and Sports, sports clubs, event organizers, local governments, non-governmental organizations, school teachers and university faculties, sports celebrities and cultural leaders are expected to contribute to the extremism in sports prevention educational service to facilitate socially acceptable behaviors of the sports supporter communities – knowing that many supporters are still unaware of positive behavioral models [5, p. 229]. Such extremism in sports prevention initiatives will be designed to limit the traditional repressive measures as much as possible and efficient.

Conclusion. As things now stand in Serbia, the extremism in sports prevention initiatives and projects compliant with the five UN criteria are still underdeveloped and ineffective, whilst the extremism in sports is still controlled by the criminal and administrative codes. The efforts to implement the primary extremism in sports prevention projects focused on the school and young supporter communities are still non-systemic and inefficient. Most of such projects initiated by the Ministry of Education, municipal police departments, schools and non-governmental organizations are very limited in

project areas and/ or timeframes. The local football clubs appear still unprepared to decisively contribute to the extremism in sports prevention initiatives. The efforts to control violence in sports need to be leaded by the supporter communities in cooperation with the sports club management and supported by efficient legislative provisions to put the process on a clear and effective institutional basis.

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Governmental policy instruments to support regional physical education and sports sector

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Abstract

Objective of the study was to analyze efficiency of the governmental policy instruments to support progress of the regional physical education and sport sector, with the Sverdlovsk Oblast taken for the case study.

Methods and structure of the study. We analyzed, for the purposes of the study, standard Statistical Reporting Forms No. 1-FC, 5-FC, 3-AFC and 2-GTO; public information data flow of the Sverdlovsk Oblast Ministry of physical education and sport; and the relevant legal, regulatory, policy-setting and progress management policy documents of the regional Sverdlovsk Oblast physical education and sport sector control agency for the period of 2010 through 2020.

Results and conclusion. We analyzed in the study the following regional governmental policy instruments proved effective for the physical education and sport sector support and advancement purposes:

– Analyses of the physical education and sport sector progress statistics including the sector staffing; sector financing by the progress vectors; progress statistics of the local social-needs-centered non-profit organizations; progress statistics of the All-Russian GTO Complex in the region; and reports of the sports facilities operations with the design service capacities versus the actual attendance statistics;
– Sports training establishments in the region;
– Core regional sports;
– Public-private partnerships; and
– Major physical education and sports events in the region.

Keywords: *physical education and sport sector control, national administration, sports management, control instruments, regional sports administration.*

Background. Governmental policies to control, support and advance the regional physical education and sport sector are ranked among the top priorities by the national research and analytical community as they are critical for the physical education and sport sector progress on a comprehensive and harmonic basis,

Objective of the study was to analyze efficiency of the governmental policy instruments to support progress of the regional physical education and sport sector, with the Sverdlovsk Oblast taken for the case study.

Methods and structure of the study. We analyzed, for the purposes of the study, standard Statistical Reporting Forms No. 1-FC, 5-FC, 3-AFC and 2-GTO; public information data flow of the Sverdlovsk Oblast Ministry of physical education and sport; and the relevant legal, regulatory, policy-setting and progress management policy documents of the regional Sverdlovsk Oblast physical education and sport sector control agency for the period of 2010 through 2020.

Results and discussion. We designed our analysis of the governmental policy instruments to support the Sverdlovsk Oblast physical education and sport sector as follows:

1. Analysis of the governmental statistical reports

We analyzed the standard Statistical Reporting Forms No. 1-FC, 5-FC, 3-AFC and 2-GTO to out-

line the regional physical education and sports progress trends in every progress vector, and equip the research and analytical community with a clear and comprehensive picture of the physical education and sport sector situation and progress. As demonstrated by many policy study reports, the standard governmental statistics reporting forms provide the most relevant and informative data for the physical education and sport sector progress analysis [1-3].

Physical education and sport sector staffing statistics demonstrate growth in the physical education and sport sector service personnel associated with progress in the professional education and skill levels – mostly due to the growing proportion of the highly educated professional physical education and sport specialists in the total staff (from 51% of the highly educated professionals in the total Sverdlovsk Oblast physical education and sport staff of 9,558 in 2010 to 61% highly educated professionals in the Sverdlovsk Oblast physical education and sport staff of 13,396 in 2020).

Physical education and sport sector financing statistics for the study period show a gradual reduction in the professional sports funding versus growths in the mass sports financing pursuant to the national physical education and sport sector progress policies by the strategy vectors.

Social needs centered non-profit organizations (hereinafter referred to as the Sverdlovsk Oblast NPOs) have proved beneficial for the physical education and sport sector progress, conditional on a well-designed and effective interdepartmental cooperation and a clear legal and regulatory framework for Sverdlovsk Oblast NPO contributions to the governmental policies and practices; plus good information flow and mutual consulting and support services [4].

All-Russian "Fit for Labor and Defense" Physical Education and Sport Complex (hereinafter referred to as the "GTO") with its 86 GTO test centers in every Sverdlovsk Oblast municipality and 366 certified GTO test grounds across the region.

Sports facilities statistics, with the design service capacity and the actual attendance reports that provide a basis for the regional sports infrastructure development projects based on the following: (1) sports infrastructure progress analyses with estimates of the actual regional supply and demand for the sports infrastructure services; and (2) actual attendance statistics with the supply and demand analyses and operation and maintenance (O&M) cost estimates to produce the social service efficiency indices (thus the design service capacity of the sports facilities was reported at 26.3% and 56.4 of the demand in 2010 and 2020, respectively; versus the actual attendance of 47.5% and 71.4% of the design service capacity in 2012 and 2020, respectively).

2. Sports training establishments in the region

The Sverdlovsk Oblast government has taken persistent efforts to encourage transition of the sports reserve training system to the inclusive sports training formats. The relevant regional sport training organizations have reported progress in transitions to the inclusive sport training formats.

3. Core Sverdlovsk Oblast sports

As things now stand, the Sverdlovsk Oblast government has formally approved 42 core sports for the region including 23 Summer Olympic, 10 Winter Olympic, and nine other sports disciplines. It should be mentioned that presently the Sverdlovsk Oblast is ranked third on the core regional sports list of the Russian Federation. The core Sverdlovsk Oblast sports support policies have proved beneficial as demonstrated by the flow of medals won by Sverdlovsk Oblast sports leaders in the formal national and international events: 1337, 1600 and 2694 medals in 2010, 2015 and 2020, respectively.

4. Public-private partnerships (mostly the municipal-private ones, hereinafter referred to as the public-private partnerships)

The public-private partnerships have been encouraged by the Federal Ministry of Sports in its Physical Education and Sport Sector Progress Strategy for the period up to 2030. In 2010 through 2020, the Sverdlovsk Oblast government has reported support for the sports infrastructure development projects with contributions from the public-private partnerships mechanisms on 21 sports facilities.

5. Major physical education and sports events

We would mention the following most popular major physical education and sports events hosted and/or sponsored by the Sverdlovsk Oblast government: annual All-Russian "Christmas Starts" Athletics Tournament; annual "Europe-Asia" Athletics and Skiing Marathons; annual All-Russian "Ice of Our Hope" Mass Skating Event; 2015 European Table Tennis Championship; Ski Jumping World Cup qualifiers of 2015-2020; International "Grand Slam" Judo Tournament of 2017-2019; 2018 World Football Championship; 2019 World Boxing Championship; FIBA 3x3 Challenger and FIBA 3x3 Women's Series 2019 international basket-

ball tournaments; 2020 FIDE Chess Candidates Tournament; etc.

Conclusion. We analyzed in the study the following regional governmental policy instruments proved effective for the physical education and sport sector support and advancement purposes:

– Analyses of the physical education and sport sector progress statistics including the sector staffing; sector financing by the progress vectors; progress statistics of the local social-needs-centered non-profit organizations; progress statistics of the All-Russian GTO Complex in the region; and reports of the sports facilities operations with the design service capacities versus the actual attendance statistics;

– Sports training establishments in the region;

– Core regional sports;

– Public-private partnerships; and

– Major physical education and sports events in the region.

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Winter sports: situation and progress coverage by journal “teoiya i praktika fizicheskoy kultury”

UDC 796: 316

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Abstract

Objective of the study was to analyze the winter sports situation and progress trends in the Teoiya i Praktika Fizicheskoy Kultury coverage for the last decade.

Methods and structure of the study. We made a content analysis of the winter sports coverage by the Teoiya i Praktika Fizicheskoy Kultury journal for the period of 2011 to 2021 that totaled 132 issues with 5,366 publications.

Results and conclusion. We analyzed the key trends in the winter sports coverage by the Teoiya i Praktika Fizicheskoy Kultury for the last decade. It should be emphasized that the national winter sports have clearly deserved more attention from the research community for the period. The winter sports coverage variation profile showed a persistent growth with minor sags in 2012, 2017 and 2019. Most of the articles considered different winter sports training issues and elements, mostly the physiological, biomechanical and psychological ones. We found it traditional for the research community to prioritize the winter sports elite training topics. Regional winter sports were found underrepresented in the coverage for the period. As for the winter sports range in the publications, we were surprised to find no publications on skeleton and bobsled despite the fact that they are listed with the Olympic sports. We would recommend the national sports research community give a higher priority to the studies of winter sports to expand this share of the Teoiya i Praktika Fizicheskoy Kultury coverage later on since these sports are historically, traditionally and deservedly ranked with the strategic segment of the national sports industry.

Keywords: *content analysis of scientific research, winter sports, journal Teoiya i Praktika Fizicheskoy Kultury.*

Background. Modern winter sports in the present social progress context have evolved into a fully-fledged social institution due to many factors including their growing popularity on the national and global turfs, progress-facilitating governmental policies and competitive accomplishments of the national winter sports leaders on the global arenas. Since theses sports are of growing interest for many sciences, the ongoing research have been actively covered by the research and theoretical journal Teoiya i Praktika Fizicheskoy Kultury.

Objective of the study was to analyze the winter sports situation and progress trends in the Teoiya i Praktika Fizicheskoy Kultury coverage for the last decade.

Methods and structure of the study. We made a content analysis of the winter sports coverage by the Teoiya i Praktika Fizicheskoy Kultury journal for the period of 2011 to 2021 that totaled 132 issues with 5,366 publications [1].

Results and discussion. The content analysis of the Teoiya i Praktika Fizicheskoy Kultury coverage for the last decade found 198 winter sports-covering publications estimated at 3.7% of the total and analyzing 16 winter sports. It should be mentioned that the Physical Education and Sports Statistics Form No. 1 Section “Sports and Physical Activity progress in the Russian Federation" lists 20 winter sports including 13 Olympic; 5 sports still unlisted in the Olympic program (ski polyathlon, ski orienteering, Nordic walking, Nordic all-around, and bandy; plus national hunting skiing; and ice-stock formally recognized by the Russian Federation [2].

The winter sports coverage for the period was dominated by cross-country skiing (33%), ice hockey (17%), biathlon (16%), ski jumping (6%) and speed

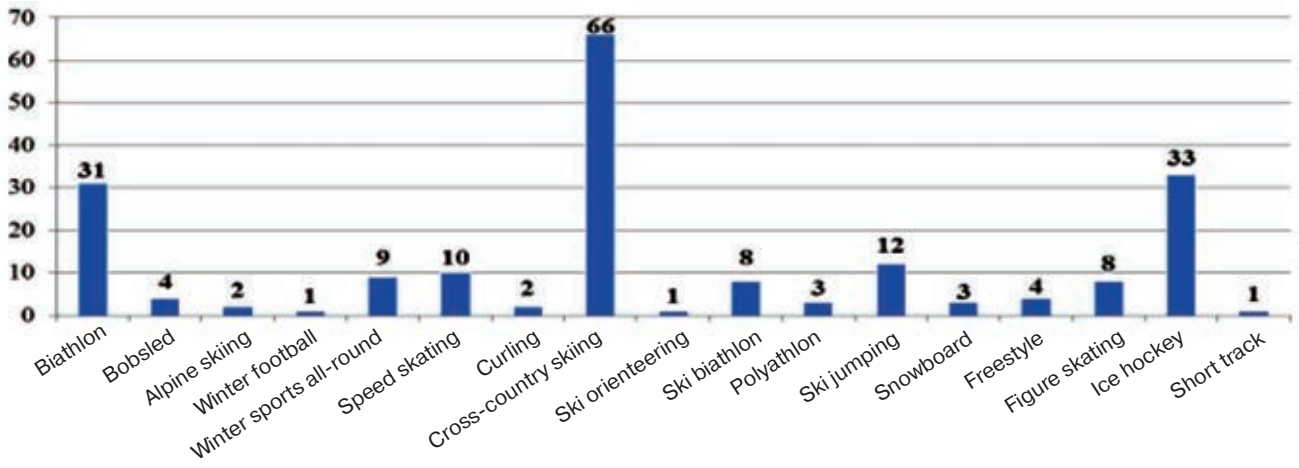

Figure 1. *Winter sports coverage for the 2011-2021 decade, % of the total*

skating (5%). The non-Olympic winter sports in the coverage included winter football, ski orienteering and polyathlon. Such Olympic winter sports as skeleton and bobsled (luge) were uncovered by the journal for the study period (Fig. 1).

Of special interest is the winter sports coverage variation for the period (Fig. 2). Basically it shows a growth trend with minor sags in 2012, 2017 and 2019 and a peak in the 2021 pre-Olympic season – in contrast to the 2014 and 2018 pre-Olympics that showed no growth in fact (Fig. 2).

Furthermore, we classified the winter sports coverage for the decade by the topics and percentages as follows:

– Winter sports training issues including the anthropometric, physiological, biomechanical, biochemical, humanitarian, psychological, psycho-physiological and legal issues and aspects plus the informational, theoretical and practical support related ones: 42%;

– Winter sports training types (special, technical, physical, tactical, etc.): 23%;

– Winter sports training management and control issues: 14%;

– Competitive performance: 5%;

– Socio-cultural and historical aspects of progress in winter sports: 5%;

– Competitive performance analyses and forecasts: 4%;

– Winter sports selection issues: 3%;

– Winter sports research progress analyses: 1.5%;

– Winter sports project activity: 1%;

– Winter sports specialists training issues: 1%; and

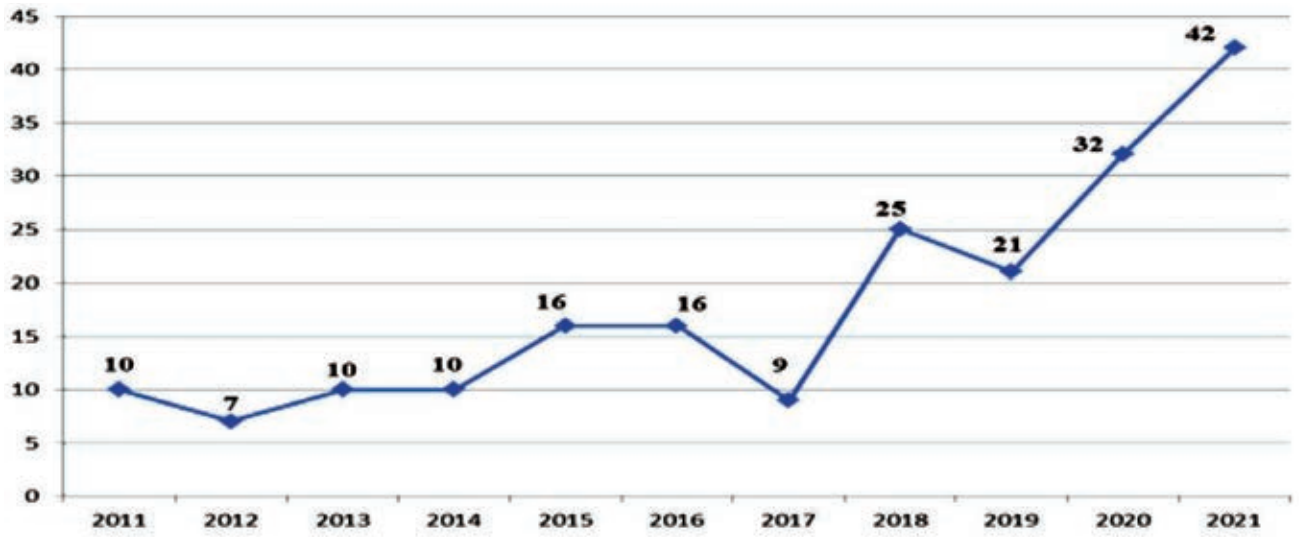

Figure 2. *Winter sports coverage variation for the 2011-2021 decade, %*

– Trainings for the GTO Complex tests: 0.5%.

The coverage was dominated by the winter sports training issues addressed by 83 articles followed by the winter sports physiology, psychology and biomechanics study reports (39, 16 and 9 articles, respectively). Special winter sports training aspects and elements were addressed by 47 publications. Specific physical and technical training problems were covered by 18 articles; special training systems were covered by 7 articles; and tactical training models analyzed by 4 articles. It should be emphasized that the winter sports training share was dominated by biathlon, cross-country skiing and ice hockey.

The winter sports project activity, winter sports specialists training, and the GTO Complex pre-test training related issues were addressed by only a few articles for the decade, including the Ski Jumping and Biathlon Project Report with contributions from a few foreign athletes, coaches and experts. The Report analyzed benefits of the field training project with the trainers' advancement service and special cultural, leisure-time and theoretical training events for the athletes [3].

As far as the coverage of the winter sports elite and reserve training systems is concerned, we found it dominated (108 articles) by the winter sports elite training issues and twice as little (54 articles) by the winter sports reserve training ones. Proportions of the winter sports elite training related articles were as follows: cross-country skiing 30%; biathlon 18%, ice hockey 15%, and speed skating 8%. And the proportions of the winter sports reserve training articles were the following: cross-country skiing 40%, ice hockey 26%, and biathlon 9%.

Issues of the mass sports were addressed by 29 articles (15% of the total) dominated by the school and student sports analyzing ones (mostly curling, ice hockey and winter football). Modest share of the studies (16%) prioritized winter sports issues specific social groups: women, students and handicapped people, though our analysis found these groups clearly deserving more attention. Dominating in the above share were the topics of women's winter sports including biathlon, figure skating, ice hockey and curling; whilst the student and handicapped winter sports were subject to only a few publications for the decade.

Conclusion. We analyzed the key trends in the winter sports coverage by the Teoiya i Praktika Fizicheskoy Kultury for the last decade. It should be emphasized that the national winter sports have clearly deserved more attention from the research community for the period. The winter sports coverage variation profile showed a persistent growth with minor sags in 2012, 2017 and 2019. Most of the articles considered different winter sports training issues and elements, mostly the physiological, biomechanical and psychological ones. We found it traditional for the research community to prioritize the winter sports elite training topics. Regional winter sports were found underrepresented in the coverage for the period. As for the winter sports range in the publications, we were surprised to find no publications on skeleton and bobsled despite the fact that they are listed with the Olympic sports. We would recommend the national sports research community give a higher priority to the studies of winter sports to expand this share of the Teoiya i Praktika Fizicheskoy Kultury coverage later on since these sports are historically, traditionally and deservedly ranked with the strategic segment of the national sports industry.

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Flag football in mass sports system: potential growth opportunities

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Abstract

Objective of the study was to analyze the flag football progress and potential growth opportunities in the national mass sports system.

Methods and structure of the study. We used the following methods for the purposes of the study: analysis of the relevant theoretical and practical study reports; analysis of the legal and regulatory framework for the physical education and sports sector; statistical reports; and summaries of the practical flag football implementation projects by the relevant physical education and sports organizations.

Results and conclusion. The age group specific physical progress and health improvement needs make the modern flag football a highly appealing and beneficial sport discipline conditional on facilitating provisions to:

– Encourage progress of the American football / flag football groups and clubs;
– Make calendars of competitions and promote popular flag football events;
– Offer training and advancement programs for the flag football coaches;
– Facilitate regional American football / flag football progress initiatives with efficient municipal programs to support recreational/ popular sports movements;
– Make sure that the academic flag football is listed with the Student Games program in Russia;
– Expand and improve the legislative and regulatory framework to spur up the flag football progress.

Modern flag football as a contactless version of American football is rather beneficial due to its popular and very accessible and affordable standards and rules that effectively encourage physical progress, motor activity and health of every population group.

Keywords: *American football, flag football, mass sports, potential growth.*

Background. Modern societies are increasingly welcoming new sports disciplines, with every new/ untraditional sport expected to make a statement in the existing national sports sector to successfully compete with the traditional disciplines. 'New sports' may be defined using different conditional criteria and meanings although generally 'new' sports mean that they have never been cultivated before in some country or entered the country at some historical point and then vanished to once come back again and even win a high popularity [3]. Modern flag football as a version of American football may be ranked among such relatively new sports in our country, with its latest comeback in 2013 and growing interest in the American football since then – as verified by the fast growing numbers of regional teams and newly established Russian American Football Federation. We feel that the flag football progress studies and analyses may be beneficial for the efforts to lure people in the active amateur and professional flag football.

Objective of the study was to analyze the flag football progress and potential growth opportunities in the national mass sports system.

Methods and structure of the study. We used the following methods for the purposes of the study: analysis of the relevant theoretical and practical study

reports; analysis of the legal and regulatory framework for the physical education and sports sector; statistical reports; and summaries of the practical flag football implementation projects by the relevant physical education and sports organizations.

Results and discussion. American football is a contact team sport rooted in the early forms of rugby and football. It was in the late 1990s that the International Federation of American football (IFAF) was established to unite 52 countries [1]. Presently American football demonstrates progress in 38 Russian constituents with support from 30 regional American football federations including 14 formally accredited ones (in Moscow Oblast, Perm Area, Udmurt Republic, Sverdlovsk Oblast, etc.). As reported by Federal Statistical Form 1-FC, the American football sport community includes 6.5 thousand athletes – that is a significant although still low figure in fact. They are served by 62 full-time coaches and two American football training establishments (in the Krasnodar Territory).

Presently American football in Russia may be grouped into the classical men's American football, women's American football and flag football. Flag football may be defined as the American football version with virtually the same rules of competitions although without special safety gear due to the contactless format. The flag football teams will strive to remove a flag or flag belt from the ball carrier ("deflag") to end a down instead of tackling players to the ground; and the high safety of the sport is the reason why children are allowed to compete [2]. In October 2021 the flag football was listed with the All-Russian Sports Register. We analyze hereunder the flag football progress and growth opportunities for a few age groups.

Schoolchildren: As found by many study reports, team sports are highly appealing for this age group, and that is why the optional part of a school Physical Education course normally offers a few special eligible sports disciplines. The optional physical education service is known to have many benefits, particularly in the extracurricular physical education and sports formats facilitated by school clubs and/ or leagues. Since activities of the school sports clubs and leagues at this juncture are still kept beyond the school physical education event schedules, flag football may be encouraged in form of qualifiers/ multi-stage competitions in the General Calendar Plan, provided the flag football trainings and competitions are recognized among drivers of the children and youth sports. Practical experience has showed that modern flag football is appealing and beneficial for every underage group regardless of the actual functionality and anthropometrics. When put on a healthy institutional training basis, flag football may be highly helpful for the motor skills and physicality building purposes including the sport-specific ones. It is important that the school flag football service is widely accessible and affordable as it claims at most RR 15 thousand per team (8-10 people) per year.

University students: The academic and extracurricular flag football is gaining popularity at universities as a modern highly sporting discipline with multiple benefits for health, socialization, mental and physical progress purposes [2]. Due to the flag football accessibility and affordability, every university may form a few flag football teams for the formal local, regional, national and international competitions. Modern academic flag football will be designed to:

– Ensure healthy extracurricular physical activity in the vocational training and higher education system;

– Encourage growth of habitually sporting populations in the vocational training and higher education system; and

– Complement the academic physical education service and elective physical education and sports disciplines in the vocational training and higher education system

It should be mentioned that academic flag football is being considered for inclusion in the competitive program of the 2023 World Student Games in Yekaterinburg.

Mid-age adults: As reported by the Ministry of Sports of the Russian Federation, the mid-age habitually sporting population has grown to 32.6% in 2020 versus the forecast of 33.2%; and in 2021 it was forecast to grow to 37.1%. Since modern flag football is a contactless and highly accessible discipline that requires no special safety equipment or accessories, it offers multiple benefits for adults. They may master relatively difficult flag football techniques and tactics applicable in American football in much more safer settings – of special importance and benefits with age.

Conclusion. The age group specific physical progress and health improvement needs make the modern flag football a highly appealing and beneficial sport discipline conditional on facilitating provisions to:

– Encourage progress of the American football / flag football groups and clubs;

– Make calendars of competitions and promote popular flag football events;

– Offer training and advancement programs for the flag football coaches;

– Facilitate regional American football / flag football progress initiatives with efficient municipal programs to support recreational/ popular sports movements;

– Make sure that the academic flag football is listed with the Student Games program in Russia;

– Expand and improve the legislative and regulatory framework to spur up the flag football progress.

Modern flag football as a contactless version of American football is rather beneficial due to its popular and very accessible and affordable standards and rules that effectively encourage physical progress, motor activity and health of every population group.

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