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CHARACTERISTICS OF BARBELL TRAJECTORY IN SNATCH, FULFILLED BY ELITE FEMALE WEIGHT-LIFTERS

Antoniuk O.V., Pavlyuk O.S., Chopyk T.V., Pavlyuk E.A.
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Abstract. *Purpose:* to determine trajectories of elite female weight-lifters' movements. *Material:* 137 elite sportswomen were tested. Analysis of sportswomen's bio-kinematic actions was fulfilled with the help of Weight lifting analyzer 3.0 apparatus, Germany. *Results:* we found correlation of barbell snatch trajectory in respect to different weight categories of sportswomen. General characteristics of barbell trajectory are equal both for men and women. We determined indicators of barbell grip deviation from vertical axis. Optimal barbell trajectory depends on relative length values of body segments and other important factors. *Conclusions:* it was proved that execution of 2nd type trajectory of barbell horizontal movement is the most wide spread and effective. Such type of trajectory is the most often for high sport results off light weight categories (48-58 kg).

Key words: anthropometric, horizontal, barbell movement, trajectory types.

Introduction

The problem of sport movements' training and correction is a central one in theory and practice of sports спорт [4, 10]. Sport movements' training and correction are the most effective if they are realized on the base of modern ideas about weight-lifting exercises' fulfillment [6, 8, 9, and 11]. One of such ideas is trajectory of barbell movement [1, 22]. As on the present moment the way of technical characteristics obtaining, their information potential and objectiveness permit to detect mistakes rather quickly. Such mistakes can be effectively corrected at different stages of sportsmen's training. Reference models were received already in 70-s of 20th century [3]. Such models represent three types of barbell movement trajectory with three kinds of each. They reflect characteristics of snatch and lifting barbell on chest (see fig.1). Since that time, scientists from different countries only have been proving their correctness [13, 17]. Alongside with it searching of more effective trajectories (the most wide spread among weight-lifters) is remaining the permanent subject of their discussions. In some works trajectory (A) [16] is offered; in other – trajectory of B type [14, 25].

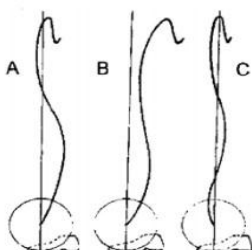


Fig.1. Types of barbell trajectories in snatch.

In his turn Hiskia G. [18] came to conclusion that type C is the most wide-spread. Other scientists [24] also came to conclusion and recommended model C as the best trajectory.

It should be noted that till now scientists have not had commonly accepted opinion about usage of these trajectories. Their conclusions were received from studies, which involved little quantity of sportsmen or sportswomen far from being elite.

Hypothesis: it is assumed that analysis of great number of elite sportswomen will permit to more precisely show one of technical fitness sides (barbell horizontal movement in snatch). It may result in reviewing theoretical and practical principles of sportswomen's technical training.

The purpose of the work is to determine trajectories of elite female weight-lifters' movements.

Material and methods

Participants: in the research we used the data of 137 the strongest in the world sportswomen of the following weight categories: 48kg (n=13), 53kg (n=12), 58kg (n=23), 63kg (n=23), 69kg (n=28), 75kg (n=16), +75kg (n=22).

Organization of the research: analysis of sportswomen's bio-kinematic motor actions was fulfilled with the help of modern apparatus complex, which works on principle of video-grams' automatic processing (Weight-lifting analyzer 3.0, Germany). Collection of these data was carried out at competitions of different levels (Championship of Europe, Budapest; Championship of Europe, Minsk; World Championship, Istanbul; World Championship, Wroclaw). In total we analyzed 238 successful snatches.

Statistical analysis was fulfilled with the help of Microsoft Excel 2010 programs.

Results of the researches

The received in our researches data permit to prove the fact that most of sportswomen practice second type (B) of barbell trajectory (see fig.2).

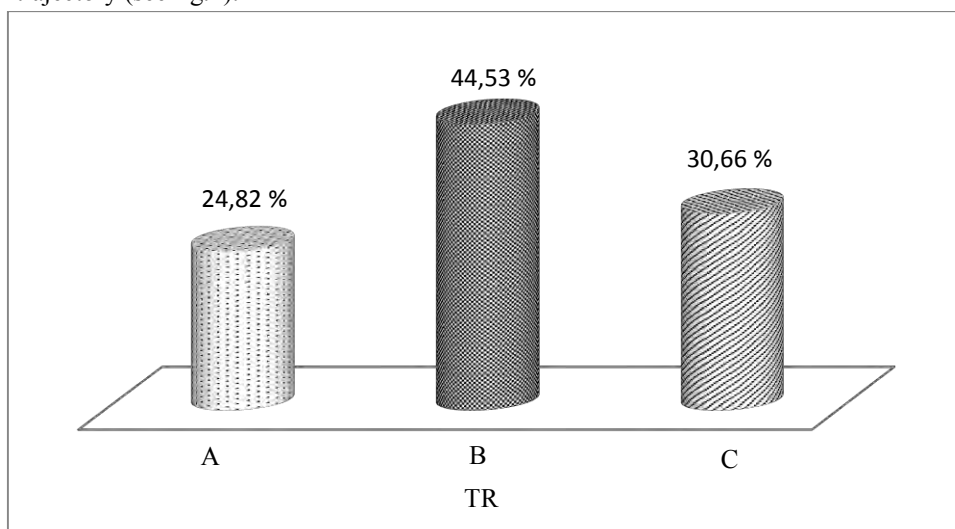


Fig.2. Types of barbell trajectories, used by elite sportswomen for snatch fulfillment: TR - type of barbell trajectory.

Evident prevalence of second type (B) application (44.53%), comparing with type A (24.82%) and type C (30.66%) was determined (see fig.3). As we can see in figure 3 sportswomen of 48 kg category mainly use trajectory B (69.23%). C-type takes only 23.08% and A-type – 7.69%.

The same situation was observed in 53 kg category. The tendency of B-type prevalence in snatch (B, 58.33%) is remaining. Type C takes second place (25%) and type A – third (16.67%).

These data change a little in categories 58 and 63 kg. In these categories sportswomen lift barbell the most often by second type (B): 52.27% and 43.48% respectively. The second place is taken by trajectory A with percentage of 30.43% in both categories.

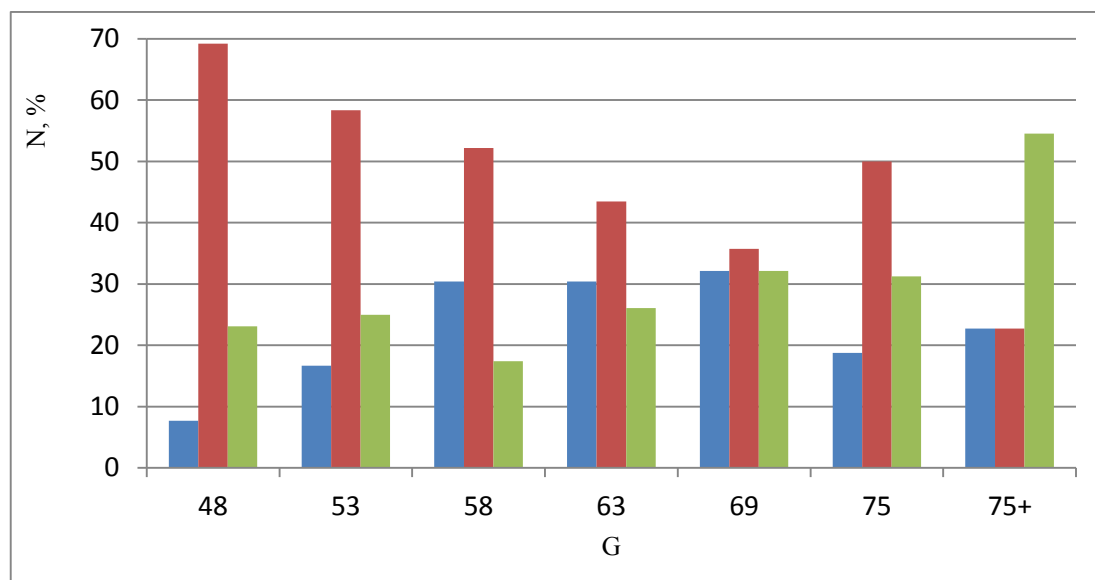


Fig.2. Barbell trajectory in snatch, fulfilled by different weight categories' sportswomen: G – weight category; N – quantity of sportswomen;

■ – type A; ■ – type B; ■ – type C

The third position by frequency of fulfillment is engaged by trajectory C: weight category (17.39%); weight category 63 kg (26.09%). In weight category 69 kg second type (B, 35.71%) prevails. It is by 3.57% more than trajectories A and C. Diagram of trajectories types' usage on 75 kg categories are similar to diagrams in categories 48 kg and 53 kg: trajectory (B) (50%), trajectory (A) (18.75%) and trajectory (C) (31.25%).

Data analysis in category above 75 kg showed that sportswomen, mainly, apply third type (C) in snatch. I.e. from 22, 12 sportswomen lift barbell by third type of trajectory – C (54.55%).

Discussion

Analysis of successful attempts in snatch showed that mainly sportswomen apply type B for lifting barbell. It coincides with the data of other authors [3]. General characteristics of barbell trajectories are equal for men and women. It coincides with the data of other researches [15, 17, and 21].

The works of American scientists showed inconsistency in barbell snatch trajectories in weight category 69 kg. More over less that half of sportswomen lifted barbell by trajectory A. It was proved in our previous works [19].

In the whole, in fig. 2 we can notice certain tendency of movement trajectories' usage. The highest percentage of fulfillment of B type is observed in 48 kg weight category. This percentage gradually reduces with weight categories' increasing. Percentage of trajectories A and C fulfillment grows with weight categories' increasing. From this diagram we can see that in 69 kg category balance between trajectories types' fulfillment exists. With further growth of weight categories correlation again changes. Many scientists try to explain this phenomenon by influence of body anthropometric sizes [2, 12, and 23]. For example, Garhammer J. [16] found that optimal trajectory depends on relative lengths of body segments and other important factors. Specialists in other kinds of sports support the opinion that technique of exercises' fulfillment is influenced by constitutional and typological features of sportsmen's bodies [5, 7]. Though, the role of anthropometric factors in determination of optimal barbell trajectory has not been cleared up yet [19].

It is necessary to pay attention to indicator of barbell deviation from vertical axis. By the data of authors [20] ineffective barbell lifting results in great energy losses. It is reflected in barbell excessive horizontal movements. In our opinion this characteristic has not been studied sufficiently. It opens prospects of further researches with paying attention to main three types of barbell trajectories.

Conclusions

We proved that usage of second type barbell horizontal movement (B) by sportswomen is the most widespread and effective for achievement high sport results.

Sportswomen of light weight categories (48-58 kg) use type B the most often.

It was determined that many sportswomen of the heaviest weight category (+75kg) use C type of barbell trajectory.

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Conflict of interests

The authors declare that there is no conflict of interests.

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ASSESSMENT OF SENIOR PUPILS' PHYSICAL FITNESS CONSIDERING PHYSICAL CONDITION INDICATORS

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Abstract. Consideration of physical condition indicators in assessment pupils' physical fitness permits to differentiate training and health restoration processes at physical culture lessons. Purpose: to substantiate criteria for pupils' physical fitness assessment, considering their physical condition indicators. Material: in the research 10-11 form pupils (n=406; 211 boys and 195 girls) participated. After physical fitness testing by requirement of acting programs we carried out diagnostic of pupils' psycho-emotional state. Results: by results of physical; fitness we observed substantial deviation from universal law of normal distribution. It was found that physical condition indicators of most pupils are beyond normal. It was also determined that the most informative indicators are body length, chest circumference and body relative mass. We substantiated that it is necessary to consider physical condition indicators, when determining physical fitness level. We also substantiated and worked out differentiated normative for assessment pupils' physical fitness. Conclusions: testing without consideration physical condition indicators does not facilitate pupils' motivation for further physical self-perfection. Such testing results in high situational anxiety and unfavorable psycho-emotional state of pupils.

Key words: pupils, tests, physical fitness, physical condition, motives.

Introduction

Organization of educational work with pupils on the base of differentiated approach ensures the best educational and health related effects. That is why such organization is very promising for physical culture (PC) optimization in modern schools. Physical condition (PCn) indicators are considered to be the most significant criteria for differentiated assessment of one sex-age group pupils' physical fitness (PF) differentiated assessment. It is substantiated by high significance of physical condition in realization motor potentials; simplicity and accessibility of registration; by close interconnection with bio-mechanical structure of physical exercises and intensity of organism's growth [1].

Specialists [2-5, 20, 21] regard the acting requirements to PF as imperfect. These requirements are not sufficiently substantiated. They do not meet age, motor and functional characteristics of children and youth. Acting PC program [6] does not envisage differentiation in assessment of pupils PF, depending on their morphological indicators. That is why Ministry of science and education of Ukraine stressed on importance of PC academic programs' adjustment to age, individual characteristics of child's growth and formation. Besides, it is necessary to consider positive international experience (resolution of Board of MSE of Ukraine, dt. November 2008, minutes № 13/ 1-2; 10 11/1, it. 4).

As on to day there have been a large number of tests for assessment of pupils PF. Besides, it has been worked out the following:

- Authors' methodic of assessment of pupils' motor fitness, which combine commonly known control exercises in different variants [7, 8];
- Diagnostic system for children's psycho-motor readiness for studying at school [19];
- Individual requirements to junior pupils' PF [9];
- Normative system for PF and health express control of secondary school age pupils [20].
- Objective criteria for determination of secondary school age pupils' functional reserves [21].

However, differentiation of requirements according to indicators of organism's natural condition is offered rather rarely. No attention is paid to the fact [10-12] that consideration of somatic metrical indicators positively influences on youth's attitude to PCn, PF, and their somatic and psychic health. There is a little of substantiated scientific data on determination of how PCn indicators influence on results of PC tests received by senior pupils of modern schools. In studies of specialists [10-16] searching of criteria, which it is necessary to consider, was initiated. But special literature data are often contradictory.

It is necessary to determine optimal set of morphological characteristics, which would characterize senior pupils' motor abilities to the largest extent. It will permit to substantiate and work out differentiated criteria of pupils' progress assessment. Building of PC programs, considering differentiated norms and PCn indicators of senior pupils will permit to individualize physical education process. It will also facilitate pupils' effective training and health improvement.

The purpose of the research was to substantiate criteria for physical fitness assessment of 10-11 form pupils, considering their physical condition indicators.

Material and methods

Participants: in the research 10 and 11 form pupils (n=406, 211 boys and 195 girls) participated. We also involved experts (n=19) – PC teachers with work experience of more than 20 years, in the research. The questioning of experts was required for analysis of the worked out approach to testing pupils' PF: feasibility of testing programs for teachers; feasibility of requirements for pupils; readiness for determination of sport reserves and for formation of pupils' skills in self-control.

Organization of the research: the research was carried out on the base of 12 comprehensive educational establishments of Lvov. We fulfilled PF testing of senior pupils and determined indicators of their PCn. After PF testing by traditional, not differentiated requirements of PC program, we diagnosed pupils' psycho-emotional state.

Medical-biological methods of the research stipulated determination of the following PCn indicators: body length, body mass and chest circumference. Assessment of body length and mass was fulfilled in compliance with regional PCn standards [17]. Relative body mass (*BMI – body mass index*) was assessed by traditional methodic. *Psycho-diagnostic* implied application of V.A. Rosanova's methodic [27] for determination of pupils' motivation for success; SAM methodic (express assessment of self-feeling, activity and mood) was used for assessment of personal psychic state; psycho-emotional reaction to loads; for determination of individual features and biological rhythms of psycho-physiological functions. Besides, we used methodic of Ch.D. Spilberger, adapted by Yu.L. Khanin [26] for pupils' anxiety registration. *Testing* of pupils' PF was fulfilled by requirements of PC academic programs [6]. Questioning of experts envisaged their assessment and analysis of components' effectiveness of authors' system of differentiated PC requirements components effectiveness.

Statistical analysis (correlation, partial correlation, factorial and cluster) was used for substantiation of PF assessment criteria.

Results of the research

We found that PC lessons with PF testing without consideration physical condition indicators negatively impact on their psycho-emotional state: they do not facilitate motivation of 53–59% pupils for further physical self-perfection; result in high situational anxiety of 67–83% pupils (see fig.1). After testing unfavorable psycho-emotional state is felt by 11–35% of pupils. After such PC lessons in pupils we observed insufficient motivation for success and high situational anxiety. Besides, we registered lower than normal mean values of self feeling, activity and mood. It can be assumed that elimination of testing negative influence will facilitate strengthening of pupils' social and psychic health.

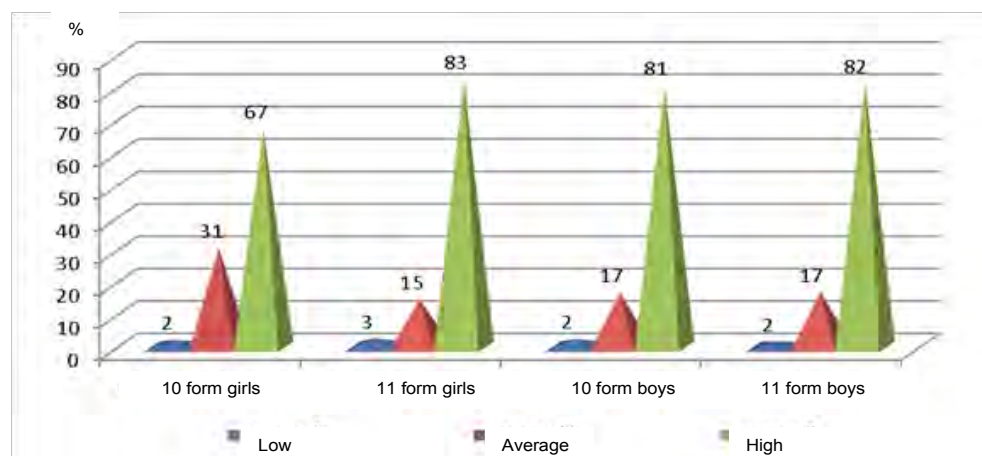


Fig.1. Level of senior pupils' situational anxiety after physical fitness testing at physical culture lessons:

We found that only some exercises in separate gender groups (torso bending in 11 form girls and in 10 form boys); long jump from the spot in 10 form girls and in 10-11 form boys; shuttle run and chin ups in 11 form boys) have normal distribution of initial levels. In most cases distribution of marks is asymmetric, i.e. asymmetry in respect to mean value is much higher than bordering values (in torso bending and 30 meters' run in 10 form girls and boys to the side of high marks; shuttle run in 10 form girls and boys and in 11 form girls – to the side of low marks) with insignificant quantity of average marks.

It was found (see fig.2) that PCn indicators are beyond normal in the following pupils: in 35.6% – by body length; in 65% – by body mass; in 45.6% – by chest circumference and in 20% – by relative body mass.

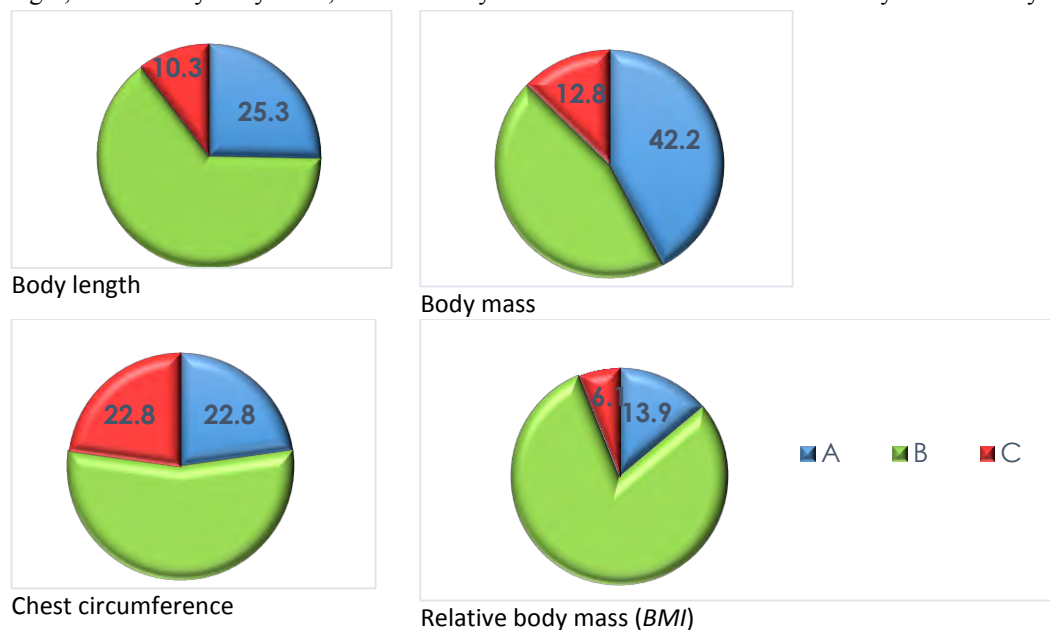


Fig.2. Percentage of pupils with different physical condition indicators: A – beyond normal; B – normal; C - lower than normal.

Analysis of correlations (see table 1) showed that in most cases between results of PF tests and PCn indicators of pupils there were registered weak and average by strength (though confident) correlations. Generalization of these data witnessed that chest circumference (CC) substantially illustrates PF natural level of senior pupils in test exercises. In most scientific works this indicators is underestimated. Values of relative body mass (*BMI*) create relatively more confident correlations with test results than indicators of absolute body mass. Thus, we proved information potential of criteria PCn, CC and *BMI* in differentiation PF requirements.

Table 1. Closeness of physical condition indicators' correlation to results of test exercises, fulfilled by senior pupils ($n=360$)

Tests Indicator s	Contingent	30 meters' run	Long jump	Forward bending	1500 meters' run	Shuttle run 4x9m	Chin ups
Body length	total	-0.194**	0.411** *	0.070	-0.218***	-0.269***	-0.079
	boys	-0.131	0.310*	0.126	0.149	-0.078	0.061
	girls	-0.350**	0.130	0.358**	-0.073	-0.046	-0.055
	total						
Body mass	total	-0.164**	0.245** *	-0.059	-0.237***	-0.253***	-0.056
	boys	0.403**	-0.086	-0.213*	0.198*	0.069	0.072
	girls	0.141	0.028	-0.002	0.168	-0.054	-0.120
	total						

Tests Indicator s	Contingent	30 meters' run	Long jump	Forward bending	1500 meters' run	Shuttle 4x9m	run	Chin ups
	total	-0.318***	0.451** *	0.293***	-0.367***	-0.125*		0.439** *
CC	boys	-0.145	0.696**	0.442**	-0.632**	-0.339**		0.418**
	girls	-0.082	0.523**	0.358**	-0.386**	-0.079		0.416**
BMI	total	0.511***	-0.019	-0.135*	-0.127*	-0.111		-0.018
	boys	0.491**	-0.267**	-0.274**	0.068	0.090		0.006
	girls	0.422**	-0.090	-0.265**	0.227*	-0.054		-0.044

Notes: * – correlation coefficients are confident at $p < 0.05$; ** – at $p < 0.01$; *** – at $p < 0.001$

Analysis of partial correlations between PCh indicators (as well as results of factorial analysis) proved significance of body length, CC and BMI for differentiation of PF requirements for senior pupils. Average level ($r_{xy-z} = 0.632$, $p < 0.001$ and $r_{xy-z} = 0.650$, $p < 0.001$ respectively) of long jump from the spot positive influence points at CC without consideration of body length and mass. It witnesses that in conditions of equal body length and body mass children with greater CC could jump at longer distance. If to eliminate CC influence, partial correlation coefficients ($r_{xy-z} = 0.578$, $p < 0.001$ and $r_{xy-z} = 0.515$, $p < 0.001$) between distance of jump and body length (as well as between jump distance and body mass) remains to be rather high. I.e. in other equal conditions children with great chest circumference have advantage in this exercise. CC values, without consideration of body length and mass ($r_{xy-z} = 0.499$, $p < 0.001$ and $r_{xy-z} = 0.485$, $p < 0.001$ respectively) positively weakly (though approaching to average closeness) are reflected in results of chin ups. It proves that children with trained chest will have advantage in chin ups.

In other tests exercises CC big values (in other conditions equal) negatively impact on results. Pupils with great CC (in case of equal body length and mass) would run 4x9 meters' distance a little slower. It is witnessed by negative correlation coefficients ($r_{xy-z} = -0.405$, $p < 0.001$ and $r_{xy-z} = -0.426$, $p < 0.001$ respectively). In case of equal body length and mass children with little CC values will have advantage ($r_{xy-z} = -0.382$, $p < 0.001$ and $r_{xy-z} = 0.388$, $p < 0.001$ respectively) in 30 meters' run. Less than normal chest circumference values will provide advantage also in 1500 meters' run ($r_{xy-z} = -0.318$, $p < 0.001$ and $r_{xy-z} = 0.323$, $p < 0.001$ respectively).

CC values (without consideration of body length and mass) showed higher partial correlation coefficients ($r_{xy-z} = 0.499$ and $r_{xy-z} = 0.485$ against $r_{xy-z} = 0.439$) with results of chin ups that before elimination of influence. In the same way partial correlation coefficients ($r_{xy-z} = 0.632$ and $r_{xy-z} = 0.650$ against $r_{xy-z} = 0.451$) between CC and long jump results substantially increased. It also proves significance and demand in corrections of requirements to pupils, considering natural values of somatic metric indicators.

Correlation of body length (if mass does not change) insignificantly influences on results of long jump ($r_{xy-z} = 0.396$, $p < 0.001$): tall children jump longer. Even to less extent ($r_{xy-z} = -0.186$, $p < 0.05$) body length influences on shuttle run results. It witnesses that in run for dexterity short by body length pupils have advantage. Results of other exercises (if to eliminate body mass) are not influenced by body length indicators ($r \leq |0.065|$). Body length, with CC being unchanged, positively influences ($r_{xy-z} = 0.578$, $p < 0.001$) on long jump. I.e. tall children have advantages in long jumps. A little to less extent ($r_{xy-z} = -0.341$, $p < 0.001$) body length negatively influences on quantity of chin ups. I.e. in chin ups (if CC values are equal) children of smaller body length have advantage. Such children also will have advantage (without consideration of CC) in run for dexterity ($r_{xy-z} = 0.234$, $p < 0.01$). Between these indicators there is weak but confidently negative partial correlation. Body length without CC does not influence on results of 30 meters' and 1500 meters' run ($r_{xy-z} \leq -0.127$). The received by us results proved information of special literature that anthropometrical indicators do not influence on results of forward bending ($r_{xy-z} \leq |0.110|$).

Factorial matrix of 10-11 form girls includes 4 leading factors, which explain 75.20% of general dispersion. According to the obtained matrix first factor covers 21.78%. It was called "flexibility". It includes results of two exercises – 30 meters' run (0.924) and torso bending (0.734). Other factor explains 18.54% of general dispersion and was called "anthropometry". It consists of body mass (0.903) and body length (0.777) values. The third factor

(18.35%) was called “endurance”. It includes results of two exercises, connected with aerobic and power endurance: 1500 meters’ run (0.833) and chin ups on low horizontal bar (0.762). The forth factor determines 16.53% of dispersion. It combined results of shuttle run (0.889) and long jump from the spot (0.566). Both these exercises require quickness that is why this factor was called “quickness”.

Boys’ factorial matrix of PCn and PF included 8 leading factors, from which the first three cover 67.39% of general dispersion. The first factor was 31.45% of dispersion. To the largest extent results of 1500 meters’ run (0.805), torso bending (0.786), 30 meters’ run (0.743) and long jumps from the spot (0.606) are connected with this factor. This factor was called “general physical fitness”. It should be noted that at second by significance place (explains 18.94% of dispersion) anthropometric factor is. The most significant for it were body length (0.866) and body mass (0.869). In the third factor (17.94% of dispersion) the highest were results of shuttle run (0.783) and chin ups (0.732).

So, generalization of factorial analysis data proved that PCn indicators (first of all body length and mass) take important (second) by significance place in structure of factors, determining boys’ and girls’ physical fitness level.

Cluster analysis (see tables 2 and 3) permitted to find that among tested by us senior pupils not all groups have all possible variants of PCn highest, lowest, lower than average and average indicators. We registered only 3 (girls) and 6 (boys) group[s] with sufficient quantity of persons, whose bordering (high or low) PCn indicators are accompanied by high or low results of physical fitness testing. Requirements to these groups were differentiated, depending on PCn indicators. Some more cluster groups were represented only by 1(2) persons that did not permit to differentiate PF requirements.

Table 2. Results of cluster analysis (girls)

Table 2: Records of character analysis (g.m.s.)														
Indicators		Body length	Body mass	Chest circumference	BMI	Pinette's index			Long jump	Torso bending	60 meters' run	Shuttle run 4x9m	Chin ups in lying position	
1	X	162.353	C 52.670	C 83.329	C 19.996	C 26.353	H	169.719	C 9.5976	H 5.875	B 10.601	B 9.8902	C	
	N	82	82	82	82	82		82	82	82	82	82		
	σ	.74321	.61719	.52863	.21615	.68436		2.12166	.45079	.05672	.07796	.57421		
2	X	166.000	C 74.000	B 81.000	H 26.900	B 11.000	C	200.000	B 18.000	B 4.800	B 10.300	B 20.0000	B	
	N	2	2	2	2	2		2	2	2	2	2		
	σ	.00000	.00000	1.0000	.00000	1.0000		.00000	.00000	.0000	.00000	.00000		
3	X	170.500	B 70.000	C 94.500	B 24.025	C 6.0000	B	198.250	B 13.000	C 6.200	C 10.425	B 12.0000	C	
	N	4	4	4	4	4		4	4	4	4	4		
	σ	1.55456	2.5495	2.0615	.47500	2.0412		15.0685	1.2909	.2000	.38161	1.87083		
4	X	160.6154	H 51.3077	H 98.0769	B 19.9308	C 11.2308	C	176.1538	B 9.6154	H 6.3615	C 10.6385	B 22.9231	B	
	N	13	13	13	13	13		13	13	13	13	13		
	σ	1.4655	1.1344	.38333	.4631	1.4682		1.7753	.5375	.0804	.05609	.6646		

Results of cluster analysis were used for working out approximate academic requirements of PF, considering sex and PCn indicators of senior pupils: body length, relative body mass and CC. Their information potential was substantiated by us at previous stages of the research [19-21]. Limits of average level of pupils’ competence were $X \pm \sigma$, sufficient and low – from $X \pm \sigma$ to $X \pm 2\sigma$, high - above $X \pm 2\sigma$.

Results of experts’ questioning proved that the offered system of assessment of pupils’ PF, considering PCn level, is rather fruitful for increasing teachers’ functioning effectiveness; on training pupils’ physical qualities, formation of their skills in control and self-control. Such system can be applied in physical culture teaching in comprehensive schools.

Discussion

Our data supplement information [22, 23] about indifferent and often negative senior pupils’ attitude to PC lessons. Alongside with it, it was found that PC lessons with PF testing by traditional program requirements worsen children’s psycho-emotional state. Besides we supplemented data [24, 18, 26], that after passing control tests in pupils insufficient motivation for activity is observed as well as high situational anxiety and lower than average self-feeling, activity and mood.

Table 3. Results of cluster analysis (boys)

Indicators	Body length	Body mass	Chest circumference	BMI	Pinette's index	Long jump	Torso bending	60 meters' run	Shuttle run 4x9m	Chin ups on horizontal bar
1	X 178.611 N 18 σ 1.07600	C 58.611 18 .84459	H 95.111 18 .82402	B 18.372 18 .24639	H 24.888 18 1.04127	C 217.333 18 2.49575	B 5.0389 18 .07927	B 10.500 18 .45194	B 9.6111 18 .05653	B 10.777 18 .46831
3	X 176.769 N 13 σ 1.42844	C 70.5385 13 1.45715	C 98.2308 13 .77752	B 22.615 13 .56020	C 8.0000 13 1.35401	B 224.230 13 3.37820	B 5.1154 13 .08309	B 13.384 13 .66543	B 9.4077 13 .13130	B 12.076 13 .61458
5	X 173.043 N 23 σ 1.01272	C 68.8261 23 .82129	C 88.6087 23 .71334	C 23.013 23 .30667	C 15.6087 23 1.26482	C 201.130 23 2.33067	C 5.6217 23 .07750	C 5.7391 23 .30293	C 9.8043 23 .14008	C 14.434 23 .76697
6	X 172.958 N 24 σ .98812	C 66.5417 24 1.02147	C 79.5833 24 .89870	H 22.237 24 .24736	C 26.8333 24 .87986	C 190.041 24 2.67468	H 5.3417 24 .07540	C 8.0833 24 .42099	B 10.641 24 .17723	H 7.8333 24 .28018
7	X 165.846 N 13 σ 1.35328	C 60.3846 13 .85138	H 91.5385 13 1.39420	C 21.961 13 .16034	C 13.9231 13 1.23237	C 198.076 13 3.93124	H 4.8846 13 .05867	B 9.6154 13 .26647	B 9.4846 13 .14180	B 7.6154 13 .82849
10	X 169.333 N 15 σ .79682	C 66.8667 15 .79801	C 95.0000 15 .83381	B 23.333 15 .24624	C 7.4667 15 .72287	B 211.000 15 2.71679	B 5.7733 15 .04522	H 8.2000 15 .69144	B 10.206 15 .20082	C 9.7333 15 .90746
11	X 171.750 N 4 σ 2.65754	C 71.0000 4 2.61406	B 79.0000 4 .00000	H 24.050 4 .73993	C 21.7500 4 2.25000	C 142.000 4 5.81664	H 6.0250 4 .02500	H 5.7500 4 .47871	B 9.2250 4 .30380	B 17.250 4 .85391

Strong deviation from law of normal distribution in assessment of PF tests by existing PC program witnesses that it is necessary to improve PF requirements for senior pupils.

Reasonability of PF improvement according to PCn indicators is substantiated by substantial quantity of senior pupils, who have higher or lower than normal PCn indicators (35.6% – body length indicators; 65% – body mass; 45.6% – chest circumference indicators and 20% – by value of relative body mass).

Our researches enriched scientific information about demand in consideration PCn indicators in determination of PF level. Our data prove information [15] about influence of body length on results of exercises, connected with bearing own weight. It should be noted that general tendency of body length's positive influence on results of most run exercises was not confirmed when dividing the tested sample by sex. Exclusion was only correlation of body length with 30 meters' run results ($r=-0.35$, $p<0.01$).

Our data attested results [12, 13] about dependence of PF tests' passing (30 meters' run, long jump from the spot, forward bending, 1500 meters' run and shuttle run 4x9 m) on body length: results of 100 meters' and 1000 meters' run ($r = 0.44$ and $r = 0.42$) [12] and results of filled ball throw, high jump from the spot, long jump and shuttle run [13]. Alongside with it, in our research we determined that body length does not influence on results of forward bending (except girls, whose torso forward bending results improve with body length increasing - $r=0.36$, $p<0.01$) and chin ups. But correlation between these indicators is practically absent. Thus we proved results of some researchers [14, 11], who insist on absence of PCn influence on PF indicators. Contradictory character of information about PCn and PF indicators correlations only underlines the complexity of the studied problem.

For the first time we proved that implementation of PF differentiated normative for senior pupils, considering natural PCn level, facilitated substantial weakening of situational anxiety. It is confirmed by increase of pupils' quantity: with low anxiety level (by 21%); with average level (by 7%). And vice versa: quantity of pupils with high anxiety level significantly reduced (by 28%). We also observed strengthening of motivation for PC lessons; quantity of pupils, attending sports circles, increased by 2%. By 5% more pupils became to fulfill physical exercises independently. By 12% quantity of missed without excuse PC lessons reduced.

We also confirmed information about importance of CC consideration [14] when working out differentiated normative for senior pupils as well as for the first time substantiated higher significance of relative body mass indicators, comparing with absolute body mass. For the first time we substantiated and worked out differentiated requirements for assessment PF level of 10-11 form comprehensive schools' pupils, considering three PCn indicators: body length, relative body mass and chest circumference.

Conclusions

PF testing without consideration PCn indicators does not facilitated motivation of 53–59% pupils for further physical self-perfection. They result in high situational anxiety of 67–83% pupils; unfavorable psycho-emotional state of 11–35% pupils. As a result we observed insufficient motivation of pupils for success in their activity (115.34 ± 33.19 – 124.00 ± 34.13 conv.un.), high situational anxiety (49.38 ± 10.07 – 50.94 ± 8.96 conv.un.) lower than normal mean values of self-feeling, activity and mood (47.59 ± 9.35 – 49.73 ± 7.89 conv.un.). It substantiates importance of PCn indicators' consideration in determination PF level in senior pupils.

In assessment of PF tests' passing by senior pupils we observed substantial deviation from law of normal distribution. Only separate exercises in some gender groups had normal distribution of educational progress levels. Quantity of senior pupils, whose indicators were above normal, is rather substantial: 35.6% – by body length indicators, 65% – by body mass, 45.6% – by CC and 20% – by BMI.

It was found that the most informative PCn indicators by level of influence on senior pupils' PF are body length, CC and BMI. CC shows average level of partial correlation influence ($r_{xy-z}=0.632$, $p<0.001$ and $r_{xy-z}=0.650$, $p<0.001$ respectively) on results of long jump from the spot (without consideration body length and mass). CC values (without consideration body length and mass) ($r_{xy-z}=0.499$, $p<0.001$ and $r_{xy-z}=0.485$, $p<0.001$ respectively) positively weakly but closely to average density, influence on chin ups results. Factorial analysis proved significant (second by significance) importance of PCn indicators of senior pupils. The second by significance factor of senior pupils' matrixes (18.54% of general dispersion in girls and 18.94% – in boys) combined indicators of body length and body mass.

We worked out differentiated requirements for assessment of 10-11 form pupils' physical fitness, considering sex and PCn indicators: body length, relative body mass and chest circumference. Experts proved that the offered system of pupils' PF assessment, considering their physical condition is efficient: in improvements of teacher actions' effectiveness; in development of pupils' physical qualities; in formation pupils' skills in control and self-control.

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INFORMATIVE PEDAGOGIC CONTROL INDICATORS OF 14-15 YEARS AGE GIRLS' MOTOR FITNESS

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Abstract. *Purpose:* to determine informative indicators for in-group and intra-group control of 14-15 years age girls' motor fitness. *Material:* in the research 99 girls participated: 14 years old (n=38), 15 years old (n=61). *Results:* for control of 15 years age girls' motor fitness the most informative are indicators of speed power, dynamic power endurance and physical condition. It was found that 14 years age girls have better power fitness than 15 years girls. It points at the fact that in 15 years' age the reasons of lagging behind 14 years girls are increase of body mass and reduction of motor activity. *Conclusions:* the received data show that factorial analysis as well as discriminant one is methodological base for determination of tests' in-group and intra-group informational potential. The most informative tests for determination of age dynamic are static and dynamic power endurance of abdomen muscles and connected with them result of long jumps from the spot.

Key words: motor fitness, tests, factorial, discriminant, analysis, girls.

Introduction

The problem of school physical education quality's rising appears in connection with weakening of children's and adolescents' motor functioning [6, 12, 31, 36]. The reason of motor activity reduction is complexity of individual approach realization at school physical culture lessons [4] and non consideration of adolescents' sensitive periods. It can result in negative after effects: worsening of health [1, 12], weakening of motivation for physical culture practicing in school [11, 16, 15].

One of this problem's solutions is working out pedagogic control methodology and, on its base, control over physical education of children's and adolescents [14, 17, 24, and 25].

In the process of physical education pedagogic control is directed at motor abilities increase [8, 10, and 22], training process [2, 4, and 20], control of physical exercises' and rest intervals' regimes in adolescents' and children's physical education [9, 21, and 35].

Effectiveness of pedagogic control depends on determination of informative indicators and on assessment methods for children's and adolescents' motor fitness [7, 26, and 30]. One of effective methods of determination indicators' informational potential and motor fitness assessment is modeling [3, 13, 5, and 32].

Thus, determination of pedagogic control informative indicators on the base of modeling of schoolchildren's motor fitness structure is important and relevant.

The purpose of the research is to determine informative indicators for in-group and intra-group control of 14-15 years age girls' motor fitness.

Material and methods

Participants: in the research 99 girls participated: 14 years old (n=38), 15 years old (n=61) (school No.22, Kramatorsk). Their parents gave consent for children's participation in experiment.

Organization of the research: testing program consisted of commonly known tests [18, 19].

Statistical analysis: the materials of the research were processed with IBM SPSS 20 program. Factorial and discriminant analysis were fulfilled. In factorial analysis we used the method of principle components with invocation method: Varimax with Kaiser's normalization. For every variable we calculated the following: mean values, standard deviations, t- test for independent samples. In discriminant analysis we formed prognostic model of belonging to group. This model builds functions in the form of linear combination of predictor variables that ensure the best distribution into groups. Further, these functions can be used in new observations with known predictor variables and unknown belonging to group. For every canonic discriminant function we calculated the following: Wilks' *Lambda*, Chi-square. For every step we calculated: prior probabilities, Fisher function's coefficients, non-standardized coefficients of function, Wilks' *Lambda for every canonic function*.

Results of the research

In table 1 we gave results of motor fitness testing of 14-15 years' age girls. Analysis of testing results shows that 14 years girls demonstrate statistically confidently better results in tests №3 "Keeping angle on parallel bars, sec.", №6 "Pressing ups in lying position, quantity of times" ($p < 0.05$). 15 years girls have statistically confident difference from 14 years girls by body mass and are statistically confidently better in tests №4 "Right hand strength, kg", №5 "Left hand strength, kg", №8 "Long jump from the spot, cm", №10 "Forward torso bending from sitting position, cm", №11 "Shuttle run 4x9 m, sec.", №12 "Taking sitting position from lying position during 60 sec., quantity of times" ($p < 0.05$).

Difference in results of tests №7 "Chin ups, quantity of times", №9 "Legs' raising up to straight angle from hanging on Swedish wall position, quantity of times" between 14 and 15 years age girls statistically was not confident ($p > 0.05$).

Table 1. Comparative analysis of 14 and 15 years age girls' motor fitness Таблица 1.

Test №	Test description	14 years age girls (n=38)		15 years age girls (n=61)		t	p
		X	m	X	m		
1.	Body mass, kg	49.684	1.496	57.180	2.261	2.417	<0.05
2.	Body length in standing position, cm	162.95	.97	165.08	1.95	.825	>0.05
3.	Keeping of angle on parallel bars, sec.	3.2	.49	1.1	.16	4.630	<0.05
4.	Right hand strength, kg	16.553	.677	20.229	.694	3.571	<0.05
5.	Left hand strength, kg	15.842	.642	18.967	.645	3.248	<0.05
6.	Pressing ups in lying position, quantity of times	11.52	1.37	8.98	.64	1.874	<0.05
7.	Chin ups, quantity of times	5.55	.46	5.26	.44	.433	>0.05
8.	Long jump from the spot, cm	141.55	4.36	166.00	2.39	5.331	<0.05
9.	Legs' raising up to straight angle from hanging on Swedish wall position, quantity of times	6.52	.88	6.24	.56	.282	>0.05
10.	Forward torso bending from sitting position, cm	16.47	1.22	21.06	.79	3.313	<0.05
11.	Shuttle run 4x9 m, sec	11.78	.14	10.73	.09	6.730	<0.05
12.	Taking sitting position from lying position during 60 sec., quantity of times	25.47	1.14	38.11	.78	9.464	<0.05
13.	From lying on abdomen position torso raising upward during 60 sec, quantity of times	25.95	1.96	37.25	31.34	2.416	<0.05

For determination of the tests' in-group informational potential for 14 years girls we conducted factorial analysis by results of 13 tests (see table 2). In the process of analysis we marked out four factors, which explain 66.992% of indicators' total dispersion.

Factor 1 is the most informative (24.094%). It correlates with static and dynamic strength of abdomen muscles and speed power fitness. The factor was named "power fitness".

Factor 2 (information potential 15.770%) correlates to the largest extent with hand static strength. It was named "static power fitness".

Factor 3 (information potential 14.566%) correlates to the largest extent with test № 13 “From lying on abdomen position torso raising upward during 60 sec., quantity of times”. The factor was named “dynamic endurance of back muscles”.

Factor 4 (information potential 12.563%) correlates to the largest extent with relative strength indicator. It was named “relative strength”.

Analysis of populations shows that for motor fitness control the most informative are tests №4 “Right hand strength, kg”, №5 “Left hand strength, kg”, №8 “Long jump from the spot, cm”, №13 “From lying on abdomen position torso raising upward during 60 sec., quantity of times”.

Table 2. Matrix of 14 years girls’ motor fitness factorial analysis. Invocation method: Varimax with Kaiser’s normalization

Test №	Test description	Components				Populations
		1	2	3	4	
1.	Body mass, kg		.475		-.593	.669
2.	Body length in standing position, cm				-.775	.701
3.	Keeping of angle on parallel bars, sec.	.629				.476
4.	Right hand strength, kg		.915			.841
5.	Left hand strength, kg		.893			.847
6.	Pressing ups in lying position, quantity of times	.375		.624		.537
7.	Chin ups, quantity of times	.423			.661	.662
8.	Long jump from the spot, cm	.655		.407		.745
9.	Legs’ raising up to straight angle from hanging on Swedish wall position, quantity of times	.781				.641
10.	Forward torso bending from sitting position, cm	.767		-.396		.771
11.	Shuttle run 4x9 m, sec	-.564		-.405		.508
12.	Taking sitting position from lying position during 60 sec., quantity of times	.667				.583
13.	From lying on abdomen position torso raising upward during 60 sec, quantity of times			.849		.726
14.	Completely explained dispersion, %	24.094	15.770	14.566	12.563	66.992

For determination of the tests’ in-group informational potential for 15 years girls we conducted factorial analysis by results of 13 tests (see table 3). In the process of analysis we marked out five factors, which explain 70.630% of indicators’ total dispersion.

Factor 1 is the most informative (17.237%). It correlates with hand static strength and was named “static strength”.

Factor 2 (information potential 15.614%) correlates to the largest extent with relative strength. It was named “power fitness”.

Factor 3 (information potential 14.257%) correlates to the largest extent with physical condition indicators. The factor was named “Physical condition”.

Factor 4 (information potential 10.288%) correlates to the largest extent with speed power (test No.8 “Long jump from the spot, cm” and dynamic endurance of abdomen muscles (test No.12 “Taking sitting position from lying position during 60 sec.”). It was named “Power fitness”.

Factor 5 (information potential 10.288%) correlates to the largest extent with flexibility indicators (test No.10 “Forward torso bending from sitting position, cm” (test No.8 “Long jump from the spot, cm” and dynamic endurance of abdomen muscles (test No.12 “Forward torso bending from sitting position, cm”. It was named “Flexibility”.

Analysis of populations shows that for motor fitness control the most informative are indicators of speed-power (test №8 “Long jump from the spot, cm”, dynamic power endurance (test No.12 “Taking sitting position from lying position during 60 sec.” and physical condition.

Table 3. Matrix of 15 years girls’ motor fitness factorial analysis. Invocation method: Varimax with Kaiser’s normalization

Test №	Test description	Components					Populations
		1	2	3	4	5	
1.	Body mass, kg			.857			.786
2.	Body length in standing position, cm			-.885			.809
3.	Keeping of angle on parallel bars, sec.			.326		.633	.518
4.	Right hand strength, kg	.774					.681
5.	Left hand strength, kg	.875					.774
6.	Pressing ups in lying position, quantity of times		.855				.774
7.	Chin ups, quantity of times		.867				.794
8.	Long jump from the spot, cm	.374			.784		.819
9.	Legs’ raising up to straight angle from hanging on Swedish wall position, quantity of times		.626		-.458	.354	.780
10.	Forward torso bending from sitting position, cm					.718	.630
11.	Shuttle run 4x9 m, sec	-.665					.480
12.	Taking sitting position from lying position during 60 sec., quantity of times				.798		.727
13.	From lying on abdomen position torso raising upward during 60 sec, quantity of times	-.315			.398	.468	.610
Completely explained dispersion, %		17.237	15.614	14.257	13.234	10.288	70.630

For determination of tests’ intra-group informational potential we conducted discriminant analysis of 14-15 years age girls’ motor fitness. The analysis showed that tests №10 “Forward torso bending from sitting position, cm” and № 3 “Keeping of angle on parallel bars, sec.” make the biggest contribution in change of function (see table 4, standardized coefficients). The highest correlations with function have tests №12 “Taking sitting position from lying position during 60 sec., quantity of times”, №8 “Long jump from the spot, cm”, №3 “Keeping of angle on parallel bars, sec.” (see table 4, structural coefficients). So, the most informative coefficients for age dynamic determination are static and dynamic power endurance of abdomen muscles and connected with it result of long jumps from the spot.

Table 4. Results of discriminant analysis of 14-15 years girls' motor fitness

Test №	Test description	Coefficients of canonic discriminant function			
		Standardized	Structural	For classification	
				14 years 1	15 years 2
1.	Body mass, kg	.145	.160	1.368	1.398
2.	Body length in standing position, cm	.075	.055	2.389	2.408
3.	Keeping of angle on parallel bars, sec.	-.634	-.306	1.021	.099
4.	Right hand strength, kg	.221	.236	1.051	1.189
5.	Left hand strength, kg	-.353	.227		
6.	Pressing ups in lying position, quantity of times	.119	-.124	-.195	-.363
7.	Chin ups, quantity of times	.144	-.056		
8.	Long jump from the spot, cm	.116	.353	1.088	1.105
9.	Legs' raising up to straight angle from hanging on Swedish wall position, quantity of times	-.318	-.019	1.088	1.181
10.	Forward torso bending from sitting position, cm	.729	.219	-.367	-.313
11.	Shuttle run 4x9 m, sec	.122	-.445	40.168	38.856
12.	Taking sitting position from lying position during 60 sec., quantity of times	.145	.626	-.034	.319
13.	From lying on abdomen position torso raising upward during 60 sec, quantity of times	.075	.160	.130	.166
	Constant			-554.228	-558.883

Discussion

For practical application of discriminant analysis results canonic discriminant function coefficients for classification shall be used (see table 4).

Analysis of the received results shows that 14 years age girls have better power fitness (test № 3 "Keeping of angle on parallel bars, sec.", test №6 "Pressing ups in lying position, quantity of times") than 15 years age girls. It points that in 15 years age the reasons of lagging behind 14 years girls are increase of body mass and reduction of motor activity. It supplements the data of other authors [4, 15, 16] illustrating that the reason of adolescents' low motor fitness is significant reduction of motor functioning. All these take place together with loss of interest to school physical culture lessons and negative attitude to physical culture in general

The received results expand information about special aspects of motor abilities' development in children and adolescents and permit to obtain new information with the help of modeling method [5, 23, and 32].

The received data supplement also the data of other authors [27, 29, 33] about demand in structural and functional analysis of children's and adolescents' motor fitness as well as they prove the opinion that discriminant model can be used for pedagogic control of 14-15 years age schoolchildren's fitness level. The received functions can further be used in new observations with known predictor variables and unknown belonging to group.

The propesct of further researches are determination of discriminant function effectiveness in managing children's and adolescents' physical education.

Conclusions

For control over 14 years girls' motor fitness the most informative are tests №4 "Right hand strength, kg", №5 "Left hand strength, kg", №8 "Long jump from the spot, cm", №13 "From lying on abdomen position torso raising upward during 60 sec, quantity of times".

For control over 15 years girls' motor fitness the most informative are speed power indicators (test №8 "Long jump from the spot, cm"), dynamic power endurance (test №12 "Taking sitting position from lying position during 60 sec., quantity of times") and indicators of physical condition.

The obtained data witness that factorial and discriminant analysis are methodological base for determination of tests' in-group and intra-group informational potential. For determination of age dynamic the most informative tests are static and dynamic endurance of abdomen muscles and connected with them result of long jump from the spot.

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Conflict of interests

The authors declare that there is no conflict of interests.

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SPECIFIC FEATURES OF ELITE BODYBUILDERS' TRAINING PROCESS IN COMPETITION
PERIOD

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Abstract. *Purpose:* To substantiate methodic of training process construction for elite bodybuilders in competition period with usage of different training methods. *Material:* elite bodybuilders – members of combined team of Ukraine (n=16) participated in the research. *Results:* we presented comparative characteristic of the most often used bodybuilding training methodic. Besides, optimal training methodic in competition period was worked out and substantiated. Such methodic permits to improve body proportions at the account of fat layer reduction. By the data of Harvard step-test the sportsmen improved organism's functional potentials by 6%. *Conclusions:* the offered methodic noticeably reduces probability of functional unfavorable states (over-training, overloading, traumas). The methodic permits to achieve the required sport form without over-tension adaptation-compensatory mechanisms and acquire maximal muscular relief; improve proportions with minimal losses of muscles' volume.

Key words: training, bodybuilders, proportions, competition period, training methodic.

Introduction

Bodybuilding – is a kind of sports, in which sportsmen try to develop their constitution in the most harmonious way. Competition criteria of bodybuilding are mass of muscles, muscle separation (expressed separation of one muscles' group from other) and muscle definition (muscular relief and internal muscular specifying); proportional condition of muscular groups [9, 10]. In competition training period sportsmen try to reduce percentage of fat and improve proportions [6]. Specificities of training construction in bodybuilding were copied from more studied and developed kinds of sports (weight- and power-lifting) [13, 14].

Analysis of domestic and foreign literature showed that many works were devoted to construction of training process in competition period [8, 15]. A.V. Samsonova [1] showed that bodybuilders require special approach to training process. Bodybuilding training differs from other power kinds of sports, in which condition of muscular fibers is only result of power training. It is known that the highest potential for growing is intrinsic to II-B type fibers. It was found that interval mode of training was the most optimal: range of repetitions– 8-12; load level - 70-80% from single maximum [2, 5]. V.M. Platonov [3, 4] showed demand in micro and macro-periodizing in different kinds of sports. Introduction of different by load micro-cycles facilitates increase of muscular volume and reduce sub cutis. The recommended duration of competition period is 8-12 weeks. The problems of periodizing in bodybuilding were dealt with by V. Usychenko [6]. The author analyzed the existing variants of macro-periodizing and showed advantages and disadvantages of one-cycle, two-cycle and three-cycle planning systems in bodybuilding.

Ben and Joe Weider worked out system of elite bodybuilders' training, which was characterized by high volume of training sessions. They widely used such methodic techniques of intensity increase as supersets, drop-sets, giant sets. The recommended mode of work (6 training during week micro-cycle) was oriented on development of anaerobic capacity [9, 10]. V.Yu. Jim showed disadvantages of this system. They included increasing risk of sportsmen's over-fatigue. The author offered system, envisaging individualization of training process during annual macro-cycle [6, 7, and 21]. In particular, for competition period load of 40-70% from maximal is recommended with quantity of training days 6 and quantity of one exercise repetitions - 20-25.

Correlation of anaerobic, aerobic works, as well as special load (for compulsory competition program for elite bodybuilders in competition training period) has not been still studied yet.

Hypothesis: it was assumed that the worked out methodic for elite bodybuilders in competition training period can be effective, if to use one-cycle annual macro-cycle and optimally select micro-cycles. Such approach will facilitate improvement bodybuilders' sport perfection.

Purpose: to work out and substantiate methodic of training process construction for elite bodybuilders in competition period.

Material and methods

Participants: elite bodybuilders – members of combined team of Ukraine (n=16) participated in the research. Their age was 25-33 years. Their body mass values were 85 ± 2 – 105 ± 2 kg. The participants were divided into two groups: control (n=8) and experimental (n=8).

Organization of the research:

The research was conducted on the base of Kharkov state academy of physical culture (weight-lifting and boxing department) in different gyms (“Pheromone”, “Tetra”, “Black Bison”, “Forma”, CJSS № 9*, «Misto”, “Metallist” in Kharkov), SC** “Dynamo” (Komsomolsk), club “Sensei” (Kiev) and SC “Neftechimik” (Kremenchug).

On the base of weight-lifting and boxing department of Kharkov state academy of physical culture and sport circles of Kharkov and Poltava regional bodybuilding federations we conducted pedagogic experiment.

*CJSS – children- junior sport school (*note of translator*)

** SC – sport club (*note of translator*)

Participants of experiment trained 6 times a week. In experimental group training the worked out by us methodic of competition period construction (see table 1) was introduced. Control group trainings were conducted by traditional scheme (see table 2), used in sport clubs. In both groups, at the beginning and at the end of training competition period we controlled anthropometric data and power indicators, which did not confidently differ at the beginning of experiment ($P > 0.05$).

Statistical analysis was fulfilled with the help of Statistika 10.0 programs. Student’s t-criterion was used for checking of differences’ confidence between samples’ indicators and was considered to be statistically significant at $p < 0.05$.

Results of the researches

In training process of elite bodybuilders we used one-cycle planning system in annual macro-cycle (see table 1).

Table 1. Scheme of one-cycle planning in annual training of bodybuilders

Period	Stage	Meso-cycle	Months
Preparatory	General-preparatory	Involving	XII
		Basic	I
		Basic	II
		Basic	III
		Basic	IV
	Special-preparatory	Control-preparatory	V
		Control-preparatory	VI
		Pre-competition	VII
		Competition (selective competitions)	VIII
		Control-preparatory	IX
Competition	Competition	Competition (main competitions)	X
Transitive	Recreational	Recreational	XI

Effectiveness of training was assessed by dynamic of power and endurance indicators; by dynamic of anthropometric changes and organism’s functional state.

Control group sportsmen had three meso-cycles in competition period. Each meso-cycle consisted of four week micro-cycles. Control-preparatory stage consisted of three advanced and one recreational micro-cycle. Pre-competition meso-cycle consisted of one involving and three advanced micro-cycles. Competition period included one involving, two advanced and one competition micro-cycles (see table 2).

Table 2. Scheme of CG training in competition period

Stage	Meso-cycle	Micro-cycle
Competition	Control-preparatory	Adv., adv., adv., rec.
	Pre-competition	Inv., adv., adv., adv.
	Competition	Inv., adv., adv., comp.

Notes: Adv. – advanced; Rec. – recreational; Inv. – involving; Comp. – competition.

Experimental group sportsmen had two competition meso-cycles (I and III). The second meso-cycle was control-preparatory. Every meso-cycle consisted of four micro-cycles. The first competition meso-cycle consisted of involving, advanced, preparatory and competition micro-cycles. The first competition meso-cycle was completed by selective competitions. Control-preparatory meso-cycle included involving, two preparatory and competition micro-cycles. It is completed by main competitions of the year (see table 3).

Table 3. Scheme of EG training in competition period

Stage	Meso-cycle	Micro-cycle
Competition	Competition (selective competitions)	Inv., adv., prep., comp.
	Control-preparatory	Recr., inv., adv., adv.
	Competition (main competitions)	Recr., prep., prep., comp.

Notes: Inv. – involving; adv. – advanced; prep. – preparatory; recr. – recreational.

In competition stage the main task is acquiring maximal relief of muscles by sportsmen, fat layer reduction; proportions' improvement and preservation of muscles' mass [17, 18, 20].

In EG training process was built in the following way: during advanced micro-cycles sportsmen trained in zone of sub-maximal relative power. The work in such zone lasts up to 5 minutes [1, 19, and 22].

Sportsmen trained twice a day during six days. One day was day off. One training was conducted in simulators gym in zone of moderate and great relative power with usage Joe Weider's principles [9, 16]: supersets. Tri- sets, Giant sets, drop sets. Training session took 50 minutes – 1 hour. The training was directed on development of II-A type muscles that permitted to achieve maximal relief of muscles with minimal losses of muscles' volume.

Other training in the same day in first meso-cycle had aerobic orientation. Trainings of aerobic orientation with little and moderate loads were used for quicker recreation after power trainings. Besides, they developed general endurance and improvement sportsman's functional state. The means of trainings were: run on treadmill swimming in water pool, stationary bicycle. Time of training and degree of load varied depending on the tasks of micro-cycle.

In second meso-cycle quantity of aerobic trainings shortened up to three a week. Trainings of compulsory static positions and positions of free programs were added.

In third meso-cycle of competition stage EG program changed in the following way: part of aerobic trainings was replaced with working at compulsory competition positions. Static training took one hour a day and six times in week micro-cycle. Sportsmen took seven compulsory positions in front of mirror and kept every position one and half minute each. Coach looked after proper tension of all demonstrated muscles. With it face muscles should be relaxed and express positive emotions and self confidence (see table 4).

Table 4. Time of exercises and loads of different character for EG in competition period

Competition period								
Meso-cycle	№ of micro-cycle	Type of micro-cycle	Time, minutes			Degree of load		
			Ae.	An.	Tech.	Ae.	An.	Tech.
Competition period (selective competitions)	1	Inv.	130	240	165	Av.	Subs.	Low
	2	Adv.	100	240	185	Low	High	Av.
	3	Prep.	115	165	245	Av.	Av.	High

Control preparatory	4	Comp.	0	180	120	Low	Av.	Av.
	5	Recr.	115	175	155	Av.	Av.	Av.
	6	Inv.	100	225	155	Low	High	Av.
	7	Inv.	105	240	145	Low	Bord.	Av.
	8	Adv.	105	240	130	Low	Bord.	Low
Competitions	9	Recr.	115	175	175	Av.	Av.	Subs.
	10	Prep.	90	165	240	Av.	Av.	High
	11	Prep.	90	165	240	Low	Low	High
	12	Comp.	0	180	120	Low	Low	Av.

Notes: Low – low load for recreation; Av. – average load for supporting physical qualities; Subs. – substantial loads for physical qualities’ development; High – high loads for physical qualities development; Bord. – bordering loads for physical qualities development (by Zatsiorsky, 1995 [25]) Ae. – aerobic load; An.- anaerobic load; Tech. – technical training (in bodybuilding work at competition program).

During competition period in every micro-cycle quantity of barbell lifting and quantity of lifted kilograms varied. The data by every micro-cycle and total data of meso-cycle are presented in table 5.

Table 5. Quantity of barbell lifting and load in kg for EG in competition period

Meso-cycle		Micro-cycle	QBL, basic	QBL, shaping	Tonnage, basic, kg	Tonnage, shaping, kg
Competition competitions)	(selective	Inv.	691	358	57251	9319
		Adv.	825	423	76519	12457
		Prep.	548	642	42969	18762
		Comp.	441	301	37583	9309
Total			2505	1724	214322	49847
Control preparatory		Recr.	687	331	51891	5659
		Inv.	735	406	61608	11086
		Adv.	791	431	76311	13247
		Adv.	918	502	85954	14807
Total			3131	1670	275764	44799
Competition competitions)	(main	Inv.	691	358	57251	9319
		Prep.	517	615	36552	16470
		Prep.	511	603	29542	13434
		Comp.	441	301	37583	9309
Total			2160	1877	160928	48532

Notes: QBL - quantity of barbell lifting; Tonnage – any mass measured in tons.

Table 4 data show that in first competition meso-cycle experimental group sportsmen fulfilled 2505 barbell basic lifts and 1724 – shaping lifts. Tonnage was 214.322 thousand kg in basic exercises and nearly 50 thousand in shaping. Thus, load distribution permitted to perfect relief of muscles with minimal losses of muscles’ volume. The task of this meso-cycle was to select sportsmen for main competitions of season. In control-preparatory meso-cycle load distribution in EG was as follows: in basic exercises QBL was 3131 (by 24% more than in previous meso-cycle); in shaping – 1670 (by 3% less than in previous). In basic exercises sportsmen lifted 275.764 thousand kg (by 28.6% more than in previous meso-cycle) and in shaping – 44.799 thousand kg. (by 10% less, than in previous meso-cycle). Increase of loads in basic exercises and reduction in shaping was conditioned by the tasks of meso-cycle. The purpose of these tasks was improvement of muscles’ separation and definition. It is known that exercises of basic character influence more powerfully on sportsman’s organism.

In third meso-cycle EG sportsmen fulfilled 2160 barbell lifts in basic exercises (by 31% less than in the second meso-cycle and by 13% less than in the first). Tonnage was 160.928 thousand kg. In basic exercises (by 41% less than in the previous and by 24% less, comparing with the first meso-cycle) and 48.532 thousand kg in shaping exercises (that was by 8% more than in second meso-cycle and by 2% less than in the first meso-cycle).

In table 6 we give changes of anthropometric data for control and experimental groups.

Table 6. Mean indicators of anthropometric data reduction in CG and EG elite bodybuilders in competition period ($n_1 = n_2 = 8$)

Indicators	CG			EG			<i>p</i>
	$\bar{X}_1 \pm m_1$	<i>V</i> , %		$\bar{X}_2 \pm m_2$	<i>V</i> , % ^{<i>t</i>}		
Body mass, kg.	17.54	± 0.82	13.14	8.40	± 0.10	3.27	21.37 <0.001
Neck circumference, cm.	3.12	± 0.03	2.76	1.33	± 0.01	2.25	55.50 <0.001
Chest circumference, cm.	14.84	± 0.14	2.76	4.03	± 0.03	2.25	72.92 <0.001
Inhale, cm.	14.84	± 0.14	2.76	4.09	± 0.03	2.22	72.51 <0.001
Exhale, cm.	14.84	± 0.14	2.76	3.94	± 0.03	2.30	73.52 <0.001
Waist circumference, cm.	6.88	± 0.10	4.17	12.06	± 0.16	3.85	26.85 <0.001
Shoulder circumference, cm	4.53	± 0.08	4.90	1.49	± 0.03	4.92	36.73 <0.001
Forearm circumference, cm.	4.45	± 0.04	2.76	1.18	± 0.01	2.30	73.52 <0.001
Thigh circumference, cm.	8.80	± 0.09	3.03	2.92	± 0.04	4.13	56.88 <0.001
Shin circumference, cm.	3.52	± 0.04	3.03	1.31	± 0.02	4.13	52.18 <0.001

Notes: t – Student's t-criterion or determination the confidence of difference; p – level of confidence (difference was considered to be confident at $p < 0.05$).

By the results of our research EG sportsmen lost less amount of body mass. For assessment sportsmen's functional state we used Harvard step-test. Both groups sportsmen ascended on of platform of 50 cm height during 5 minutes with race 30 ascend and descend per one minute. After fulfillment, during 30 seconds pulse is measured. Pulse also is measured at 2nd, 3rd and 4th minutes of recreation.

$$\text{HST index} = \frac{t \times 100}{(f_1 + f_2 + f_3) \times 2},$$

where $f_1; f_2; f_3$ – pulse data at 2nd, 3rd and 4th minutes of rest and, t – time of test fulfillment.

Table 7. Harvard step-test results

	t, time in seconds	f1	f2	f3	IHCT
Control group	300	79.75	74	68	67.6625
Experimental group	300	67	62.5	55.5	81.47

Notes: Indicators of Harvard step-test: <55 – bad physical fitness; 55–64 – below average; 65–79 average; 80–89 – good; >90 – excellent.

By the data of Harvard step-test control group sportsmen had average physical fitness and experimental group sportsmen – good. It witnesses that experimental group sportsmen recreate quicker and have better functional state. This test was conducted also for testing sportsmen's functional state in preparatory and general preparatory periods [21]. In time of special-preparatory and competition stages both groups' sportsmen improved their results. In control group IHST improved by 1.79%, and in experimental group – by 6%.

As far as power indicators concern both in control and experimental groups single maximum reduced (see fig.2).

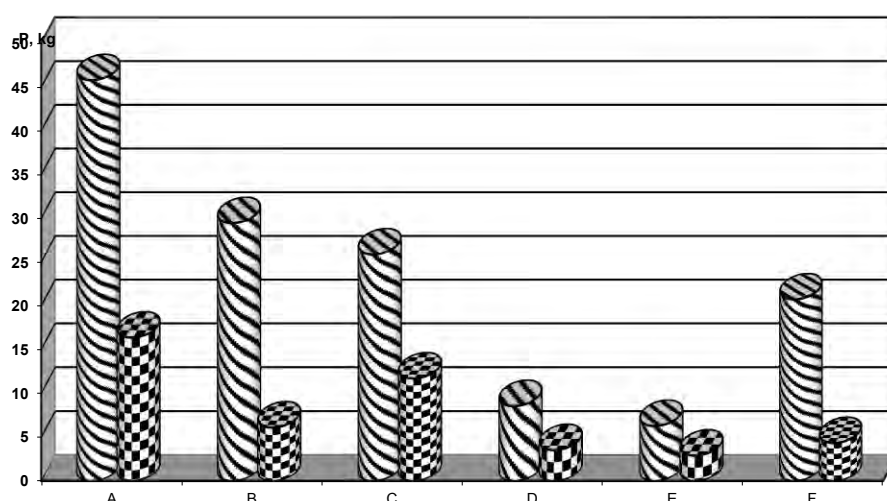


Fig.2. Dynamic of changes in special physical fitness (SPF) in control and experimental groups in competition period: P – Indicators; A – Squatting with barbell; B – Barbell pressing in lying position; C – back strength; D – barbell pressing in standing position; E – arms' bending in standing position; F – barbell pressing with narrow grasp, in lying position.

▨ - control group;
▣ - experimental group.

As per results of our research both groups' sportsmen lost power in connection with reduction of body mass. Sportsmen, who trained by experimental methodic reduced their indicators less noticeably (see fig. 1).

Discussion

Recent years some researches devoted to content and methodic of elite bodybuilders' training with different methods of endurance and power qualities have been fulfilled [6, 7, and 11]. Besides, there are works on training process planning in competition period and its influence on bodybuilders' competition form. However, influence of aerobic and anaerobic power trainings on sportsmen in competition period has not been studied yet.

We note demand in micro-periodization for sportsmen in competition period as well as offered the system of one-cycle training. Such approach coincides with recommendations of V.M. Platonov [3, 4]. We considered demand in selective competitions and proved the data of muscular relief improvement in competition period, providing optimal loads [23, 24]. Besides we expanded the data of V.V. Usychenko on usage of one-cycle annual planning system [8].

In our research we proved significance of usage of Joe Weider's methods of intensification increasing [9, 16]. For solution of micro-cycle tasks we offered application of such methods with certain dozing for every micro-cycle. Besides, we expanded Ben and Joe Weider's methodic by replacing some anaerobic exercises with aerobic ones [9, 10]. Such methodic facilitates better recreation of sportsmen. Exercises for aerobic endurance facilitate quicker elimination of sub cutis.

We also confirmed the data about better training regime for muscular fibers' overgrowth: optimal regime is 3-4 attempts (8-12 repetitions in each) [1, 2].

The obtained results enrich our previous researches on improvement of elite sportsmen organism's functional state after dozed aerobic loads [11, 12]. We supplemented the data about demand in introduction compulsory positions and free competition program in training program [17, 21]. In the offered by us methodic we mentioned the required quantity of such exercises, depending on micro-cycle. We also expanded the data of domestic [6, 21, 15] and foreign authors [9, 17, 20] about increasing the most important power and endurance indicators.

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Conclusions

Perfection of elite bodybuilders' training process permits to think that the offered for EG program gives more expressed effect. The offered methodic of training process perfection substantially reduces probability of unfavorable functional changes in sportsmen (over-tension, over-training, traumas). It permits to achieve the required sport form without over-tension of adaptation-compensatory mechanisms. Such methodic permits for sportsmen to acquire maximal relief, improve proportions with minimal losses of muscles' volume.

Conflict of interests

The author declares that there is no conflict of interests.

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FUNCTIONAL FITNESS LEVEL OF MILITARY COLLEGE CADETS

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Abstract. *Purpose:* to work out and study influence of author's physical training program on functional fitness of military college officers. *Material:* in the research 83 3rd year cadets of military college participated (experimental group, n=41; control group, n=42), of age 19-21 years. The cadets' functional state was registered by indicators of Shtange's test, Genchi test, test of Ruffiet – Dixon, Cooper's test. The volume of trainings was 4 hours a week. *Results:* it was found that the acting training programs do not permit to completely prepare combat soldier's organism for fulfillment of his tasks. We also found the purposefulness of special exercises and means' application in physical trainings, which would be approached by their structure to military officers' professional actions. *Conclusions:* it is recommended to conduct training with complex combining of different physical training sections (accelerated motion, overcoming obstacle course, hand-to-hand fighting and etc.) with special means (armor vest, tactic unloading system, helmet, weapon, gas mask, training grenades and so on).

Key words: military, college, functional state, readiness, physical load.

Introduction

Analysis of scientific works [1, 6] showed that in conditions of anti-terrorists operation professional functioning has certain specific features and put forward high requirements to physical and psychological fitness of ground troops' military officers.

In works [3, 6] it is noted that the main characteristics of professional functioning are watching at checkpoints, guarding of strategic objects (airports, railway stations, hospitals, storehouses and etc.) fulfillment of tasks in cities and towns (moving in ruined buildings, in premises with restricted space and so on.). Fulfillment of tasks in such condition requires from soldiers to manifest high coordination in complex conditions.

Scientists [2, 4, 8] mention that significant physical and psychic loads result in military officers' nervous-emotional tension. All these cause tensed work of cardio-vascular and respiratory systems. A number of authors [10, 11, 19] say that nervous-emotional tension results in the following: weakening of workability; increase of heart beats rate (HBR), breathing and BP; weakening of attention concentration; narrowing of attention and memory; increase of mistaken actions; quick fatigue.

In works of many scientists [14, 16, 17] it is underlined that regular physical training increase plasticity of organism's regulatory systems. It happens at the account of functional reserve improvement. High physical fitness of military officers significantly expands their functional potentials [9]. With it adaptation to regular physical loads results in economizing of energy losses, when fulfilling military tasks [5, 8].

Analysis of works [10, 15] showed that in the process of physical training it is necessary to use special exercises and means, which by their structure would be maximally approached to soldiers' professional actions. It also significantly raises functional potentials of military officers' organism.

Scientists remark that in acting programs of military college cadets' training the content of exercises has no special orientation on professional functioning. It does not permit to prepare soldier's organism completely for fulfillment of his tasks. In this connection it is necessary to improve physical training program for military college cadets [1, 7, 18].

Hypothesis: it was assumed that military college cadets trainings by the author's physical training program is more effective, comparing with acting program from Interim instructions on physical training in Armed Forces of Ukraine. Such approach will facilitate improvement of cardio-vascular and respiratory systems' operation that, in heir turn, will improve combat effectiveness of military officers.

The purpose of the research – is to work out and study influence of author's physical training program on functional fitness of military college officers.

Material and methods

Participants: in the research 83 3rd year cadets of military college participated (experimental group, n=41; control group, n=42), of age 19-21 years. All cadets had statistically equal physical fitness and physical condition indicators. Experimental and control groups were formed by method of equal pairs. All participants gave written consent for participation in experiment.

Organization of the research: the research was conducted on the base of sergeants' Military college of National academy of land troops (Lvov) from September 2015 to July 2016.

Physical training according to Interim instructions on physical training in Armed Forces of Ukraine took 4 hours a week. The training consisted of three parts: warming up, main and finalizing. Dozing of loads at trainings considered individual physical condition of every cadet. The load value was determined by heart beats rate, according to cadet's age.

The author's physical training program envisages fulfillment of exercises, maximally approach to practical actions in military professional functioning. Its main distinction from traditional program is the fact that the author's trainings complexly combined different parts of physical training. Besides, experimental group cadets used special means (armor vests, helmet, gas mask, training grenades and stimulators of hand-to-hand combat. The trainings were conducted on the base of military detachment (see table 1).

Table 1. Main distinctions of physical training programs for military college cadets

Description	Acting physical training program	Author's physical training program
Content of physical training program	Endurance – 40%. Quickness and physical qualities – 25%. Strength – 20%. Hand-to-hand combat – 15%.	Endurance – 50%. Quickness and physical qualities – 10%. Strength – 25%. Hand-to-hand combat – 15%.
Parts of physical training	Gymnastic and athletic training Accelerated motion and light athletic Obstacle course Hand-to-hand combat Military-applied swimming and rowing	Complex combination of different physical training parts
Means of physical training	Exercises from Interim instructions on physical training in Armed Forces of Ukraine	Interim instructions on physical training in Armed Forces of Ukraine combined with exercises of combat training (actions on combat machinery, on march; fortification works; shooting and so on).
Special means	No	Gas mask, general protection kit, weapon, armor vest, tactical unloading system, rucksacks, pioneer spade, knives, grenades.

The cadets' functional state was registered by indicators of Shtange's test, Genchi test, test of Ruffiet – Dixon, Cooper's test [12, 13].

Shtange's test envisages breath pause after inhale and is to be fulfilled in sitting position. The tested shall make deep (but not maximal) inhale and keep pause as long as possible (pressing nostrils with fingers). The time of pause is registered with stop-watch. For healthy untrained persons the range of pauses is: 40-60 sec for men and 30-40 seconds for women. In sportsmen this time is bigger (up to 60-120 sec. – men and up to 40-95 sec. – women).

Genchi's test envisages breath pause after exhale and is used for detection of hidden coronary insufficiency and organism's resistance to hypoxia. It is fulfilled in lying position. The tested makes usual (not excessive) exhale and keep pause. The time of pause is measured with stop-watch. For healthy untrained persons the range of pauses is: 25- 40 sec for men and 15-30 seconds for women. In sportsmen this time is bigger (up to 50-60 sec. – men and up to 30-50 sec. – women).

Ruffiet's-Dixon's test serves for assessment of heart workability under physical load. The test envisages registration of heart beats' rate in different periods of recreation after relatively not high loads. The tested is in lying position during 5 minutes. Then HBR for 15 seconds is registered (P1). Then the tested makes 30 squats for 45 seconds

and again takes lying position. His HBR is again registered after first 15 seconds (P2). Then HBR for the last 15 seconds from the first minute of recreation is registered (P3). Heart workability is assessed by formula:

$$\text{Ruffiet's index} = [4 \cdot (P1 + P2 + P3) - 200] / 10.$$

The results are assessed by the value of index: from 0 to 15. Less than 3 units mean good workability; 3-6 – average; 7-9 – satisfactory and 10-14 means bad (strong cardiac de-compensation).

Organism's reaction to physical loads in the process of experiment was assessed on the base of pedagogic observations.

Statistical analysis: the processing of experimental results was fulfilled with the help of Microsoft Office Excel programs. The confidence of differences between indicators was checked with Student's criterion and considered to be significant at $p < 0.05-0.001$.

Results of the research

Dynamic of Shtange and Genchi's tests results points at insufficient level of physical fitness (experimental group 37.31 ± 0.72 sec. and control group – 37.25 ± 0.71 sec.; $t=0.059$, $p>0.05$). At the end of first stage of the research Shtange's test results in control group were 37.81 ± 0.76 sec. ($t=0.538$, $p>0.05$). At second stage control group indicators improved up to 38.16 ± 0.82 seconds. But they did not differ confidently from initial indicators ($t=0.839$; $p>0.05$). Shtange's test results at the end of acting physical training program illustrated that the acting physical training program does not permit to confidently improve the work of military officers' respiratory system (38.37 ± 0.83 seconds at $t=1.025$, $p>0.05$) (see fig.1).

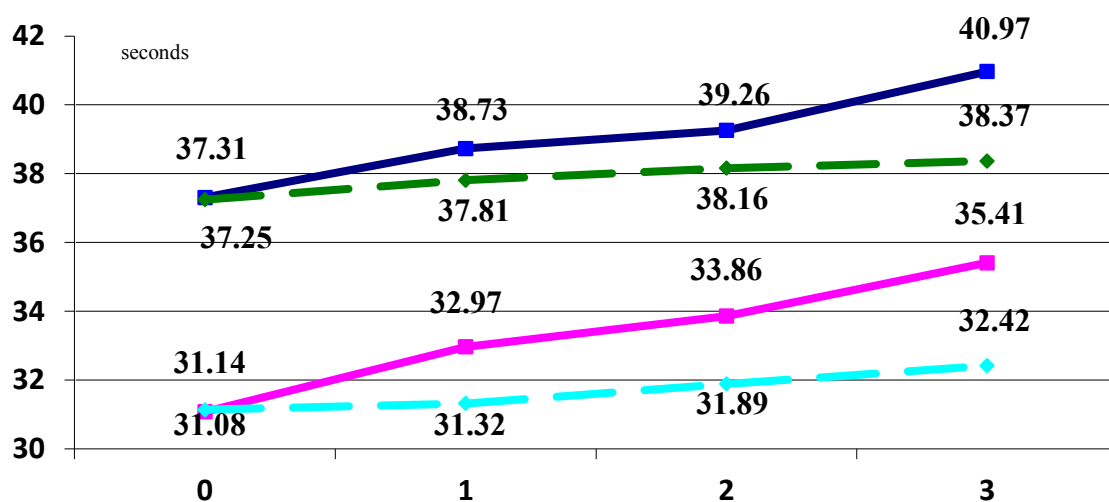


Fig.1. Dynamic of Shtange and Genchi's tests results in experimental and control groups during formation experiment, seconds

— — - results of control group cadets;
— — - results of experimental group cadets;

0 – initial indicators; 1 – first stage of the research; 2 – second stage of the research; 3 – third stage of the research.

Experimental group indicators in Shtange's test reach level of fitness by assessment table. It corresponds to satisfactory level and confidently exceeds initial data (40.97 ± 1.17 seconds, $t=2.664$; $p<0.05$).

Testing of respiratory system, by Genchi's test also proved positive influence of author's physical training program, comparing with the acting one. At the beginning of experiment these indicators (31.14 ± 0.85 sec.) confidently did not differ from control group indicators at second stage of experiment (31.32 ± 0.58 sec.; $t=0.583$; $p>0.05$). In the course of experiment experimental group results constantly grew. At the end of the first stage (32.97 ± 0.64 sec.) Genchi's test results exceeded initial data by 1.83 sec. ($t=1.719$; $p>0.05$). At the end of second stage of the experiment

the difference of results in respect to the beginning of the experiment was 2.72 sec. ($t=2.441$; $p<0.05$). At the end of experiment Genchi's test results in experimental group were 35.41 ± 0.69 sec. This 4.27 sec. ($t=3.900$; $p<0.001$). It corresponds to standard indicators for this age people (satisfactory work of respiratory system).

In control group Genchi's test initial results (31.08 ± 0.58 sec.) corresponded to unsatisfactory work of respiratory system. At the end of first stage (31.32 ± 0.64 sec.) they improved by 0.24 sec. ($t=0.277$; $p>0.05$). At the end of second stage (21.89 ± 0.68 sec.) the results improved by 0.81 sec. ($t=0.906$; $p>0.05$). At the end of experiment they improved by 1.31 sec. ($t=1.425$; $p>0.05$).

Testing of cardio-vascular system's functioning was fulfilled with test of Ruffiet-Dixon. Assessment of heart workability in control group cadets showed that the received data correspond to mark "satisfactory". The obtained indices of Ruffiet-Dixon in experimental group, at the end of experiment, (8.76 ± 0.22 bpm) correspond to average level of heart workability (see table 2).

It was noted that Ruffiet-Dixon's indices in control and experimental groups improved and have confident changes in respect to initial data ($t_{CG}=11.182$; $t_{EG}=9.286$; $p<0.001$). But comparative analysis of testing results of the tested groups showed that experimental group results confidently exceed indicators of control group ($t=2.198$; $p<0.05$). Further, difference between control and experimental group results increases up to 0.98 bpm at the end of second stage ($t=3.201$; $p<0.01$) and up to 1.48 bpm at the end of experiment ($t=5.558$; $p<0.001$).

Table 2. Dynamic of Ruffiet-Dixon's test results in experimental and control group cadets in the course of experiment, bpm

Stages	Control group (n=42)		Experimental group (n=41)		Confidence of difference	
	Mean arithmetic	Mean error of mean arithmetic	Mean arithmetic	Mean error of mean arithmetic	t	p
Initial data	12.32	0.11	12.29	0.31	0.09	>0.05
1 stage	11.89	0.15	11.23	0.26	2.19	<0.05
2 stage	11.01	0.24	10.03	0.19	3.20	<0.01
3 stage	10.24	0.15	8.76	0.22	5.55	<0.001

For complex assessment of cardio-vascular and respiratory systems' physical fitness of experimental and control groups' cadets we fulfilled Cooper's test (see table 3).

Table 3. Dynamic of Cooper's test results in experimental and control groups during experiment, meters

Stages	Control group (n=42)		Experimental group (n=41)		Confidence of difference	
	Mean arithmetic	Mean error of mean arithmetic	Mean arithmetic	Mean error of mean arithmetic	t	p
Initial data	2114	25.9	2127	29.7	0.32	>0.05
1 stage	2159	30.8	2296	32.2	3.07	<0.01
2 stage	2207	27.6	2349	30.8	3.43	<0.01
3 stage	2278	27.9	2425	33.1	3.39	<0.01

Discussion

Modern conditions of Armed Forces of Ukraine combat (professional) functioning require high level of physical fitness and military applied skills from military officers. That is why there appears demand in training of military officers (cadets) of land troops to professional activity with better quality and in the shortest time. As on to-day for optimization of military college cadets' physical training study of loads' characteristics, which they endure in fulfillment professional tasks, remains relevant.

The results of our research proved the data of scientists [9], that military officers' high physical fitness significantly expands their functional potentials. With it adaptation to regular physical loads results in economizing their energy losses [5, 8], when fulfilling combat tasks. It significantly raises military officers' combat effectiveness.

We also supplemented the data of scientists [10, 15] about purposefulness of special exercises and means' application in physical trainings (which, by their structure are approached to military officers' professional actions). By our researches' and other scientists' results [1, 7, 18], we substantiated the program of physical training for military college cadets. Implementation of the author's physical training program permitted to improve military college cadets' functional readiness for fulfillment their tasks.

Conclusions

The research showed that trainings with complex combining of different physical training parts (accelerated motion, overcoming obstacle course, hand-to-hand combat and so on) and with application special means (armor vests, tactic-unloading system, helmet, weapon, gas mask, training grenades and etc.) facilitate improvement military officers' functional state. For example in experimental group cadets results of cardio-vascular and respiratory systems' functioning are confidently better than in control group.

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Conflict of interests

The author declares that there is no conflict of interests.

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ANTI-AGING BY MEANS OF PHYSICAL EDUCATION (ON EXAMPLE OF SWIMMING)

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Abstract. *Purpose:* to work out complex anti-aging program to find its influence on biological age and temp of elderly persons' ageing. *Material:* in experiment 78 persons (44 men and 34 women with accelerated organism's ageing) participated. Two groups were formed. In both groups trainings were conducted three times a week. Each training took 55-80 minutes. Realization of the program was in three stages: preparatory-adaptive, training and supporting. Testing of the author's program took ten months. For determination of biological (functional) age and temp of organism's ageing we used methodic by V.P. Voytenko. *Results:* we expanded ideas about slowing of involution changes in human organism without medication means. The main means of the program were special blocks of swimming. We determined the demand in formation of person's desire for further physical development, for accumulation knowledge and skills in correct selection and fulfillment of physical exercises; for independent controlling own physical fitness. *Conclusions:* In preparatory part we recommend to use the following blocks: warming up, breathing, theoretical block. In main part the following blocks were used: exercises with objects, imitation exercises, facilitating mastering swimming; jumps and exercises on ground; distant swimming; hypoxic exercises. In final part game and breathing exercises were used. It is recommended to use principle of variability, which envisages planning of training process in compliance with age-gender specificities.

Key words: ageing of person, biological age, anti-ageing, swimming, physical activity.

Introduction

In conditions of population's ageing especially important has become the problem of workability and health preservation of people, who work; provision them with work in compliance with profession, age and functional potentials [2, 15]. Recent decades sharp worsening of health of all Ukrainian population strata has been happening. Researchers [6, 9, and 13] attract attention to too early "wear out", ageing of organism [12]. The degree of this "wear out" can be assessed by biological age and calculated organism's ageing temp with the help of the received indicators [11].

In 90-s years of 20th century new sector of medical science appeared and started to quickly develop. It was anti-ageing – anti-age medicine [6, 7, 8]. It was proved that physical education means can substantially influence on quickness of ageing (organism's wear out) by inhibition of involution changes [11]. Modern science tries to struggle with many symptoms of ageing (skeletal muscles' atrophy; reduction of joints' mobility; partial loss of functional reserves of organism's physiological systems and bio-energetic potential; weakening of organism's potential for physiological re-generation). It permits to keep mental and physical workability at proper level.

The back up of workability is closely connected with functioning level of different human organism's systems. It is possible at the account of correctly chosen strategy of successful ageing [26, 28]; physical exercises' practicing [19, 20]; level of physical activity [21]; sound eating [22]; proper condition of cardio-vascular system [23] and composition of body [25].

In opinion of authors [7, 8] swimming facilitate successful ageing. Swimming practicing is recommended to use as non-medical mean for too early ageing prophylaxis [15]. Domination of biological markers of cardio-vascular and respiratory systems in determination of human organism's ageing has been proved [16]. Other authors found that swimming facilitates improvement of external breathing functional indicators [27] as well as renders health related effect [24]. Thus, differently directed health related measures can strengthen human workability and ensure successful; ageing.

The purpose of the research is to work out complex anti-aging program to find its influence on biological age and temp of elderly persons' ageing.

Material and methods

Participants: medical workers of 50-60 years' age, characterized by accelerated temp of ageing.

Organization of the research: the tested were divided into control and anti-ageing groups. Control group included people, who, by their interests, practiced aerobic, cyclic exercises (run, skating, bicycle racing, walking and so on). In group of anti-ageing influence we applied the author's program, which included: morning exercises, stretching, swimming and independent trainings. In both groups trainings were conducted three times a week; each training took 55-80 minutes, depending on stage of program. Realization of anti-ageing program was conducted in three stages: preparatory-adaptive, training and supporting. Testing of the program took ten months. For determination of biological (functional) age we used methodic by V.P. Voytenko [12].

For determination of biological age we used the following formulas:

BA (biological age) men:

$$BA = 26.985 + 0.215 \times BPS - 0.149 \times BP + 0.723 \times SAH - 0.151 \times SB$$

BA women:

$$BA = -1.463 + 0.415 \times PBP + 0.248 \times BM + 0.694 \times SAH - 0.14 \times SB$$

Where: BPS – blood pressure (systolic), mm. merc.col.

PBP – pulse blood pressure, mm. merc.col.

BP - breathing pause after deep inhale, sec.

SB – static balancing, sec.

BM – body mass, kg.

SAH – subjective assessment of health (to be determined with the help of questionnaire, containing 29 questions).

For determination of human ageing temp we compared individual BA with PBA (proper biological age), which characterizes population standard of age “wear out”. Correlation BA/PBA points at difference between BA of the tested person and his/her peers.

PBA was calculated by the following formulas:

PBA (proper biological age) – men:

$$PBA = 0.629 \times CA + 18.56$$

PBA women:

$$PBA = 0.581 \times CA + 17.24$$

Where CA – calendar age

Statistical analysis was fulfilled with the help of Excel 2010 program.

Results of the research

The program is characterized by orientation on realization principle of variability, which envisages planning of academic material in compliance with age-gender characteristics.

Working out anti-ageing program we followed a number of requirements:

- Load's adequacy to age and sex, strict dozing and regulation of physical load;
- Systemic application of physical loads;
- Gradual expansion of means for complex ensuring influence on different muscular groups, joints and visceral organs;
- Selection of general, special, preparing and imitation exercises according to physical and technical fitness;
- Selection and application of exercises for cardio-respiratory physiological reserves;
- Organization of special motor regime;
- Improvement of psychological state.

Main mean of anti-ageing program was swimming in the form of special blocks. These blocks facilitated complex influence on organism. The blocks included gymnastic and breathing exercises as well as stretching. Application of these means was realized in organized trainings and as independent trainings. All these were registered in individual diary.

Realization of anti-ageing program was fulfilled in three stages: preparatory-adaptive, training and supporting.

Preparatory-adaptive period takes two months and implied application of threshold and moderate intensity physical loads. Its main tasks were: overcoming water-phobia and mastering or perfection main swimming techniques; adaptation of cardio-vascular and respiratory systems to physical loads; weakening of psychological tension and creation of optimistic mood; training of physical qualities and organism's hardening.

Second stage, training, took five months. It was characterized by average and peak intensity of physical loads. The tasks of this stage were: improvement of organism's physiological systems' functioning; perfection of organism's adaptation potentials; improvement of cardio-vascular and respiratory systems' state; improvement of elasticity of skeletal-muscular apparatus soft tissues and joints' mobility; backbone unloading and increase of its segments' mobility; further development of physical qualities;

Third stage, supporting, lasted three months and involved physical loads of moderate intensity.

The tasks of this stage were: further increasing of motor functioning and preservation of the achieved physical condition; increase of muscular and cardio-respiratory endurance; correction of psycho-emotional state; formation of healthy life style skills.

The structure of the program

Morning exercises (ME): are to be fulfilled every day, during 15-20 minutes before breakfast. Both control and experimental groups fulfilled complexes for all muscular groups. Beforehand, complexes of these exercises were distributed in the groups in text form.

Swimming: the structure of swimming trainings envisages specialized blocks, which permit to selectively influence on different physiological system and fitness sides.

In preparatory part the following block were used: warming up, breathing exercises, theoretical block. The main part of such trainings included exercises with objects, imitation exercises for training swimming abilities; jumps and exercises on ground; distant swimming; hypoxic exercises.

The recommended by regulations optimal dozing of health related swimming is purely oriented and can be less or higher. It depends on person's individual potentials. For more precise control of loads by indicators of maximal, peak and threshold heart beats rate (HBR) we used the following formulas:

$HBR_{max} = 220 - \text{age (in years)}$;

$HBR \text{ bottom border} = (220 - \text{age (in years)}) \times 0.6$;

$HBR \text{ top border} = (220 - \text{age (in years)}) \times 0.75$.

Stretching: the purpose of stretching was to achieve its physiological effect – myostatic reflex, with which in relaxed muscle there happens increase of muscular fibers' contraction. As a result, metabolism increases in muscles and high tonus is ensured owing to perfection of conjunctive tissues' carcass of skeletal muscles.

Independent trainings were directed at formation of further physical self-perfection, accumulation of knowledge and skills to correctly select and fulfill physical exercises, to independently control own physical fitness.

Reduction of experimental group women's biological age after 7 months' trainings by anti-ageing program was 7.19% ($p < 0.05$), and after 10 months – 10.41% ($p < 0.05$).

Table 1. Dynamic of biological age (BA), proper biological age (PBA) and ageing temps of men and women changes after application anti-ageing program ($M \pm m$)

Stages	Control group			Experimental group		
	Biological age	Proper biological age	Ageing temp (BA-PBA)	Biological age	Proper biological age	Ageing temp (BA-PBA)
Men $n=23$				Men $n=21$		

Before	58.5±0,5	52.9±0,5	5.6	58.7±0.5	53.3±0.4	5.5
After 2 months	58.3±0,5	52.9±0,5	5.4	58.2±0.4	53.3±0.4	4.9
After 7 months	58.3±0,5	52.9±0,5	5.4	57.0±0.4***	53.3±0.4	3.7
After 10 months	58.2±0,5	52.9±0,5	5.4	56.8±0.5***	53.3±0.4	3.5
<i>Women n=15</i>				<i>Women n=19</i>		
Before	52.3±0.4	48.9±0.	3.4	52.8±0.4	49.4±1.6	3.4
After 2 months	52.0±0.4	48.9±0.4	3.1	51.8±0.4	49.4±1.6	2.4
After 7 months	52.0±0.4	48.9±0.4	3.1	49.0±0.6*** ••	49.4±1.6	0.4
After 10 months	51.3±0.5	48.9±0.4	2.3	47.3±0.5*** ••	49.4±1.6	-2.1

Notes: *** – (p<0.05) indicator is confident, comparing with initial data; •• – (p<0.05) indicator is confident, comparing with control group.

The received by us results witness about effectiveness of motor functioning in resisting to natural processes of age involution. Application of the authors' anti-ageing program facilitated confident reduction of biological age of the tested (50-60 years' age). This anti-ageing program can be used in recreational-rehabilitation centers, sanatoriums as well as at working places and places of residence as a mean for prevention organism's too early ageing.

Discussion

Accelerated ageing of any age person has been remaining a relevant problem of medicine [1, 3, 6, 12, 18] and physical education [13, 14]. The problem of longevity prolongation and activity of elderly people is still important in medical, social, economic and pedagogic spheres, in the aspect of physical education. It is purposeful to use application of physical education means for biological age correction [4]. Results of our research prove the data of other authors [26] about importance of searching individual means for ensuring longevity and life quality. Immobile way of life accelerates people's ageing [21] that witness about correctness of our research. However, the proofs that physical exercises can radically change body ageing are rather doubted [28]. Results of our research illustrate that physical exercises (to be more exact- swimming) can significantly strengthen resistance to ageing.

The data about implementation of the received results in physical education science are the novelty. For the first time we worked out anti-ageing program, oriented on inhibition negative biological changes of organism of 50-60 years' age persons with accelerated ageing. Theoretical substantiation of stretching, morning exercises; swimming and independent trainings' introduction in the program was conducted. For the first time we proved effectiveness of the authors' program for biological age and organism's ageing temp correction. It permits to recommend it for application as gero- protection mean for people of older age groups.

Conclusions

Application of authors' anti-ageing program permitted to substantially influence on biological age of 50-60 years' age.

Confident reduction of biological age witnesses about purposefulness of motor functioning in old age for negative biological changes' inhibition.

On examples of control and experimental groups we showed effectiveness of motor functioning independent on age, in which a person starts it.

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DEVELOPING CRITERIA FOR SELECTING FREESTYLE WRESTLING COACHES AT INTERNATIONAL LEVELS

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Abstract. *Purpose:* The objective of this research was to design and develop criteria for selecting freestyle wrestling coaches at international levels and determining the degree of these criteria importance with respect to coaches and wrestlers' point of view. *Material:* The research method was of descriptive-survey type. The sample population of this study included 79 freestyle wrestlers and 87 freestyle wrestling coaches selected from 381 participants at wrestling world championship competition in 2013 by classified random sample technique. The measuring instrument was researcher-made questionnaire with 56 variables, evaluated by Delphi method ($\alpha = 0.879$); internal validity of the questionnaire was assessed by a number of experts who have a long term coaching experience at high levels in wrestling. Statistical methods, used for analysis of data, were descriptive and inferential statistics (Friedman Test, Kruskal-Wallis Test and One Sample Kolmogorov-Smirnov Test). *Results:* The results of this study indicated that there was no significant difference among coaches and wrestlers on significance level of 8 main criteria for selecting national freestyle wrestling coaches ($P > 0.05$), but they had some differences in the order of dimensions' significance. *Conclusion:* Psychological skills such as Personality traits and characteristics of motivational as well as scientific knowledge and Management Skills have been considered as a very important criterion, so Wrestling Federations should pay considerable attention to these dimensions.

Key words: Freestyle wrestling, coaches, criteria, National team, wrestlers.

Introduction

One of the most significant elements in sport teams' success relates to role of team coach. Anyone who has practiced sports knows what an impact a coach can have, well or bad. Coaching wrestling is a special profession [7]. In most resources coaching is considered an intensive job and a coach is described as a person who should implement a set of communicative-managerial skills within a wide range of coaching roles [24, 23]. In this regard, the selection of people for the post of coach, mainly at national level and based on the use of job-specific criteria has been particularly problematic for federations.

One of federations' responsibilities is selecting efficient coaches for national teams. Fair and consistent selection of national coaches by sport federation is hard and argumentative task as the concerned managers should select the most qualified coach from a large number of candidates as a head coach, inside and even outside the country. Unfortunately, few studies have been done till now and it is not clear what parameters and features should be considered in selection of national coaches. Due to the lack of such criteria and importance of these characteristics in identifying and selecting qualified and competent coaches to hold national team coach, it is necessary to determine the national coaches' selection criteria, in order to identify the best person as well as evaluate and analyze the coach performance in each period.

When critically evaluating the review of the relevant literature, including studies conducted by the various researchers, the researcher found out that very few studies so far have been devoted to developing criteria for selecting freestyle wrestling coaches at international level. It shows that this topic has not been paid attention to by a lot of researchers. However, some of the studies mentioned in the reviewed literature tried to identify characteristics of coaches, the summary of which is as follows: in a study entitled "Springfield High meeting outlines 10 characteristics and traits for new Wildcats boys' hoops coach" along with a group of 30 people gathered at Springfield High School, to discuss the characteristics and traits they want to see in the Wildcats' next boys' basketball coach. After two brainstorming sessions 10 traits were agreed including passion for academics as well as athletics, great communication skills with stakeholders and networks (includes parents, kids and fans). coaching experience and life coach who mentors and develops kids, become an active and visible part of the community, understands diversity, ability to motivate, personal integrity and ethics and honesty, disciplinarian and fair to all and respect (for others), develops and hires a strong staff [27].

Monazzami (2009) has conducted a research with the title of "the codification of criteria for selecting national Volleyball coaches". Results revealed that there is no significant difference between managers, coaches, experts and athletes in the case of four criteria (technical, managerial, social, personality) for selection of national coaches. Also, there is significant difference between all subjects in the case of coach selection criteria. Eventually, from the viewpoint of all responders, respectively, technical criteria, managerial, personality and social had the most

importance in selecting national coach in volleyball [19]. Frost J.L. (2012) Examined “characteristics contributing to the success of a sports coach” and founded identifying particular characteristics (qualities and abilities) of successful sports coaches such as quality of practice, communicating with athletes, motivating athletes, developing athletes’ sports skills, and possessing knowledge of the sport could offer other coaches help in improving their performance [6]. Mackenzie (2012) determined “some Coaching Roles” such as: advisor, assessor, counselor, demonstrator, friend, facilitator, fact finder, fountain of knowledge, instructor, mentor, motivator, organizer and planner, role model, supporter. He also believed that coaches initially need to develop the skills of organizing, safety, building rapport, providing instruction and explanation, demonstrating, observing, analyzing, questioning and providing feedback [16]. Tajik (2010) undertook a study titled “planning and compilation assessment indicators of Iran’s Taekwondo coaches”. After final analyses the results were as below: There was significant differences among the views of coaches, athletes, and managers about the social characteristics, human relations, individual characteristics, ethical characteristics, sport experiences and managerial skills; whilst no significant differences was observed in four other aspects (educational, personality, coaching, and planning). All the three groups had chosen the criteria for choosing Taekwondo coaches by the below priority as: personality (8.20), ethical characteristics (7.85), coaching characteristics (7.70), educational characteristics (6.81), managerial skills and leadership (6.72), planning and programming (6.62), social characteristics (5.64), human relations (5.44), sport experiences (5.43), and individual characteristics (4.39) Afsane purak S. A., et al. (2012) undertook a study with the title of “Development of Indicators of the National Judo Coaches Selection: Athletes and Coaches’ Perspectives”. These indicators included communicational, psychological, motivational, personality-moral, supportive-feedback, goal setting, experimental-technique, efficacy, leadership and management and performance assessment indicators. Data analysis results showed that there were no significant differences among statistical samples regarding Coaches’ Selection indicators ($p > 0.05$). Also there were different priorities about Coaches’ Selection indicators in samples ($p < 0.05$) [29].

It is pertinent to note that the above reviews have also brought to the notice of the researcher about the importance of each criterion which has been selected by him in the present study. Hence, the reviews which the researcher has come across are not only justifying the appropriateness of the research problem under taken but also provided necessary further directions in completing study. Thus, considering the literature review, the researcher decided to do the study with the following research problem “Developing Criteria for Selecting Free Style Wrestling coaches at International Level”.

Materials and Methods

The purpose of this study was to identify characteristics for selecting free style wrestling coaches at international level. The research method is of descriptive-survey type. In the present study, wrestling coach is major characteristics or interest of the researcher for that purpose. According to Krejcie & Morgan table 79 free style wrestlers, 87 free style wrestling coaches from 310 participants of wrestling world championship competition in 2013 were selected by classified random sample technique.

Data gathering tool was the researcher-made questionnaire. Its content validity was evaluated by the opinion of some experts, who have strong background in coaching field. Also, its reliability was evaluated using Cronbach’s alpha coefficient adjusted at the level of 0.86. Eventually, the final questionnaire which contained the features and criteria for selection of the coach of wrestling national team was designed by considering 8 aspects including motivational characteristics, sport characteristics, personality characteristics, management skills, scientific characteristics, communication skills, coaching experience and individual characteristics. The significance level of each criterion is determined using Likert measurement scale. Delphi method was used in selecting factors of national coaches. For distributing questionnaire, researcher went personally to Istanbul (Turkey) and gave all necessary explanations before distributing the questionnaires. The questionnaires were gathered by researcher two days later.

To extract the results of data, descriptive statistics methods including frequency, percentage, standard deviation, mean, descriptive index and central tendency were used for each factor in the demographic section of the survey. In section 2 and in research statistical hypothesis test Friedman Test and Kruskal-Wallis Tests were used. The mentioned tests were applied to determine the priorities of 8 major criteria and compare the differences among coaches and wrestlers’ viewpoints on the level of the importance of criteria for selecting wrestling national freestyle coaches. One Sample Kolmogorov-Smirnov Test was used to indicate normality of data distribution. The Statistical Package for Social Sciences 18 (SPSS) was used to conduct the statistical analysis. An alpha level of 0.05 was used for statistical significance ($p \leq 0.05$).

Results

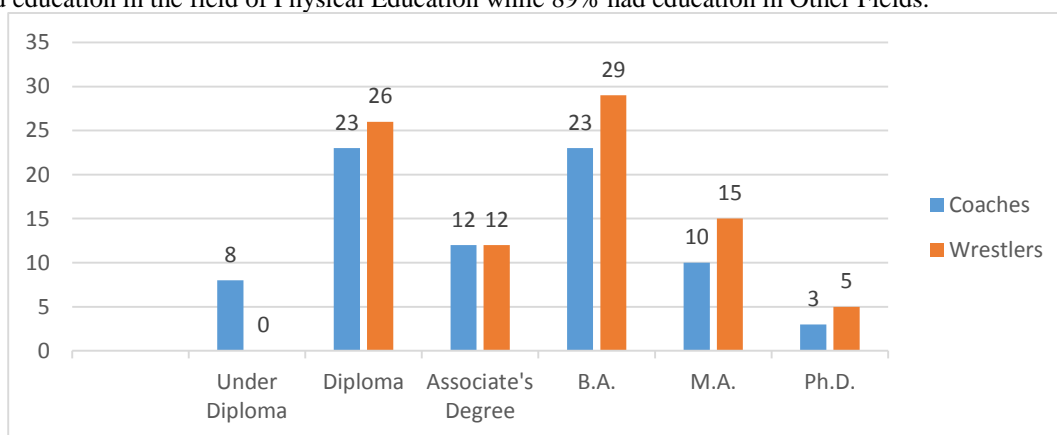
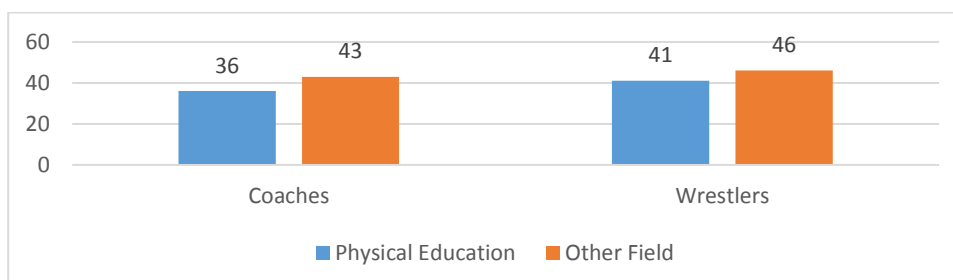
The findings of this study are as follows:

Table 1. Distribution and frequency rate of demographic variables

Demographic Variables		Frequency	Percent
Statistical population	Coaches	79	47.6
	Wrestlers	87	52.4
	Level 1	11	13.9
Coaching degree	Level 2	8	10.1
	Level 3	12	15.2
	International	48	60.8
	Total	79	100
Experience in coaching	Under 2	65	82.3
	2 to 5	5	6.3
	6 to 10	2	2.5
	11 to 15	5	6.3
	Over 15	2	2.5
	Total	79	100

From the table 1 it is clear that the population consisted of 79 coaches (47.6%) and 87 wrestlers (52.4%). Regarding coaching Degree among coaches, 11 persons of coaches have level 3, 8 persons have level 2 (lowest frequency), 12 persons have level 1 and 48 persons have International degree in coaching (highest frequency). Maximum experience of coaching in national team annually was related to less than 2 years (82.3%) while minimum experience was more than 15 years (2.5%).

In diagram 1, with regard to the frequency distribution of Educational Qualification among statistical population, 4.8% were the holders of under diploma, 29.5% Diploma, 14.5% had associate's degree, 31.4% bachelor's degree, 15% master's degree and 4.8% had PhD. In diagram 2, regarding Educational Field, among the 166 subjects, 77% had education in the field of Physical Education while 89% had education in Other Fields.


Diagram 1. The frequency of subjects' educational qualification

Diagram 2. The frequency of subjects' educational field

According to Table 2 and the results of Friedman test to determine the priorities of 8 major criteria from the viewpoints of the coaches ($\chi^2 = 100.5$, $df=7$, $P<0.05$), they considered motivational characteristics (5.85) as the most important criteria and the lowest index was given to individual characteristics (2.92). While, regarding Friedman test ($\chi^2 = 84.5$, $df=7$, $P<0.05$), wrestlers considered personality characteristics (5.95) as the most prioritized factor and the least prioritized factor was individual characteristics (3.18).

Table 2. Priority of coaching dimensions by Coaches, and Wrestlers

Subjects	Coaches					Wrestlers					Total	
Domain of Coaching	Priority	MR	x ²	df	sig	Priority	MR	x ²	df	sig	Priority	MR
Personality Characteristics	2	5.55				1	5.95				1	5.75
Management Skills	4	4.55				2	5.43				4	4.99
Individual Characteristics	8	2.92				8	3.18				8	3.05
Scientific Characteristics	3	5.14	100.5	7	0	4	5	84.5	7	0	3	5.07
Communication Skills	7	3.49				7	3.44				7	3.46
Motivational Characteristics	1	5.85				3	5.25				2	5.55
Sport Characteristics	5	4.4				5	4.09				5	4.24
Coaching Experience	6	4.12				6	3.66				6	3.89

In diagram 3, the results of Friedman test indicate that all subjects ranked respectively to the following items as selection criteria for wrestling national freestyle coaches: personality characteristics (5.75), motivational characteristics (5.55), scientific characteristics (5.07), management skills (4.99), sport characteristics (4.24), coaching experience (3.89), communication skills (3.46) and individual characteristics (3.05).

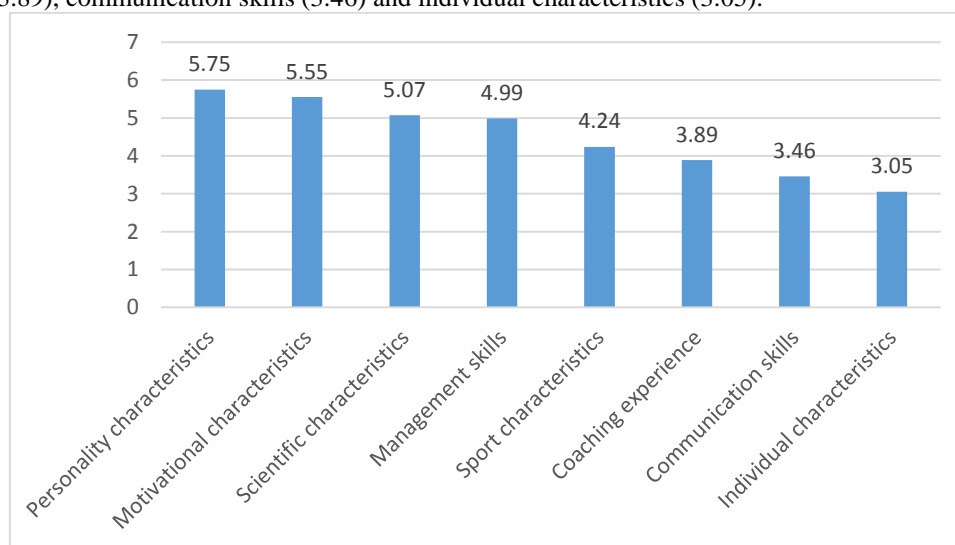


Diagram 3. The priority of coaching dimensions from all samples' viewpoints

As it is seen in Table3, there was no significant difference among coaches and wrestlers on significance level of 8 main criteria for selecting wrestling national freestyle coaches (df=4, P>0.05). In other words, all samples agreed on the level of importance of each criterion.

Table 3. Results from statistical tests to prioritize coaching selection criteria

Statistical Indicator	Descriptive Data			Kruskal-Wallis		
Criterion	Groups	n	Mean Rank	Chi-Square	df	Sig
Personality Characteristics	wrestlers	87	103.57	1.868	4	0.76
	coaches	79	101.44			
Management Skills	wrestlers	87	101.69	3.205	4	0.524
	coaches	79	102.3			
Individual Characteristics	wrestlers	87	99.93	3.926	4	0.416
	coaches	79	109.11			
Scientific Characteristics	wrestlers	87	98.89	3.233	4	0.52
	coaches	79	107.68			
Communication Skills	wrestlers	87	99.18	2.81	4	0.59
	coaches	79	104.39			
Motivational Characteristics	wrestlers	87	99.29	2.597	4	0.627
	coaches	79	105.47			
Sport Characteristics	wrestlers	87	99.16	3.535	4	0.473
	coaches	79	105.27			
Coaching Experience	wrestlers	87	101.9	7.797	4	0.099
	coaches	79	101.34			

Discussion

As it was observed coaches and wrestlers consider the following items as the criteria for selection of the coach of wrestling national team including: 1) Personality characteristics, 2) Motivational Characteristics, 3) Scientific Characteristics, 4) Management skills, 5) Sport Characteristics, 6) Coaching Experience, 7) Communication Skills, 8) Individual characteristics. Moreover, with regards to Friedman test results, there is significant difference among coaches and wrestlers' viewpoints to determine the priorities of eight major criteria for selecting wrestling national freestyle coaches. In general, all samples had similar beliefs about the criteria importance for selecting wrestling national freestyle coaches, but they had some differences in the order of importance of the dimensions. The most prioritized factor in choosing a coach was "Personality characteristics". It was considered as a very important criterion, so wrestling federations should pay a considerable attention to this dimension. Some of researchers believe that personality characteristics are significant aspect required for hiring coaches [4, 12, 25, 15, 27, 21, 3, 18, 30]. The result of the current study is in line with the results of research by Plasters Writer S. (2009) & Naisri K. (2009), but contradicted results from studies by [13, 2, 19, 29] indicated significant difference among coaches, experts, athletes and managers in the case of the level of importance of personality characteristics [13, 2, 19, 29].

The least prioritized factor was "Individual characteristics". Thus, it plays little role in selection process of national coaches according to all subjects' viewpoints so it can be ignored. Such a finding correlates with the results of studies by [13, 26, 20, 29]. "Motivational characteristics" was considered as important criteria. As noted by [9], psychology in coaching plays an effective role in the coach's success and the athlete's functional development as well as motivational and communicational skills. All samples showed a strong similarity in "Scientific characteristics". They believed that this criterion was important. More coaching courses should be offered and publicized to current coaches so they can obtain updated information and professional knowledge to perform their coaching duties. "Management skills" was considered as relatively important criterion. The results of the current study are also quite similar to the findings of Dahalkvist A. and Svensson M (2001) which found type of leadership and appropriate behavior are more important in coaching process. "Sport characteristics" and "Coaching experience" were other criteria which were considered as relatively important factors. This criterion was also considered by FIFA (2012) and AFC (2011) in their coaching books and noted that a coach should be equipped with technical and tactical skills [11]. "Communication skill" was put in seventh priority. In other words, it was considered as a less important factor. Some of researchers referred to this criterion [9, 14, 28, 24 and 17]. These criteria and their subthemes each represent the thoughts of many of the finest coaches and wrestlers in freestyle wrestling, so developing strengths within each of these areas will assist a coach greatly in becoming an effective coach now and in the future.

Conclusion

With respect to the present study results it seems that international level wrestling coaches should have multi-dimensional skills such as psychological skills, unique personality, management skills as well as scientific adequacy that render determining effect on sport performance; thus sport authorities specially Wrestling Federation should have specific attention to these important issues in selection international level coaches.

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DOPING IN OLYMPIC SPORT: SIGNS OF THE CRISIS AND WAYS TO OVERCOME IT

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Abstract. The paper contains analysis of modern history of the spread of doping in Olympic sport, the IOC's fight against this negative phenomenon and activities of the World Anti-Doping Agency (WADA) established in 1999 and designed to eradicate doping. It is shown that, despite ever-increasing financial and human resources along with expanded legal capabilities, intensive propaganda efforts, increased volume of testing, severe sanctions, support from reputable international organizations (UN, UNESCO, Council of Europe), the Agency's multi-year activities is not only brought the Olympic sport closer to solving the problem, but also dramatically aggravated and made it dangerous for the credibility and the well-being of the Olympic movement. It is not only and not so much about the competition in elite sport, which has dramatically increased recent years, and socio-political and commercial attractiveness of success at the Olympics, but about fundamentally misguided methodology underlying WADA's activities, based on neglect of biological, medical and sports sciences' achievements, and realities of modern elite sports, and drawn up on the ideas of lawyers, economists and "universal managers". The paper outlines in detail outcomes of WADA activities and anti-doping laboratories accredited by the Agency, which manifested themselves in many crisis phenomena moved far beyond the limits of the Olympic sport. Furthermore, the prospects of coming out of the grave crisis developed in this area are delineated.

Keywords: doping in Olympic sport, anti-doping activities, WADA, World Anti-Doping Code, WADA prohibited list, crisis phenomena, rights of athletes and physicians.

Introduction

Doping is a phenomenon that occupies a particular place in high performance sport. The use of doping contradicts to the basic principles of sport, ideals, and values of the philosophy of Olympism. It is quite natural that the International Olympic Committee for more than half a century has fought against this phenomenon, and, in 1999, initiated the establishment of the World Anti-Doping Agency (WADA), a special international organization designed to fight doping, particularly on the World Olympic stage. However, the Agency's years-long effort, along with the constantly increasing legal, financial, and human capabilities, continuous improvement and revision of main documents, active information and propaganda activities, expansion and tightening of sanctions not only have not solved the issue of the fight against doping, but have made it more severe. The number of doping scandals and acute conflicts in various Olympic sports only increase, charges and penalties may be imposed not only on the athletes, but also on the coaches, physicians, attendants, and officials. The UN, UNESCO, Council of Europe, leaders and high-ranking representatives of legislative and governmental bodies of many countries are involved in the issue. In the media, doping scandals overshadow the sporting events itself that adversely affects the credibility and popularity of the Olympics and compromises the Olympic movement in public consciousness by associating it with widespread fraud and corruption.

But how do things stand in most popular professional sports: football, Formula One motor racing, golf, boxing, and North American team games such as American football, baseball, basketball, and hockey? Here, the fight against doping and other negative phenomena is carried out efficiently enough, but without dramatization; isolated violations and scandalous incidents and punishments have occurred, but their level and number are incomparable with the immensity of the sporting activity itself and do not have a significant impact on the popularity and credibility of the sport. But all these kinds of sports are popular among spectators, mass media, and sponsors; and, in this regard, some of them not only compete, but also surpass in popularity the Olympics.

Thus, experts, sports fans, and the general public ask a natural question: why the issue of doping in the Olympic sport is immeasurably more acute than in professional sports? They have found the answer in the approach to the fight against doping. In the Olympic sports, it was developed by the World Anti-Doping Agency with the support of the IOC. However, the governing bodies of the above-mentioned professional sports strongly disagree with this approach, they implement own approaches to counteract doping, and decline to cooperate with WADA.

Therefore it makes sense to look a bit more closely at the issue of doping in Olympic sport: whether it is so severe that it poses a threat for it or the methodology of the fight against doping and the anti-doping system created by the WADA turn it into one like this.

The purpose of the work: to carry out critical analysis of problematic situation with doping taking in the Olympic sport.

Results and discussion

FIGHT OF THE INTERNATIONAL OLYMPIC COMMITTEE AGAINST DOPING AND ESTABLISHMENT OF THE WORLD ANTI-DOPING AGENCY

Before Juan Antonio Samaranch took over the leadership of IOC in 1980, the fight against doping in Olympic sports was carried out, but it was not of central importance and it was unsystematic. Samaranch singled out the anti-doping fight as one of the priorities of the IOC. However, despite all the measures and efforts that were taken, the problem has not been solved. IOC Medical Commission, headed by Prince Alexander de Merode, was not sufficiently active and consistent, and in the late 1980s and early 1990s, this result in a series of scandals involving massive doping fraud in Canada, United States, East Germany, and Bulgaria.

Gravely concerned at the situation with doping and the lack of real progress in combating its spread in sports, in the early 1990s, the IOC changed the policy to increase the funding for the anti-doping activities and to further tighten sanctions, but with no real results. Development and introduction of new effective drugs and methods of concealing doping obviously had outstripped the development of anti-doping control system.

Achievements of the anti-doping system proved to be much more modest than those of people who had been introducing various doping substances and methods in Olympic sports. Reported cases of doping were rare, nevertheless, indirect data, numerous media materials, statements by experts, athletes by themselves, their coaches, and doctors indicated that the fight against doping has not brought any tangible positive results: the phenomenon has spread and acquired a massive scale in particular sports [10].

International and national sports federations have started to demonstrate lack of interest in identifying the cases of doping, especially that involving outstanding athletes. For example, it is known about the enormous damage to the credibility of popular sports such as track and field athletics and weightlifting that has been done by a series of disqualifications of great athletes for using prohibited drugs. In practice, neither sports federations nor multiple sponsoring firms were interested in such scandals.

Since the late 1990s, experts in sports, representatives of business community and media have fairly criticized the very concept of the IOC's anti-doping fight as insufficiently grounded and suffering from serious errors (not to mention the practice of anti-doping laboratories, which, being intended to maintain the purity and respect for moral and ethical values in sport, showed by their activities many contrary examples). There have been cases, where sanctions against doping not only have been a source for questions from the public, but also have been challenged before the civil courts.

In particular, all major arguments that were used as the basis for the concept of anti-doping fight have been quite rightly criticized:

- 1) doping is unacceptable for moral and ethical reasons, due to the fact that it is banned;
- 2) doping gives an athlete an unfair advantage to those, who did not dope;
- 3) ban on doping is motivated by the concern about the health of an athlete.

Each of these arguments seems quite reasonable and unambiguous, however only provided the rational, evidence-based basis for it.

Without going into an in-depth analysis, here is a list of the most obvious contradictions between the original assumptions and actual practices that have led to a justified criticism.

Naturally, that the use of banned items is unacceptable in sport for ethical and for legal reasons, and in this regard, there should be no doubt. However, as rightly argued by many experts, this statement is indisputable only if it is proven from ethical, legal, medical, and technological points of view the validity of the ban on an enormous number of publicly available products and methods, which are widespread and, in many cases, badly needed for an athlete in

order to preserve his health and streamline the preparation process. Unfortunately, there were not only doubts, but also serious scientific evidence to argue that, in many cases, the practice of anti-doping activities impinged on the legitimate rights of athletes, was in contradiction to the principles of sports training, and deprived an athlete of a full-fledged health care [10, 43].

The argument to ban the substances and methods because they give an athlete an unfair advantage over non-doped athletes was also very disputable. These items reflect scientific and technical achievements, and, in all cases, where there are unequivocal evidence of their positive effects on sports performance and no medical contraindications, their use seems justified.

Today, high performance sport is the scene for the implementation of the latest advancements of science. Organizational and managerial framework, financing, sports uniform, equipment, fitness equipment, diagnostic systems, dietary technologies, recovery aids, pharmacological agents, and much more, all this, if properly used, can bring an unfair advantage over other athletes. Every major sporting event gives a number of examples of advantages over the competitors that an athlete has if he uses the scientific innovations. This is a natural process characteristic of any activity, and that is why the argument that an athlete, who apply drugs in a proper way, gets an unfair advantage, is unsubstantiated. Athletes have the same advantage when they use new effective constructions of skis, bikes, sleds, boats, swimming suits, skates, the effective diet and drinking regime, programs of psychic regulation, etc., etc. Moreover, it is known that the basis for many outstanding achievements of recent years was the use of substances, which were allowed initially, but later were banned.

Equally vulnerable was the argument constantly declared by representatives of the anti-doping services, according to which the anti-doping fight is motivated solely by the concern to preserve the health of an athlete. The extend of the list of prohibited substances and methods has long gone beyond the bounds required to maintain the health of athletes, deprived them of the ability to use many of the advancements of medicine for preventive and curative purposes, not to mention the stimulation of the efficiency of the training process. In this regard, the athletes have become the only employees of dangerous occupations that are deprived of the right to protect their health with effective drugs, and to prevent and control not only occupational diseases, but also ordinary common diseases [3, 11, 13, 40 and 41].

The greatest danger to the health of athletes is the practice of ergogenic pharmacological substances illicit buying on the black market from random people that was established in high performance sport. This is understandable, given the lack of proper education and tight control by the anti-doping services over the actions of the athletes, coaches, and doctors related to the acquisition, transportation, storage and use of doping drugs, as well as sanctions for such violations. Substandard medicines, which flooded the black market, have become an additional serious factor of risk for the health of athletes.

The system of organization and carrying out testing, as well as the objectivity of the test findings were constantly criticized. The cases where insufficiently reliable methods were used and the lack of system in the organization of control: regular testing of some athletes and liberal attitude to others, were of particular concern. The system of sanctions appeared to be completely one-sided since the entire responsibility and heavy penalties were imposed only on the athlete, but there were cases where athletes involved in doping did not even know that they were treated with prohibited drugs or could not assume that prohibited substances were present in beverages or food.

It became apparent that a lot of victories and records at the Summer Olympics, the Winter Olympics and World Championships in sports such as athletics, weightlifting, swimming, cycling, rowing, speed skating, cross-country skiing, biathlon, and several others, were won or broken through the use of prohibited substances and methods or substances and methods that were allowed at the time of the competition, but then banned. A huge number of objective and subjective grounds were accumulated for this stating including the reports of anti-doping laboratories, expert opinions, confessions of athletes, doctors, and coaches, the results of litigation, etc.

The described phenomenon occurred against the backdrop of full activities of anti-doping services that eloquently proved ineffective anti-doping policy in those years. It is increasingly recognized that Olympic sport has largely turned into an arena of competition between pharmaceutical companies, international and national doping control systems, medical and biological experts, coaches, and athletes, focused on the widespread use of stimulants on the one hand, and anti-doping laboratories, which are aimed at the detection of these drugs' use and the imposition of appropriate sanctions on the other. In such circumstances, experts of any country, who are serious about Olympic

training system, are faced with the choice of own attitudes and the formation of an appropriate approaches to the issue. The situation has also worsened as a result of the imperfection of the anti-doping system that has led to its use as a tool to discredit the sport of individual countries and to eliminate competitors in the international sporting arena.

The head of the IOC's medical commission Alexandre de Mérode, who was in charge of the anti-doping fight for many years, was perfectly aware of all these difficulties and tried to impede the proliferation of doping and not to harm sport and athletes. He was willing to compromise, he turned a blind eye to the positive findings to the test in some cases and he was not inclined to repressive measures, he searched and did not find a solution to the issue, knowing full well that conflicts and scandals related to doping will always occur and power solutions will be ineffective. So he took the desire of younger and radical fighters against doping to establish the World anti-doping agency that should be independent from the IOC and ISF with a quiet skepticism.

The situation with the problem of doping in Olympic sports gave the foundation for one of the influential members of the Executive Committee of the IOC and the candidate for the post of IOC President Richard Pound to make a proposal at the regular election in 1998 for the establishment of an independent anti-doping agency that will be beyond the control of the IOC and other organizations within the International Olympic system.

At that time, the IOC has experienced hard times due to the corruption scandal involving allegations of bribery used to win the rights to host the 2002 Winter Olympics in Salt Lake City, and Juan Antonio Samaranch, who was concerned about more important, in his view, problems facing the Olympic movement, has agreed to establishment of such an agency.

This question was raised at the World conference on doping in sport, held in February 1999 in Lausanne. Working group for the preparations of the Conference was headed by Richard Pound. Under his leadership, the membership of the Conference was determined, which included, along with representatives of all branches of the International Olympic movement, representatives of the governments of different countries and anti-doping services. After difficult discussions, the decision to create the World Anti-Doping Agency (WADA) was endorsed. In November 1999, WADA was established as an independent private law foundation structured on the basis of equal representation of the Olympic movement and public authorities. Richard Pound became the first president of WADA. The Agency was composed of representatives of the IOC, NOCs, ISFs, and Olympic athletes.

Unfortunately, WADA was created in haste without serious analysis of the problem and prepared documents, on the basis of the same approach and by the same people who not only were not getting closer to the solution of the issue of doping in the 1980s-1990s, but also have exacerbated it.

WADA defined the following objectives of its activity in the Statute:

1. To promote and coordinate at international level the fight against doping in sport in all its forms including through in and out-of-competition; to this end, the Foundation will cooperate with intergovernmental organizations, governments, public authorities and their public and private bodies fighting against doping in sport.
2. To reinforce at international level ethical principles for the practice of doping-free sport and to help protect the health of the athletes.
3. To establish, adapt, modify and update for all the public and private bodies concerned, including the IOC, ISFs and NOCs, the list of substances and methods prohibited in the practice of sport.
4. To encourage, support, coordinate and, when necessary, undertake, in full cooperation with the public and private bodies concerned, in particular the IOC, ISFs and NOCs, the organization of unannounced out-of-competition testing.
5. To develop, harmonize and unify scientific, sampling and technical standards and procedures with regard to analyses and equipment, including the homologation of laboratories, and to create a reference laboratory.
6. To promote harmonized rules, disciplinary procedures, sanctions and other means of combating doping in sport.
7. To devise and develop anti-doping education and prevention programs at international level, in view of promoting the practice of doping-free sport in accordance with ethical principles.
8. To promote and coordinate research in the fight against doping in sport.

From the earliest days of existence, WADA has been particularly active in the following fields:

- development of agreements with international federations of Olympic sports on in-competition testing and unannounced out-of-competition testing;

- broadening the practice of testing athletes and tightening sanctions, expanding the list of prohibited substances and methods, relying on the capabilities of the IOC-accredited anti-doping laboratories;
- formation of own independent anti-doping policy and receiving its support from the IOC, NOCs, ISFs, national governments, and international organizations (UN, Council of Europe, UNESCO, etc.).

Following the announcement of main objects of WADA, it became clear that at least a few things will cause serious issues in the anti-doping fight. Firstly, among the variety of WADA's activities there was not allocated the essential one: large-scale cooperation with professionals directly involved in the training of athletes (coaches, doctors, scientists, dietitians, etc.) to create and develop for different sports the model programs of pharmacological support of the training and competitive process aimed at preventing occupational diseases, rehabilitation after injuries and overtraining, improved utilization of functional capacities of the athlete's body in training and competitive activities, accelerating recovery responses, etc. The absence of such activity could not but lead to a hidden, constantly evolving confrontation between anti-doping laboratories and WADA, on the one side, and coaches, doctors, scientists, and other experts working directly with athletes, on the other. Secondly, the content of the last section seemed to be concerning, moreover, in practice, it became a major in WADA's activities and, at the same time, the source of most of its problems, because the agency took as a basis for its work the creation of "own independent anti-doping policy" instead of development and implementation of common policy together with the IOC, ISFs, and the largest academic centers. Thirdly, WADA was not ready to develop on the basis of the achievements of sports science, medicine, pharmacology, and nutrition an entirely new preventive and not punitive approach for the fight against doping, and went on the way of bankrupt approaches implemented by the IOC in previous years [13]. These principal methodological errors have to lead and, ultimately, led not only to a heavy crisis in the system of the anti-doping fight in Olympic sport, but also turned the issue of doping and fight against it into a serious risk factor for the entire Olympic movement.

For a short period of activity (1999-2003) much has been achieved by WADA:

- serious attention of the world and media has been attracted to the issue of doping in sport and begun the cooperation in this field with the structures of the UN, Council of Europe, UNESCO, etc.;
- it has significantly strengthened the role of the agency itself and, with the support of IOC's leadership, turned it into a body superior, in terms of anti-doping activities, not only to the NOCs and the majority of ISFs, but also, to a certain extent, to the IOC and to individual provisions of the national legislations of different countries;
- it has actively promoted its own independent anti-doping policy and ensured, mostly, its support from the IOC, NOCs, ISFs, national governments, and international organizations;
- it has dramatically intensified the practical activities that were confined mainly to expanding the List of prohibited substances and methods, increasing test coverage, particularly during the training process, and tightening penalties for doping;
- it has developed, discussed and adopted in 2003 at the World Conference on doping in sport the Anti-Doping Code, which predetermined the activities of the overall anti-doping system.

HISTORY OF THE WORLD ANTI-DOPING CODE ADOPTION AND ITS SPECIFICS

The most important field of WADA's activity since its inception in 1999 was the preparation for the adoption of the World Anti-Doping Code, which would replace the outdated Olympic movement Anti-Doping Code that suffered from serious deficiencies.

Before analyzing the basic provisions of the World Anti-Doping Code, it should be noted a highly active and uncompromising position taken by WADA in promoting developed by it draft Code in the International Olympic system, national governments, and authoritative international organizations.

Skillful political maneuvering allowed WADA to ignore most of the serious criticisms and adopt the Code at the World Conference on doping in sport held in Copenhagen, in March 2003. The Conference was preceded by a series of international events held under the auspices of the IOC and UNESCO, with the participation of the heads of the NOCs and the ISFs, Sports Ministers of different countries, as well as by several meetings of the International intergovernmental consultative group on anti-doping in sport.

The Conference adopted the third version of the Code, prepared with taking into account some critical comments received from organizations and experts after the consideration of the first and second versions, which

helped to improve the document and to make it more flexible and understandable. Nevertheless, the overall approach and the principal methodological framework of the Code practically were not affected and ultimately the original wording proposed by WADA was adopted that provided a legal basis for its practice during the preceding few years.

It is important to note a principal thing associated with the discussion of the anti-doping policy and the draft Code at all events organized by the IOC and WADA. Representatives of anti-doping service, headed by WADA, the heads of governmental and public organizations (sports ministers, presidents and secretaries general of the NOC and ISFs) mainly were involved in discussion of the issue. As regards the professionals really involved in preparing athletes (coaches, sports doctors, scientists working in the field of athletic training, special nutrition, the use of recovery and stimulating aids, etc.), they were virtually excluded from the discussion of the problem.

This had a significant impact on the nature and content of the Code, suggestions and comments to it, and refinements based on them. They affected mainly the organizational and legal bases of the anti-doping activities. As regards the analysis of the content of the Code and its refinement from the standpoint of the realities of the modern sport and achievements of sports medicine, sports physiology, psychology, biochemistry, pharmacology, theory and methodology of training athletes, this aspect of the case practically fell out of consideration.

It was clear already in December 2002 in Moscow and in January 2003 in Paris during meetings organized by WADA to discuss the problem of doping in sport that the Anti-Doping Code would be adopted at the World Conference on doping in sport in Copenhagen in March 2003. The Code was actively imposed despite the sharp criticism and clear unacceptability of a number of sections. For example, the leader of the meeting in Moscow quickly curtailed the discussion of the draft Code accompanied with the strong criticism, vowing to take into account criticisms and rework the document. However, a month later virtually the same version of the Code was presented at the UNESCO headquarters in Paris, but with comments that it was revised on the basis of the discussion in Moscow. The same operation was conducted by WADA's heads after the discussion of the Code in Paris, where it was criticized equally sharply. As a result, the controversial and low-quality document was submitted to the participants of the Conference, where the adoption of the World Anti-Doping Code was decided.

As recognized by Richard Pound, the Code was prepared in a very short time frame and reworked with great difficulty making the way through the huge number of complaints and criticisms. Even at the Conference, which culminated in the adoption of the Code, not only the heads of ISFs, especially of football and cycling federations, have drawn attention to the apparent deficiencies in the document, but also representatives of national governments didn't take outright "pushing" of imperfect Code. Pound himself also referred to that, when noted achievements in adopting the Code of the former Director General of the IOC and the Chair of the Conference resolution drafting committee, F. Carrard, who "had shown a remarkable ability to manipulate, 'sweet talk' the issues, persuade, and accuse" to handle difficult situations when promoting the Code [47].

All the issues that have emerged during the discussion, adoption, and subsequent implementation of the World Anti-Doping Code into the practice of high performance sport were due to the fundamentally misguided approach detailed in the version adopted in 2003 that involved, among others, the strange and unscientific definition of "doping" along with the contradictory and vague anti-doping rules and reasons to include various substances and methods into the list of banned items. This can be illustrated by following excerpt from the Code [62]: "Anti-Doping Rules are not intended to be subject to or limited by the requirements and legal standards applicable to criminal proceedings or employment matters. The policies and minimum standards set forth in the Code represent the consensus of a broad spectrum of stakeholders with an interest in fair sport and should be respected by all courts and adjudicating bodies". This approach, which is very strange from a legal point of view, has been worsened by a peculiar definition of "a broad spectrum of stakeholders", which is represented exclusively by officials of the organizations of the international Olympic system (IOC, NOCs, and ISFs), national governing bodies of sports, and a number of international organizations. At the same time, the dependence of IOC's financial support to NOCs and ISFs on the attitude to the Code was strongly emphasized. Among scientific experts, exclusively professionals of anti-doping services were present, such as lawyers, economists, and analysts in the fields of chemistry and physics. As regards professionals in preparing athletes, as well as in sports physiology, sports medicine, genetics, pharmacology, and nutrition, along with relevant research centers, virtually no place had been found for them among the "wide range of parties". And this was not accidental, but a consequence of policy implemented during the preparation of the Code, as was cynically, but frankly expressed by R. Pound to justify the need for the establishment and the operation principles of WADA:

“fundamental error made by the IOC in the field of doping was that the leadership remained in the hands of scientists, and not universal executives”.

The results of the activities of the “universal” executives and isolation of scientists and practitioners, especially coaches and sports doctors, from the issue of doping in sport become apparent from the objective analysis of the status in this field prior to the creation of WADA and in current time. Doping use has not been decreased, while the used substances and methods have become much more diverse, sophisticated, difficult to identify and dangerous to health; the number of abuses and scandals have increased; unacceptable atmosphere of suspicion, accusation, denunciations, psychological tension was created around elite athletes that adversely affected the quality of their preparation and competitive performance.

Around the Olympic sports, unlike many professional sports, an atmosphere was created and constantly maintained, that undermines its credibility, calls into question the achievements of athletes, is accompanied by disbelief and scandals, affects the interests of sponsors and partners, poses a threat of declining popularity to the Olympic Games and undermines the financial independence of the international Olympic system.

Constant refinement and updating of the Code, the adoption of its successive versions do not resolve the problem, since they concern mainly various technical details, and not misguided approach adopted many years ago during the preparation of the 2003 Code.

In order to try to explain the reasons for such situation and chart a way out of the apparent deadlock, it is advisable to go to the essentials of the content of the Code and its implementation in the practice of training and competitive activity of an athlete.

FUNDAMENTAL RATIONALE FOR THE WORLD ANTI-DOPING CODE CONTENT

In all versions of the Code, starting from the one adopted in 2003 and to the latest of 2015, the desire “... to preserve what is intrinsically valuable about sport, that is often referred to as ‘the spirit of sport’” was declared as a fundamental justification for this document and the implementation of appropriate practical activities. “The spirit of sport is the celebration of the human spirit, body and mind, and is characterized by the following values: ethics, fair play and honesty; health; excellence in performance; character and education; fun and joy; teamwork; dedication and commitment; respect for rules and laws; respect for self and other participants; courage; community and solidarity” [61-64]. However, colorful epithets alone are clearly not enough for fundamental justification for the anti-doping policy. Doping is a phenomenon, which poses a serious issue for Olympic sports, and an approach to the solution of this issue will determine the credibility, popularity, stability, and development of most Olympic sports, as well as the fate of many athletes who have dedicated their lives to high performance sport. Therefore the approach used as a foundation for the Code should be based on the objective scientific laws and principles, concise criteria, and not quite an abstract concept of the “spirit of sport”, especially since it is employed too ambiguously and has lots of different meanings, including the diametrically opposed.

Not always the “spirit of sport” is equated with the ideas, such as the glorification of the human spirit, body and mind, and categories, such as honesty, solidarity, respect, team spirit, courage, etc. To illustrate this point it is sufficient to cite excerpts from the essay “The Sporting Spirit”, written by the famous British writer and publicist George Orwell back in December 1945. “I am always amazed when I hear people saying that sport creates goodwill between the nations... You play to win, and the game has little meaning unless you do your utmost to win. On the village green, where you pick up sides and no feeling of local patriotism is involved, it is possible to play simply for the fun and exercise: but as soon as the question of prestige arises, as soon as you feel that you and some larger unit will be disgraced if you lose, the most savage combative instincts are aroused. Serious sport has nothing to do with fair play. It is bound up with hatred, jealousy, boastfulness, disregard of all rules... There cannot be much doubt that the whole thing is bound up with the rise of nationalism — that is, with the lunatic modern habit of identifying oneself with large power units and seeing everything in terms of competitive prestige. If you wanted to add to the vast fund of ill-will existing in the world at this moment, you could hardly do it better than by a series of football matches between Jews and Arabs, Germans and Czechs, Indians and British, Russians and Poles, and Italians and Yugoslavs, each match to be watched by a mixed audience of 100,000 spectators”. This point of view is not obsolete, but has supporters in the modern world. However, we quote the words of George Orwell, not because we agree with his vision, which, in our view, is one-sided and biased, but to show that the philosophical concept of “spirit” refers to intangible

basis, associated with categories such as feeling, intuition, consciousness, imagination, etc., it is the subject of perennial philosophical discussions and has no objective evaluation criteria.

However, the concept of “spirit of sport” that is characteristic enough for the modern sport and quite an understandable desire to idealize it would not be a problem if the fundamental articles of the World Anti-Doping Code were associated not so much with the “spirit of sport”, but rather with scientific achievements and the realities of life. As shown by the analysis of the document, unfortunately, this is far from being the case, as demonstrated by the so-called WADA Strategic Plan 2004- 2009 released under the eloquent slogan “Play true”. According to the Plan, all five objectives set for itself by the Agency are associated exclusively with the introduction of the imperfect World anti-doping code and display the lack of any attempts to cooperate with ISFs and scientific and educational institutions in addressing shortcomings and contradictions of the anti-doping system and eliminating the headstrong forceful introduction of anti-doping rules.

As the main criteria of the effectiveness of its activities, WADA cites empty phrases without specific meaning and inconsistent with the real activities of anti-doping services like: “We are impartial, objective, and balanced”; “We avoid improper influences or conflicts of interests that would undermine our independent and unbiased judgment”; “We observe the highest ethical standards”; “We develop policies, procedures and practices that reflect justice, equity and integrity”; etc. Thus, concise and evidence based approach to combat doping was substituted by WADA with the appeals and slogans devoid of specific content and based solely on the concept of “spirit”.

The results of this approach and respective practical activities are evident from the many scandals related to the activities of WADA and laboratories accredited by WADA since the establishment of the Agency and, ultimately, put it in a dire crisis unfolded around the problem of doping before the games of the XXXI Olympiad 2016 in Rio de Janeiro.

THE DEFINITION OF THE DOPING CONCEPT AND ANTI-DOPING RULES

It is a copybook maxim that combatting any negative phenomenon requires a clear definition and elicitation of its objective typical features rather than abstract ideas about it. And it is the scientifically substantiated concept of each particular phenomenon and its attributes that makes up a necessary basis for the further development, enrichment and practical application of the concept. Hegel noted that the concept is “in the first place a synonym for understanding the essence of a matter... The concept reveals the true nature of a thing, and not its similarity with other things”.

Therefore, to assess the current situation with fight against doping in the Olympic sports as well as its effectiveness, it is first of all necessary to analyze the concept of “doping” and the definition assigned to it by WADA, i.e. the organization currently leading the countermeasure activities.

The origin of the word “doping” is not fully investigated. Most linguists derive it from the word “dop”, which in the dialect of the Bantu (one of the African nations) stands for a narcotic drink used in religious ceremonies. In English, this word used in a somewhat modified form (“dope”) originally meant a drug mixture to stimulate racehorses. In the first edition of the Great Soviet Encyclopedia (1931) the following definition was found: «Dopping (with double “p” in the original – *the author’s remark*) is the general term for any stimulants administered to racehorses before contests in order to artificially increase their pace.

Gradually the word “doping” entered the sports terminology and at the same time the terminology of some allied sciences such as medicine, veterinary medicine, law and others. The concept of doping was unified and defined [62, 64].

Considering the concept as a logically justified and formulated idea of the subject, expressing its essential characteristics, it should be noted that there are no problems or contradictions with the notion of doping. Summarizing the definitions suggested by numerous domestic and foreign encyclopedias and specialized publications, doping is regarded as pharmacological and other agents for temporary enhancement of physical and mental bodily activities, mainly used to improve athletic performance. Most definitions emphasize immediate and short-term effect of pharmacological and other agents that stimulate physical and nervous activities.

Relating to sports, this concept was successfully specified and adopted by the Congress of Sports Medicine in Strasbourg as far back as 1965: “Doping is the injection into a body of any person made in any possible way of a substance alien to this body, of some physiological ingredient in an abnormal quantity or some other substance in an unnatural way to artificially and unfairly improve an athlete’s results in the course of participation in competitions”.

This definition is the most appropriate one both in terms of full coverage of the phenomena related to the defined concept as well as its clarity and conciseness. It contains a logical and clearly articulated general notion of the subject, highlights its essential characteristics and defines methods of their establishment. It is therefore quite natural that this definition was supported by the IOC, which started to view doping as “the intake or the use of substances alien to a body in any form, or of physiological substances in abnormal amounts administered through abnormal methods to healthy people with the sole purpose of ensuring an artificial and unfair enhancement of competition achievements” [23]. The use of this definition of doping limits the number of prohibited substances to the ones truly alien to a human body, since it is well known that the development of most pharmaceuticals is based on mobilization, stimulation and normalization of processes natural to a body, and not on the use of substances alien to it, which may be recommended only in cases of emergency (e.g., psychostimulants, drugs). Therefore it is very difficult to prove that pharmacological and other agents used in sports do not fit into natural processes occurring in a body. And it is equally difficult to detect their excessive application [3].

The authors of the World Anti-Doping Code understood the above facts very well, so they adjusted the definition of doping, the anti-doping rules and other provisions of the Code not to the objective scientific knowledge but to their own modest capabilities. Without getting deep into the history difficult for WADA in this regard, we shall focus only on the definition existing in the current version of the World Anti-Doping Code: “Doping is defined as the occurrence of one or more of the anti-doping rule violations set forth in Article 2.1 through Article 2.10 of the Code.” [64].

Such a definition causes nothing but perplexity as it contradicts all the definitions of this concept given in encyclopedic and specialized resources, not to mention the violation of elementary requirements of the formal logic. It becomes absolutely obvious if we study the list of these “anti-doping rules”. The list of violations includes not only the “presence of a prohibited substance or its metabolites or markers in an athlete’s sample” (2.1), but also “failing to submit the information on whereabouts” (2.4), “attempted use by an athlete of a prohibited substance or a prohibited method” (2.2), “possession by an athlete of any prohibited substance or any prohibited method”, “possession by an athlete support person of any prohibited substance or any prohibited method” (2.6), “prohibited association” (2.10), which is defined as communication with any experts (coaches, doctors and others), who are serving a period of ineligibility for the violation of anti-doping rules or have been found guilty in the course of investigations on doping and so on [64].

Thus, in the Code the definition of doping as well as of the anti-doping rules have been tailored to the existing imperfect and contradictory practices of the fight against doping and are designed to create a formal basis for policies and practical activities of WADA. A deliberate methodological error is obvious and it resulted in substitution of concepts, converting “doping” from a substance, stimulating physical and mental activities of people to violation of the anti-doping rules, the rules, which are vague and allowing their liberal interpretation, is obvious. Unfortunately, in these cases the Code authors focused on the concept of a “spirit” rather than on the accurate and scientifically based definition of the doping concept. Here again, we should refer to the words of Hegel, who noted that “the concept reveals the true nature of a thing, and not its similarity with other things”.

CRITERIA FOR INCLUDING SUBSTANCES AND METHODS IN THE PROHIBITED LIST

The absence of logics and the vague definition of the starting provisions, which serve as a fundamental justification for the fight against doping, the definition of doping, the anti-doping rules, led to contradictions and controversies in the subsequent sections of the Code, in particular, in such an important section as the “Criteria for Including Substances and Methods on the Prohibited List”. In particular, “A substance or method shall be considered for inclusion on the Prohibited List if WADA, in its sole discretion, determines that the substance or method meets any two of the following three criteria:

- Medical or other scientific evidence, pharmacological effect or experience that the substance or method, alone or in combination with other substances or methods, has the potential to enhance or enhances sport performance;
- Medical or other scientific evidence, pharmacological effect or experience that the use of the substance or method represents an actual or potential health risk to the athlete;
- WADA’s determination that the use of the substance or method violates the spirit of sport [64].

The Prohibited List may also include materials and methods if WADA determines there is medical or other scientific evidence, pharmacological effect or experience that the substance or method has the potential to mask the use of other prohibited substances or prohibited methods [64].

There is no need to prove that such vague criteria allow WADA including any substance or method on the Prohibited List. Any natural and harmless agents, affecting certain functional systems and mechanisms have the potential to improve performance directly or indirectly. Any, even the most harmless substances of vegetable origin, most vitamins and microelements, depending on the conditions of their application and dosage, can bear a potential health risk. Plain water consumed in a certain way is a powerful agent for influencing the performance and sports results in all sports associated with a continuous activity. Various types of dietary manipulations may seriously affect sports performance. The same effects may be produced by breathing in gas mixtures with increased oxygen content, undergoing various light procedures, electropcedures, aromatic impacts and other.

Introduction of such criteria completely blurs the line between prohibited and permitted substances and methods. And WADA has gained an opportunity to manipulate with the Prohibited List, which appears particularly dangerous if you consider the fact that according to the Code WADA's "determination on the classification of substances into categories on the Prohibited List, and the classification of a substance as prohibited at all times or In-Competition only, is final and shall not be subject to challenge". The situation gets complicated even further if you consider that, under the Code, none of the substances that belong to the prohibited class cannot be used, even if it is not mentioned in the list in view of the identity of its pharmacologic effects with the prohibited substances. No complaints about the facts that athletes have administered substances, not included into the list, shall be accepted by the anti-doping authorities. Such provisions of the Code get particularly dangerous if you take into account the fact that the adopted classification of substances is incorrect and often hardly explicable by modern medicine and its illogical principle of organization remains unchanged [3].

Therefore, experts point out quite reasonably that the distinction between prohibited and permitted substances is determined exclusively by the administrative decision of WADA, relying on the non-scientific definition of doping, subjective criteria and vague ideas about the "spirit of sports" rather than on scientific and medical foundations [13, 49]. Even greater confusion is caused by WADA's constant manipulations with the content of the Prohibited List, allowing the use of certain substances and prohibiting the use of others, transferring permitted substances to the Prohibited List and vice versa transferring prohibited substances to the Permitted List [40], as well as introducing absolutely unreasonable norms of banned substances in samples of athletes.

Studying publications and presentations of anti-doping experts, one may be shocked by the information about the catastrophic impact of prohibited substances on human health and deaths caused by their application. However, an unbiased approach shows that this information is mostly of an emotional and hypothetical nature. In most cases, we do not find a correct substantiation that it is the use of prohibited substances and not any other factors (intensive physical activities, hyperthermia, etc.) that has led to negative consequences or individual tragic incidents. The fact of their use itself is considered sufficient for such conclusions.

If we analyze the statements of another group of experts, in particular, the formulators of those substances, it is easy to find an opposite opinion that most substances prohibited in sports produce a beneficial effect on the course of adaptive, recovery and rehabilitative reactions, improve immune responses, reduce risks of injury and illnesses and have no significant harmful effects if administered in substantiated dosages and with rational medication regimen.

Thus, the inadequate definition of doping and the criteria for including substances and methods into the Prohibited List stipulated by the Code have naturally led to formation of a similar, in fact, incorrect and illogical official List of Prohibited Substances and Methods, which bothers with its size and is constantly growing. What surprises even more is the provision accepted in the Code, according to which WADA determines a substance or a method to be included into the Prohibited List in its sole discretion, and the decision to include a substance into the Prohibited List, classification of substances etc. is declared final and cannot be a subject of discussion. WADA decides if the use of a certain substance or method violates the spirit of sports. No complaints about the fact that athletes have administered substances, not included into the List by the anti-doping authorities, will be accepted etc.

Such permissiveness, ambitiousness and impunity, longing to avoid any external control are typical of WADA from the moment of its establishment, which is absolutely unacceptable in such a complex and ambiguous matter. It

becomes particularly obvious if we analyze the team and qualifications of experts of this organization. We will not find any leading experts from the field of athletic instruction, sports pharmacology and sports medicine.

IMPROVING THE WORLD ANTI-DOPING CODE

A blatant inadequacy of the World Anti-Doping Code adopted in 2003, its inconsistency; weak scientific and legal validation along with corresponding practical activities of anti-doping laboratories resulted in an extremely negative evaluation of the anti-doping system by athletes and experts from different spheres. This forced WADA to initiate activities on resolving contradictions and coping with deficiencies immediately after the document adoption. From that moment on a process of the Code revision has been in progress until now.

It was natural to expect that the subsequent version of the Code would meet the criticisms, reflecting an obvious inadequacy of the document and its extremely weak scientific rationale. But it has not happened, although the new version reflects many changes and adjustments.

But the latter only addressed the interests of the anti-doping system. The Code provisions subject to constant criticism were almost not affected. And yet obscure were the fundamental grounds for the Code, illogical was the definition of the doping concept, contrived were the anti-doping rules. The absolutely erroneous criteria for the placement of substances and methods on the Prohibited List were not changed and so on.

At the same time, the new version of the Code differed from the previous one in its severity and legal precision. However, these changes did not show any signs of concern for health and interests of athletes, the quality of their training. All additions and adjustments were designed to enhance the rights of WADA and to ensure optimal conditions for its activities.

Excessive strictness of the anti-doping policy inherent to the previous Code was preserved in its subsequent version. Moreover, significant changes were implemented to tighten control and punishment measures. Particularly strong was the indignation aroused by those provisions aimed to control the location of an athlete, as well as by methods of receiving information and collecting evidence of violations of the anti-doping rules. In accordance with the updated Code, an athlete had to provide WADA with the schedule of his whereabouts for three months ahead, determining one hour a day when he would be available for the submission to his doping tests.

In case of positive results of doping tests, the new version of the Anti-Doping Code authorized anti-doping officials to apply punishment deliberately and on a wide scale on the basis of some vague and unclear criteria such as “no intention to improve sports performance”, “venial fault”, “non-intentional nature”, “extenuating or aggravating circumstances”, “cooperation with the Anti-Doping Organization”, “youth and lack of experience” and so on.

It is obvious that these changes were WADA’s forced response to constant accusations of inadequacy and prejudice that were being hurled at the Agency throughout all years of its operation. But even more obvious was the inferiority of innovations that could not but lead, and actually led, to subjectivity, double standards and, of course, created a fertile ground for corruption and interference of outside forces.

Such approach to the improvement of the anti-doping system initiated a new round of debate, controversy and criticism, demands for the further improvement of the Code. And many years of work on the document that followed resulted in its next version that came into force on January 1, 2015. But again, during the preparation of the document the same approach as in the preparation of the previous versions was applied: formalism, dogmatism and conservative thinking. Achievements of various sports sciences, opinions of many opponents, analysis of the modern process of athletes’ training, considering immense training and competitive loads, remained in no demand, a number of fundamental rights of athletes were ignored, which is absolutely unacceptable in all spheres of human activity and other.

According to its authors, the new version of the World Anti-Doping Code was to serve as a basis for harmonization of the anti-doping policies. Indeed, this document is to some extent capable of balancing, making clearer the connections between different directions of the anti-doping activities, i.e. making them more harmonious. As to the correlations with the factors external to the anti-doping activities (the rights of athletes, the system of their training, competitive activities and lifestyle, emotional and psychological atmosphere of training and competitions, medical and scientific support, nutrition and recovery procedures etc.), being already far from harmonious, they may turn to the totally chaotic ones. For an athlete, the Code requirements are not only a constant stress-factor producing a very negative impact on health, training quality and participation in competitions, but also depriving him of a chance

to benefit from modern achievements of medicine in terms of prevention and treatment of diseases. The risk of that is very high in view of the modern sports loads that impose extreme pressure on a human body, decrease its immune resistance and increase the chances for various diseases, not to mention the multiplied risk of injuries if compared to people leading ordinary life. All of the above will be confirmed later on in detail.

The World Anti-Doping Code has become extremely voluminous, complex and difficult to understanding document. The code is comprised of 25 articles, each of them consisting of from 2-3 to 10-13 parts (a total of about 120), lots of comments, additions, amendments, various kinds of explanations, examples, and exceptions (often unexpected). And all this applies only to the core document. Besides this, there exists a constantly renewing and rather controversial Prohibited List. Various instructions of national Anti-Doping Organizations, different sports federations are being corrected and so on. No qualified lawyer, nor a qualified pharmacologist, nor a qualified sports doctor can see over this whole volume of documentation. Only a team of these experts are able to labor the content of the Code with all its bureaucratic details. The task gets even tougher for a trainer, physiotherapist, psychologist or other expert involved in the process of athletic training. Therefore, experts reasonably argue that it is impossible to comply with the requirements of the Code without special instructions for a wide range of professionals involved in training and competitive activities of athletes [40]. Unfortunately, WADA does not think about this.

The most ridiculous statement of the Code is that the blame for the violations of the whole clutter of articles, sections, exemptions, clarifications, etc., amounting to hundreds, is laid on an athlete, who has neither knowledge nor experience in this area. Acquiring such knowledge and complying with all requirements takes considerable time, which is absolutely incompatible with a busy way of life and education of a modern athlete.

The former president of the European Court of Human Rights Jean-Paul Costa ensured the legal propriety of the new edition of the Code, the document was deliberately supplemented with phrases on principles of proportionality and human rights, i.e. WADA monitors closely any responses to its actions and tries to immediately alleviate any indignation with regard to any abuse of rights of an athlete, although in a purely formal way. In addition to that, the Code states dogmatically: "Methods of analysis and permissible limit values are presumed to be scientifically valid". And this goes without any sufficient grounds for that, without taking into account any specific genetically determined peculiarities of each human body [6], in contradiction with scientifically based and generally accepted knowledge, despite openly derisive comments of experts.

The "scientific validity" of methods of including substances into the Prohibited List, their analysis and permissible limit values may be demonstrated by one of the recent WADA's cases: their emotional, with no serious justification, inclusion of meldonium, a synthetic analogue of gamma-butyrobetaine, into the list of Prohibited Substances. The substance resides in the cells of a human body and contributes to the prevention of fatigue-stress, boosts immunity, produces a cardioprotective effect. Hasty accusations of a huge number of athletes a few months before the Games of the XXXI Olympiad in Rio de Janeiro triggered a strong reaction on their part from a number of experts, media and the general public. A developer of the drug, a well-known Latvian scientist Professor Ivars Kalvins said that WADA's activities associated with this substance were frankly illiterate from a scientific point of view and violating basic legal standards. At the same time, he noted that numerous lawsuits to WADA by the athletes, demanding compensation for their moral and material losses would become a fair solution. This would simply destroy the organization.

Unfortunately, WADA protruded its opinion on the infallibility of testing to sports federations and other international and national sports organizations, though practice and results of scientific studies show that it's not true [19, 20, 39, 40]. And when athletes try to contest the results of testing, they fall under the burden of multiple standards, allowing violent interpretation, manipulation, high legal expenses, hopelessly seeking for objective solutions [13, 20].

It should be noted that almost all the innovations introduced into the Code were called for solely by WADA's desire to facilitate its own work by limiting the rights of athletes. This was manifested in tightening of sanctions, and in the content of the Athlete Biological Passport, and in the athlete availability rules, and in the expansion of the Prohibited List.

THE ROLE OF WADA'S MANAGEMENT IN SHAPING THE ANTI-DOPING POLICY

The movement of anti-doping activities towards a science-based stream is largely dependent on WADA's management. It is absolutely clear that the anti-doping policy, the Code were mostly shaped under the influence of

biased and radical ideas of Richard Pound, a distinguished man, who has done a lot for the IOC's financial capacity, but a lawyer by training and an economist according to his previous activities at the IOC. So, we should not be surprised that the core of anti-doping activities was based on economic interests and methods typical of investigative authorities, and not on scientifically based systems of training and sports medicine. After Pound's term in the office had expired, WADA was headed by a prominent expert in the field of economics, a former Prime Minister of the Australian state of New South Wales, a former Federal Minister for Finance in Australia, John Fahey. He was replaced by Craig Reedie, an expert in the field of law, with an experience of organizational work in the field of sports, but not in the field of medicine and athletic training.

If WADA had been headed by a professional knowledgeable in sports medicine, physiology and pharmacology who was familiar with the problems of sports training and understood that modern elite sport as a profession immeasurably surpassed any extreme profession in its requirements to a human body and health risks, the fight against doping would have certainly taken a different path. And then prominent experts from sports and medicine and not biased lawyers and all sorts of personalities known for their immoral and wrongful doings would have been involved to study conflict and disputable anti-doping prevention issues such as those that came up before the 2016 Games in Rio de Janeiro.

Unfortunately, the current managers of WADA, just like their predecessors, are focused on continuing their work in three directions:

- a constant search for new methods of doping detection and all kinds of indirect methods and manipulations that allow blaming an athlete;
- tougher sanctions and the use of different methods to intimidate an athlete, to increase his liability for the violation of anti-doping rules;
- longing to isolate leading experts in the field of physiology, sports pharmacology and athletic training as well as representatives of sports and other organizations who disagree with WADA from the anti-doping policy and activities.

THE POLICY OF DOUBLE STANDARDS

Surprisingly, the policy of double standards in the fight against doping may be clearly evidenced by the memoirs of the WADA initiator, the main developer of its operational strategy and the first president of this organization Canadian Richard Pound. Sensational facts are exposed in the Chapter Presenting Fraud: Doping of Pound's book *Inside the Olympics* [47]. It turned out that when at the 1988 Games of the XXIV Olympiad in Seoul a sample of Canadian athlete, sprinter Ben Johnson, who won the 100-meter race, tested positive for doping, Richard Pound, being Vice-President of the IOC at that time, not only adopted the role of a lawyer for the athlete-offender during the analysis of the latter's case at the IOC Medical Commission, which, in our opinion, is unethical and unacceptable, but also asked Canadian experts to provide him with knowingly false versions of the athlete's innocence, for example, that Johnson had had a drink with a prohibited substance deliberately given to him by someone at some reception or between races.

The IOC President Juan Antonio Samaranch, a wise and experienced politician, warned Richard Pound against the participation in this failing case with a totally foreseeable result, but Pound dropped his contrived arguments at the meeting of the IOC Medical Commission only when the Head of the Anti-Doping Agency M. Donike proved demonstratively that Ben Johnson had not only taken stanozolol, but had been doing it regularly and for a long time. Pound explained his participation in this case with the statement that Ben Johnson was entitled to the best protection available in that situation [47].

It is very difficult to explain in this context what motivated Pound to such oversharing, but it is even more difficult to understand an extremely tough and uncompromising position taken by the Head of WADA Richard Pound towards all other athletes, as well as his words cited at the end of the same chapter: "As long as I am connected to WADA and the Olympic movement, my approach to fraudsters will be such that they might be able to hide for a while, but they will not succeed in getting away" [47].

Of great interest are the opinions of famous athletes on the efficiency of the doping control system and WADA's activities. It is quite clear that many performing athletes are naturally afraid of making cutting remarks with regard to WADA and anti-doping laboratories, but some still venture to speak openly about their painful problem.

One of these athletes is, for example, Yuri Bilonog, a Ukrainian athlete, the champion of the 2004 Games of the XXVIII Olympiad in the shot put, a man who is educated and mature, said: "The problem of doping is a painful topic. I have mentioned it for many times that the World Anti-Doping Agency "has a soft spot" for Ukrainians. See it yourself: once I had to pass a doping test three times within two days (!). This was a direct violation of the international rules, which stipulated that an athlete could be tested no more than two times in two days. I guess they executed someone's order to remove a competitor. In general, as it seems to me, the problem is not in doping as such, but, as I would say, in a "selective" search. WADA can be called a punitive body of athletics, somewhat similar to KGB in the former Soviet Union. According to some information circulating among athletes, Americans simply do not allow anyone with the doping control into their country. At competitions – "You are welcome", and during training periods – "Go check the others". Prior to C. Hunter's disqualification, he was "busted" five times but only received warnings – "Be careful". But later the cards were laid on the table. When he got caught for the sixth time, he was disqualified for two years. No one would be that gentle with us for so long. The first positive doping test leads to punishment... I believe that the fight against doping at this stage is not fair. And if... WADA wants to disqualify someone, it will." [1]. It was not the only case when Yuri Bilonog sharply spoke of WADA activities. Eight years later, in 2012, WADA found a prohibited substance in the athlete's sample. The athlete was stripped of his gold medal. The circumstances of that case, as noted by the media, appeared to be very biased.

Unfortunately, the anti-doping agency has turned into an organization with an ability to manipulate fates of athletes, medals of the Olympic Games and world championships. There are many cases to support this statement. Recalling the above mentioned dramatic final of the 100-meter race at the 1988 Olympic Games in Seoul, the winner of which Canadian athlete Ben Johnson was disqualified subsequent to the result of a doping test and the gold medal was handed over to Carlton Lewis from the US who finished the second. Ben Johnson had to leave Seoul in disgrace, and his name went down into the history of the Olympic sports as an appellation. Quite different was the fate of Carlton Lewis: he was a hero of four Olympic Games, the winner of 10 Olympic medals, 9 of which were Golden. However, there are many allegations that Carlton Lewis regularly administered anabolic steroids. For example, before the Games of the XXIV Olympiad Lewis was disqualified for doping at the US National Championships in Athletics. However, the USOC managed to rehabilitate the athlete motivating that decision with a statement that the doping substance entered the athlete's body "as a result of negligence" [47].

Just as the World Anti-Doping Code had been adopted, a doping scandal related to strongest US athletes broke out on an unprecedented scale. The former director of the USOC Anti-Doping Service Wade Exum presented evidence of more than one hundred positive doping samples of the US athletes for the period from 1988 to 2002. According to Exum, the USOC encouraged the use of prohibited substances, covering up those American athletes who took doping. As a result, as he believes, 19 Olympic medals were won by the athletes who violated the anti-doping rules. Among the suspects were such athletes as Carlton Lewis, Joe DeLoach, Andre Phillips, tennis player Mary Joe Fernandez and others [35].

WADA's reaction to this information was sharp. Richard Pound said that the documents submitted by Exum "proved their longstanding suspicions that the United States were engaged in the doping use concealment" and revealed the content of the letters of the USOC executive director on some American athletes, who were still admitted to the Olympic Games in spite of the positive samples taken during inter-American competitions, and the results of these samples, as it was noted, would be interpreted as the use "by negligence".

However, this case contained one fundamental detail. The facts of the mass doping administration by American athletes were revealed by one of the former USOC managers, generalized and presented by the media, in particular, by Sports Illustrated. But where had representatives of the anti-doping laboratories, which had carried out the tests, had discovered the use of doping and had delivered the materials to the USOC and the NSF been before and why had they hidden the information? Upon seeing that the USOC and the NSF covered violators, why did laboratory managers not inform the IOC, not make the doping facts public, thus having become accomplices in these violations? Does anyone seriously believe that the anti-doping laboratories that had discovered a massive use of prohibited substances by US athletes notified the National Federations of the United States, the USOC, whereas WADA, being in charge of those labs, was kept in the dark? These facts once again demonstrated bias, partisanship and corruption of the international anti-doping system.

Before the 2008 Games of the XXIX Olympiad in Beijing WADA experts implemented a practice of testing athletes in their places of residence and training, which was made possible thanks to National Olympic Committees and national sports federations constantly delivering information on whereabouts of their athletes to the World Anti-Doping Agency. As a result, a number of athletes, caught administering doping during the preparation process, got disqualified and did not take part in the 2008 Olympics. However, after these Games it turned out that many countries represented by their teams in Beijing did not provide WADA with the information on whereabouts of their athletes and avoided out-of-competition testing.

Scandals related to doping in various countries have become commonplace in the Olympic sport that is not surprising if objectively treat controversial and inefficient activities of WADA. Surprising is the fact that in some cases they just go unreported and sink in bureaucratic marshlands, while in the other cases they are artificially inflated and accompanied by widespread investigations and unfair propaganda. In a row of those scandals an especially peculiar was the scandal with the involvement of Grigory Rodchenkov, the former Head of the Russian Anti-Doping Center: he fled Russia after his scandalous dismissal and was found in the United States, where he broke out with sensational but highly controversial and unproven disclosures. But new in these revelations was the fact that Rodchenkov himself, a prominent person in the system of international anti-doping activities, was the formulator of doping mixtures, the organizer of their administration and sample falsification. Equally surprising were Rodchenkov's statements on the incompetence, helplessness and bias of anti-doping experts in the organization of doping control at the XXII Olympic Winter Games in 2014, which were manifested in the large-scale substitution of samples, failure to objectively identify the administration of prohibited substances. Thus, Rodchenkov's hardly understandable self-chastise exerted such a disastrous impact on the image of WADA. After all, WADA is the one responsible for the doping control at the Olympic Games, who appoints a lead organization and a team of numerous experts, representatives from different countries.

RIGHTS OF ATHLETES

Any unbiased person will understand that the World Anti-Doping Code in its current version makes an athlete practically defenseless in front of anti-doping agencies, even if there is no guilt of his or it is questionable. A practice of all anti-doping activities testifies to that, as it is a well-known fact that anti-doping authorities "never admitted that their representatives had committed mistakes in testing samples" [7].

Except for employees of WADA and anti-doping labs, no one doubts that WADA protects a flawed system of anti-doping activities at the expense of health and rights of athletes, effectiveness of their professional activities as if protecting sports purity and integrity [13, 40, 59].

According to the Code, athletes are punished for violations regardless of any accidental causes, minor errors, objective necessity and so on. There is no other way to interpret numerous provisions of the Code such as: "...A violation occurs regardless of the fact whether an athlete has used a prohibited substance with intent or not, by fault, negligence or knowing use...". At the same time a violation takes place not only when tests reveal the presence of prohibited substances in the body of an athlete, but also when "prescription or attempted administration of a prohibited substance or method" has occurred or such substance "was found in possession by an athlete support person associated with an athlete's competition or training location". Such logic suggests that if, for example, some firearms or drugs have been found in possession of staff cleaning up premises of anti-doping laboratories, and this fact affords grounds for the prosecution of the lab management for illegal possession of weapons or drugs [13].

The situation gets critically dangerous for the Olympic sports, in which it is not the doping authority that is created for sports and athletes, but instead athletes and sports themselves become hostages to anti-doping activities. Ridiculous is the policy that transforms from finding evidence of the doping use into a competitive process between an athlete and the Anti-Doping Organization. According to the Code: "The burden of proof on deviations from the international standard on the basis of evidence rests on an athlete. If an athlete succeeds, the burden of proof is transferred to the Anti-Doping Organization, which will have to prove for the hearing panel that these violations have not affected the result of the analysis... Deviations from the International Standard of sampling, other anti-doping violations, which do not invalidate the results, do not deprive them of their legitimate force" [64].

Picture a situation, in which an athlete finds himself, when he needs to cooperate with experts of anti-doping authorities, proving them a legal use of a medical substance or method, bias of the current organization of doping control, inaccuracy or inconsistency of its results, without having adequate knowledge, education and legal protection.

Sacrilegious is the identification of athletes (as it was stipulated in the second version of the Code ready for adoption in 2003), whose tests revealed traces of prohibited substances (even if they had been prescribed by a physician for medical purposes or contained in food supplements unmentioned) with criminal lawyers accepting bribes from clients, psychiatrists having sexual contacts with patients etc. That version of the Code particularly stated: “An athlete who administers doping commits an equivalent violation of the rules applicable to his profession”. One can only feel astonished at the legal provisions of the World Anti-Doping Code, which clearly attempts binding international and national legislations with illegal norms, identifying actions legal for any sphere of life as felony crimes in the field of sports [45]. We must note the adopted final version of the Code dropped this absurd comparison under the influence of criticism, but we considered it appropriate to quote it in the form, in which it was provided in the second version, as it thoroughly reflects the views of WADA.

WADA’s policy for out-of-competition testing, under which an athlete must provide and keep track of his whereabouts information for three month ahead and must be available for representatives of the anti-doping authorities, seems unacceptable. Failure to provide such information or inaccurate data are classified as violations of anti-doping rules and entail sanctions. Such information must be detailed and accessible to plan out-of-competition testing and is usually submitted every three months. The information includes: an athlete’s own address; a schedule of his training; a competition schedule; regular personal activities (work or education); a daily 60-minute gap (between 6:00 and 23:00) when an athlete may be available for testing.

Any sane person realizes that no athlete will be able to provide daily detailed information of such nature for three months ahead and to strictly adhere to such harsh schedule, constantly informing WADA on all changes, so there will always be the events that will violate the described schedule. However, there is also an ethical issue, such severe regulation of sampling procedures at any time restricts personal rights and freedoms of an athlete, curtails the freedom of movement and, in fact, “ties” his entire private life to settings to the anti-doping control rules, and provokes additional emotional stress and may serve as an impairment factor for mental and physical performance. Such approach exercised only in the interests of anti-doping authorities, is not possible for any other sphere of professional activity and crudely violates the rights of citizens. And the procedure of biological sampling itself, with its doping officers, as well as the method of bio-sample transportation and storage raise many questions.

The basis for anti-doping activities should rely on a testing system, which guarantees objectivity and at the same time does not interfere with an athlete’s training, competitive activities, his life style, his right to control-free movements and other. If WADA and anti-doping laboratories cannot ensure the above for any objective or subjective reasons, then they should only do the part of work within their competence that meets this principle. As for their desire to obtain more versatile information, then they should improve their methods, carry out appropriate scientific research and only after that move on to practical activities, again, without violating the rights of athletes.

The Code provision that makes an athlete liable for any medical treatment received, which comes in conflict with the anti-doping policies and rules adopted by the Code, violates the fundamental rights of athletes and contradicts laws of most countries. In other words, an athlete is practically recommended self-treatment as any health services in any country suggest that a doctor should choose an optimal strategy for treating a disease in the most effective method, including pharmacological means, and not choose a program compliant with the ambiguous and confusing WADA’s anti-doping policy. In this way, the anti-doping activities come into an apparent contradiction with the system of medical education and health care practices. So, many experts [19, 31, 40, 51, 59, and others] state that WADA organizes its activities sacrificing health and well-being of athletes.

Athletes often find themselves in a position when they are deprived of a possibility to take effective medicines even when it is a matter of an acute need. In particular, forbidden is the administration of the most effective anesthetics, and the permitted ones may only be applied locally in the treatment of athletes or in the form of intra-articular injections, but their use must be coordinated with the doping authorities. Athletes may not administer glucocorticosteroids. They experience great difficulties with regard to medical application of anti-asthmatic medicines, insulin, antidepressants, cardio-protectors, cold-relief medicines and dietary supplements.

One should consider some recent cases of sudden deaths of top class athletes in the course of intense training activities and competitions. Indirect evidence suggests that these tragic incidents are often associated with doctors being reluctant to prescribe necessary preventive medicines for athletes, and athletes themselves fearing to use them because of the risk associated with the doping use disqualification. So, it would be reasonable if WADA experts evaluated their role in those tragic cases, and investigative authorities considered these factors in the investigations.

The norm generally accepted in the civilized world stands for the human right to non-interference into bodily conditions. A person may not be subjected to compulsory testing, and here we are talking not only about the urine and blood composition, but also of WADA's innovation related to a forceful creation of biological passports, containing physiological and biochemical profiles of athletes' bodies. As to top-performing athletes, it is even more illegal as many of biological parameters reflect their professional achievements, including the effectiveness of training processes, functional reserves and the like. All of the above constitutes a competitive advantage of athletes that they wish to keep secret.

Thus, the World Anti-Doping Code and its practical implementation limit the rights of athletes to autonomy, private life, self-determination, adequate healthcare as compared to other citizens [25, 59], contradict a number of articles of the Universal Declaration of Human Rights adopted by the UNO. And it is beyond any sense why athletes should allow the violation of their rights because of WADA's incompetency to exercise its functions within acceptable standards and regulations [13].

Activities of WADA and anti-doping laboratories in relation to athletes are a subject to constant and harsh criticism by representatives of different spheres from eminent sports, medicine and law personalities to highly qualified media representatives. Doctors express their particular concern, claiming that restricting athletes from access to modern pharmaceuticals taken for medical purposes entails serious consequences for the latter's health and even lives [27].

However, anti-doping officials have remained absolutely impervious to criticism, recommendations and appeals for many years. A natural question that has to be answered: "Why is this happening?" The answer is mostly such that a vast majority of functionaries at leading positions with WADA and anti-doping laboratories are lawyers, managers, economists, analytical physicists and chemists have a very little understanding of the system of athletic training, loads and risks of modern sports, problems of sports physiology and sports medicine. They are unfamiliar with respect for enormous efforts that athletes are investing into the process of training and competitive activities for many years of their life, at the same time opinions of experts in the field of sports and sports medicine are mere words to them. The basis of their activity, as it was proved by many years of practice, are commercial interests, their desire to preserve and strengthen their monopoly position and right to manipulations in the field of anti-doping activities.

Athletic activities in the modern sports are notable for their extraordinary diversity, complexity and intensity, characterized by a huge time consumption, extreme physical activity, sharp competition, injuries (often severe) and work-related diseases, long-lasting and complex processes of rehabilitation and sport returns. Many years dedicated to sports create difficulties in education, career and social adaptation after the retirement, family relations etc.

Naturally, this all is a heavy load to bear for an athlete's morale and in case of various negative manifestations may seriously affect athlete's health, provoke a state of severe depression. What strikes is the cynicism and lawlessness of the IAAF and WADA functionaries, who in their wish to feed their ambitions and to settle old scores with a group of sports officials and the anti-doping authority of Russia robbed a number of athletes, never convicted of any anti-doping rule violation, of their right to participate in the Olympic Games in Rio de Janeiro, ruining their sports and human lives. And many of these athletes won the world athletic fame, have millions of admirers of their talent. Their achievements ensured the popularity of their sport, its financial sufficiency and a careless life for the association officials, who scorned their rights in such a cruel way. What lesson could be learned by those young athletes who had only gained their right to participate in the Olympic Games for the first time? And can the newly and, now obviously, mistakenly elected IAAF President S. Coe, WADA's Head Craig Reedie and other politicians, who initiated that cynical punishment for innocent athletes, introduced an absurd principle of collective responsibility for the actions of people who had nothing to do with them, look into their eyes?

COMPETITIVE AND TRAINING LOADS OF MODERN SPORTS AND THE FIGHT AGAINST DOPING

In 1989, Head of the IOC Medical Commission Alexandre de Merode spoke at the joint meeting of the IOC Executive Board and the Association of Summer Olympic International Federations: "In order to get rid of a phenomenon, one should seek for its causes. Otherwise, the same causes will lead to the same results. The overloaded competition calendar requires athletes to enhance their normal capacity. This leads to the fact that on the one hand athletes are subjected to control, and on the other hand, such extreme activities can only be carried out with the help of illegal means". It's been more than a quarter of a century since then. Over this period of time a competition calendar has not only been contracted, but instead it has been expanded significantly, mainly on the account of prestigious business competitions. Professional competition has also significantly increased, which has led to an increase in competitive loads and more intense training of athletes.

Taking cycling and tennis as an example, we shall briefly describe the competition and training loads endured by athletes of the highest qualification. For example, the total load for cyclists competing in the Tour de France races is on average as follows: a total duration is 21 days (19 days of the race, two days of rest); a distance to cover is about 3500 km, an average length of stages reaches 180-190 km, half of the stages reach 180-240 km or more; a total duration of the race among strongest athletes is 85-90 hours, separate stages take up to 6-7 hours to pass. And this is only about 20% of the total competitive load, which cyclists have to do in 110-120 competitive days of the year. The competitive load is complemented by about the same, or even greater, amount of training.

A competition calendar in the modern tennis stretches through all 52 weeks of the year. During this time, the strongest tennis players of the world usually compete in 20-24 tournaments, and some of them even in 26-27. The number of matches played on average is 70-74, while individual athletes reach 82-88. In the most intense competitions, in two weeks period, the strongest athletes aspiring to win participate in 6 matches, most of which require extreme performance. Such matches are characterized by the following parameters: the duration is 246 +/- 46 minutes, the number of games is 47 +/- 6, the number of strokes is 834 +/- 110 and the tempo is 25 +/- 0.3 strokes per minute [16]. Most strokes require rapid reaction, are associated with accelerations, stops, changes of direction, maximum mobilization of a speed-power potential, abilities of aerobic and anaerobic energy systems, mental potential and others. The impact of competitive pressures on bodies of athletes is often aggravated by the fact that competitions are held on outdoor courts in heat. Such competitive loads are to be endured not only by young athletes who are in the prime of their sports career but many athletes at 30-36 years of age and older, performing on the world stage for 10-15 or even more years, burdened with occupational diseases and consequences of multiple injuries. Their competitive load is complemented by the amount of training, which is usually 1.5-2 times greater than the competitive one.

Similar loads are endured by long-distance runners, swimmers, rowers, biathletes, skiers, football players and others. Anyone, who has a little understanding of physiology or medicine, will explain that such loads cannot go without serious risks to health and a risk of a sudden death if one does not involve the potential of nutrition and pharmaceutical means. By the way, the problem of health of athletes, injuries and occupational diseases, disability and sudden death, life duration is much more acute than the problem of doping. However, in comparison with the use of doping, they are attended to at a much smaller scale, unfortunately, for quite an obvious reason.

In 1989, under the influence of the disclosures on the massive use of prohibited substances and methods by cycling participants of the 1988 Tour de France, the IOC President Juan Antonio Samaranch called for a change in the approach to the fight against doping based on a deep analysis of practice, the current scientific findings and supporting the position of Alexandre de Merode taken 10 years earlier. This statement was widely supported among the experts. For instance, the team manager of a famous professional cycling team Banesto Eusebio Unzué noted: "I am extremely grateful to the Head of the Olympic movement that he has expressed his standing on doping right at this moment when a search for cyclists administering prohibited substances has started to look like a medieval witch hunt. All the President's critics know it very well that the problem of doping is far from being unambiguous and athletes' bodies functioning in extreme conditions are often in the extreme need for those prohibited substances." His opinion was supported by a no less respected expert in the cycling sport, the manager of one of the sports clubs Manolo Saiz: "Stop being hypocrites. Samaranch has become the first person from the IOC who has had courage to treat the problem of doping without bigotry. I guess he has finally been able to find a way for a further progress of professional sports."

These views were also shared by presidents of the most authoritative sports federations, many dignitaries from political and business communities, sports and medicine. Only the representatives of the anti-doping authorities remained imperceptive to such statements, which was quite predictable.

It is currently obvious that if anyone resents the administration of physiologically and medically justified substances that enhance athletes' capacities for competitive sports without any serious consequences to their health, then one should radically change the whole system of training and competitions, which seems absolutely unreal, or focus on the development of special nutrition programs and administration of effective and safe substances, inducing performance, optimizing adaptation and recovery reactions, normalizing athletes' mental condition, preventing injury, fatigue, functional strain, overtraining, reducing risks of serious pathological mutations and sudden death, stimulating and increasing the effectiveness of posttraumatic and post-disease rehabilitation.

Anti-doping activities should rest on separating of truly harmful substances, the number of which is much lower than those on WADA'S Prohibited List, from beneficial ones, establishing permissible levels of necessary substances rather than on abstract meditations on the "spirit of sport" and persecution of athletes for applying all that is enhancing their sports results, effectiveness of training and preserving health. It is also crucially important to substitute "police" methods of the anti-doping prevention with educational activities aimed at the comprehensive use of effective and harmful substances and the exclusion of all that are dangerous and harmful.

PUBLICITY AND CONFIDENTIALITY

All activities of WADA and anti-doping laboratories on potential violators of the anti-doping rules must be of a strictly confidential nature until a formal decision on the established violations comes into effect. However, this rule is being systematically violated by the anti-doping authorities from the first years of the Agency.

Before the opening of the XIX Olympic Winter Games of 2002 in Salt Lake City, the information was unofficially circulated that the anti-doping authorities had evidence on some 20 athletes (without mentioning their names) who had allegedly been tested positive for doping during previous competitions, and that the list was to be made public on the opening day of the Games. The organizers of the "event" remained in the shadows, but a number of athletes who had come to Salt Lake City from different countries had a couple of nerve-racking days.

In mid-January 2003, a new scandal provoked by the interview of the Danish Professor Bengt Saltin, Head of the Medical Commission of the International Cross Country Skiing Federation (FIS) and a member of WADA's Health, Medical and Research Committee, to Radiosporeen of Sweden broke out. As news agencies reported, commenting Saltin's interview, Professor stated that 15 skiers had had a seriously changed blood composition in comparison with the previous season, and that gave reasonable grounds for suspecting them of the use of prohibited substances, and therefore all skiers under suspicion were subject to a special control at the coming World Cup 2003 in Val di Fiemme. Those athletes under suspicion were to be tested after every discipline regardless of the place taken. Their results would be known before each subsequent race to have time to apply sanctions [15].

These accusations that aroused a strong reaction of experts and the press were hollow words as the doping control at the FIS Cross-Country World Cup in Val di Fiemme did not find a single case of the use of prohibited substances.

Announcement of preliminary results, all sorts of speculation, rumors and suspicions are typical for activities of the anti-doping authorities, which is absolutely unacceptable as it creates an environment incompatible with effective training and competitive activities for athletes.

Particularly high is the tension connected with anti-doping activities that is whipped up before the largest competitions, especially the Olympic Games. For instance, if we analyze the publications of the sports press over a few months preceding the 2016 Games of the XXXI Olympiad, we'll see that a doping theme was in a much greater focus than the preparedness of Rio de Janeiro to host the Games, prospects for teams and athletes, entertainment program of the Games and so on.

We may just refer to a scandal that overwhelmed the Olympic sports in the first half of 2016 in connection with the ill-considered and hardly explainable inclusion into the Prohibited List of a vital cardio-protector meldonium, aggressive accusations of the use of this substance against a large group of Eastern European, mostly Russian, athletes and demands to deprive them of a right to participate in the Olympic Games. At that action, the representatives of the U.S. Anti-Doping Agency turned out to be the most zealous, while their country has more problems with doping than

any other one [5, 12, 34, 36, 58]. One could naturally detect an obvious desire to neutralize the main competitors for the medals of the Olympic Games by those events. In the beginning of June 2016, WADA reported many cases of the prohibited substance use, allegedly discovered by additional sample testing of the 2008 and 2012 Olympic Games participants. The names were not disclosed, but the atmosphere got tense even more. And here we have many questions again. First, why did they do it right before the Games in Rio di Janeiro? Second, how had WADA organized their previous doping control if they had been unable to establish such a wide use of doping?

The facts mentioned above created favorable grounds for numerous (and mostly unprincipled) media representatives, who flooded the info-sphere with scandalous publications, TV shows and even documentaries. Their content mostly relied not on the objective analysis but on indirect evidence, doubtful testimonies of biased athletes and experts, provocations, speculations, exaggerations and blatant gossips.

WADA created an environment widely favoring the use of the Olympic sports in political manipulations, accusations and appeals going far beyond sports and congesting the information space before the 2016 Games of the Olympiad. And at that, WADA and international sports federations, the International Association of Athletics Federations in particular, supportive of the Agency became hostages to the international scandal that they had initiated as the scandal threatened serious losses for the Olympic Games and the track and field disciplines most widely represented in their program.

The World Anti-Doping Agency has neither legal nor moral right to create such an atmosphere for athletes. If there are facts established, then they should be officially made public in accordance with the law and an adequate action should be taken. If there are no such facts, but WADA's experts use their Olympic sports for self-promotion, then sanctions should be applied to such experts and to the whole Agency, suspending their right to work in this sphere. The policy of putting WADA above sanctions is unacceptable.

MONOPOLIZATION OF THE ANTI-DOPING ACTIVITIES

The basis for progress in any sphere of human activity is a free competition, counteraction to monopolization, which endangers not only the competition itself, but also creates obstacles to the realization of new ideas, advanced approaches and solutions. Monopolization inevitably leads to stagnation, low credibility and degradation not only in the sphere of economics or politics, where the threat of monopolization is manifested with particular evidence, but also in science, education, culture, sports. Without any regard to that, the system of anti-doping activities is based on the policy of full monopolization. And what surprises most – it has happened in a very complex, contradictory and ambiguous sphere of knowledge and practice, where the successful development is only possible through the competition of ideas and practical solutions. Monopolization of the anti-doping activities in the Olympic sports, established by WADA over the years of its operation, has bred consumer attitudes to the Olympic sports in general, disrespectful attitudes to sports and medical science, neglectful attitudes to alternative approaches successfully exercised in the fight against doping in many types of professional sports [12, 13].

Monopolization of the fight against doping not only led WADA to self-isolation and its restricted development, but brought the problem of fighting against doping to a deadlock dangerous for the Olympic sports, produced a devastating effect on a number of important trends in the sports science, suppressed initiatives to solve the problem.

It is clear that WADA will not voluntarily give up its monopoly and huge influence in the sphere of sports and especially in the Olympic sports. However, the IOC and the ISFs will inevitably have to revise their approaches to the fight against doping, which should be based on the laws of sports and more democratic grounds rather than on dictates of one organization.

De-monopolization of the fight against doping should not be limited to problems of definition of prohibited substances and the framework for the anti-doping organization activities. The approach to the problem itself should be subjected to analysis. Experts in general medicine analyze the established sports anti-doping system with surprise and skepticism. And they believe that a fundamentally different approach should be applied. In particular, they suggest a totally new approach concerned about athletes' health to replace a lifeless, enforced by WADA, system of a total control, in which the scientific validity, accuracy and objectivity are substituted for general harassment and intimidation [3, 27]. It is very well known that a modern sport is an extreme activity, with many components, including certain pharmacological agents, potentially dangerous to the health of athletes. And doping is not the most significant one of these factors. Therefore, a one-sided and an unsuccessful fight against doping should be replaced by a global

monitoring of athletes' health by health authorities. Such monitoring would realistically assess the risk factors for the health of athletes, including the administration of health endangering products, with the help of modern diagnostic methods and accepted medical standards, impose appropriate restrictions on training and competitive activities, including suspension from competitions.

IGNORING THE EXPERIENCE OF PROFESSIONAL INTERNATIONAL AND NATIONAL FEDERATIONS

As it is known, the fight against doping is not WADA's initiative. Many decades before the establishment of this Agency, the International Associations of Football and Athletics Federations, later on - Cycling, Power Lifting Federations started their fight against doping. Professional sports organizations for baseball, hockey, basketball, American football, boxing, golf and others did not fail to engage. Each of them developed its own approaches in consideration of all factors influencing the development, popularity and authority of each sport, constantly worked on the anti-doping rules improvement. These activities never sparked any sharp conflicts within teams, leagues and players' associations, or protests by athletic trade unions, or negative reactions of the general public and media.

Unfortunately, the authors of the World Anti-Doping Code ignored this rich experience, and actively tried to impose their own code on professional sports organizations. They took a stand that no one in professional sports fights against doping at all, or this fight is unsatisfactory. But even under the formal logic, it is clear that this position was wrong as no one is more interested in the popularity of the sport, moral and ethical qualities of leading athletes, proper qualification of experts – trainers, judges, organizers, doctors than the international federation (association, league, etc...) representing this sport. So, are the federations that are truly aware of all aspects of their sport, including the most complex problems of sports training, its moral, ethical, scientific, medical and information systems, health risk factors for athletes, injury prevention incapable of dealing with the problem of doping, defining what it is and what not, organizing prevention work, introducing a system of sanctions, and so on?

In connection with the above, it is difficult to understand what gave the grounds for the former Head of WADA Richard Pound to disparage the opinion of the professional sports federations, to describe their proposals as a travesty of anti-doping activities, a disclaimer of their liabilities with regard to the honor of sports, public insult and to impose the Anti-Doping Code, knowingly unacceptable to them, on federations and leagues of professional sports [46, 47]. And so, Pound shouldn't have had any slightest reason to be offended by the negative reaction of professional sports organizations to his letters with a request to consider and accept the World Anti-Doping Code. The National Hockey League (NHL) refused even to discuss the issue. The Professional Golfers' Association informed that they did not have any problems with doping. The National Football League (NFL) and the National Basketball Association (NBA) reported that they were fully satisfied with their own effective anti-doping programs, and the problem in general was not to be considered by external organizations but by leagues and players' associations [46, 47].

The reluctance of the US professional sports associations and leagues to cooperate with WADA does not mean that they do not want to fight against doping or shut their eyes to this problem. It's just their developed approaches to this problem do not correlate with WADA's approaches in any way. This applies to the interpretation of the concept of doping, the list of tested substances, the systems of control and sanctions against athletes caught in the use of doping, dispute resolution.

For example, any cases related to penalties for professional athletes are not judged by the so-called independent Court of Arbitration for Sport in Lausanne, which is, in fact, an instrument for implementation of WADA's policies, depriving athletes of their right to legal support as openly stated by prominent experts [8], but by courts of general jurisdiction competent to judge any civil proceedings, including those related to labor relations. Of course, these courts are regulated by national labor laws of their countries and not by WADA's rules contradicting legal norms and common sense.

The fight against doping in professional sports, of course, does not solve the problem but is of a deterrent nature. Lists of prohibited substances are related to the specifics of sports, sanction systems are diverse and flexible [2, 9, 12]. And this is the case not only with American professional sports leagues, but with world football, boxing and racing. Anti-doping activities in professional sports are not destructive. They do not diminish their popularity and commercial appeal, do not lead to conflicts with television and sponsors, and in general do not suffer from those severe negative consequences, which have developed in the Olympic sport.

WADA's managers are not that naive as to expect to gain positions similar to those taken in the Olympic sports in professional football, boxing, baseball, golf, ice hockey, American football, motor racing and others, but their attempts to discuss this subject, criticizing approaches to anti-doping activities implemented in professional sports, aim to preserve WADA's positions in the Olympic sports, which cannot be considered stable and sustainable.

In our opinion, the best practices in anti-doping activities from professional sports may be extremely advantageous for the Olympic sports, especially due to the fact of the latter's professionalization and its growing rapport with professional sports, active participation of professionals in the Olympics.

THE FIGHT AGAINST DOPING IS A PROFITABLE BUSINESS

One has to admit that the fight against doping has acquired absolutely new traits over the last 15-20 years. Doping has become a sphere of serious business with its absolutely legal as well as criminal manifestations. It is quite nature that representatives of different spheres are interested in it. Among those are:

- pharmaceutical manufacturers that benefit from the maximum market advancement of their produce and are very far from the ideals of sport and the IOC policies;
- manufacturers of expensive and extremely complex analytical equipment constantly supplied and updated for anti-doping laboratories;
- advertising agents, suppliers, intermediaries ensuring the supply of pharmaceuticals;
- developers of pharmacological programs, advisers on the use of substances and methods of masking;
- anti-doping agencies, which function as commercial entities mainly interested in profit and not in solving the problem of doping in sports;
- athletes, coaches, doctors, and often representatives of sports federations interested in the achievements of athletes as a substantial source of income that is constantly rising due to a rapid professionalization and commercialization of sports.

Most of them will not benefit from narrowing the spread of doping. Even WADA and, in particular, anti-doping laboratories, which should seemingly strive to doping eradication, carry out only economically advantageous programs to expand and increase the value of testing, to extend their influence on non-Olympic sports, to associate with the richest leagues of professional sports and so on.

The fight against doping has become a powerful business sphere, generating incomes for their stakeholders that are incomparable with real efforts and the results of their activities. Therefore, any intervention into this sphere, even from the recognized dignitaries such as Juan Antonio Samaranch, Joseph Blatter, Hein Verbruggen, Vitaly Smirnov is extremely painful to such system. In line with the above, we should consider an extremely jealous attitude of WADA to the creation of alternative anti-doping structures.

Economic interests determine that intense opposition of the international system of doping control to any changes in the methodology of the fight against doping towards education and training, narrowing the range of prohibited substances and methods, differentiation of doping control systems depending on a particular sport, permission of substances that improve the effectiveness of training and prevent negative impacts of a huge physical strain of modern sports.

It is obvious that many substances and methods have been prohibited by mistake, without any sufficient reason, and most of them do not require any prohibition and restrictions but optimal dosages, and only a small number of substances (drugs, certain hormones and stimulants) must not be used at all. Control should be exercised considering peculiarities of a sport, not trying to identify the use of substances that even theoretically cannot be administered in that particular sport, such as anabolic steroids and stimulants in shooting or archery, and sedatives in weightlifting or sprint. But this would lead to a substantial cost reduction of the doping control system, alleviation of the problem and, of course, to a decrease in incomes and the importance of institutions and people involved in this sphere.

WADA's reluctance to deal with these issues becomes clear if we take a look at a financial aspect of matters.

Currently, it is difficult to obtain a complete and comprehensive information on the budget revenue and spending of WADA and more than 30 laboratories accredited by the Anti-Doping Agency, as well as on subsidiary earnings of employees of these organizations. However, even the most superficial evidence testifies to huge expenses on anti-doping activities. For example, WADA's recent years' budget ranged from 25 to 35 million U.S. dollars and

has been constantly growing. Budgets of the most active anti-doping laboratories ranged from 10 to 15 million U.S. dollars.

Of great interest are the official budget figures cited by WADA (Table 1). For example, in 2011-2012 personnel expenditures have doubled in comparison with 2009-2010. And at such substantial budget increase the expenditures for core operations – scientific research and testing – were curbed. In addition to that, the amount of the consolidated budget greatly exceeds the displayed expenditure side. It all looks very strange.

Table 1. WADA'S Revenues and Expenses in 2009-2012

Revenues and expenses by budget articles	Amounts by years, USD			
	2009	2010	2011	2012
Consolidated budget	24 905 825	28 069 083	38 865 902	35 270 630
Personnel salary	7 464 075	8 597 721	16 070 589	16 276 161
Personnel salary, % of budget	29.96	30.63	41.34	46.16
Travelling and business trips	2 627 010	3 249 554	3 632 684	3 580 896
Grants for development of new tests	6 478 044	5 933 043	4 887 468	5 718 427
Testing samples for doping	1 415 457	1 617 570	1 441 166	907 701

The main financial focus of the anti-doping system is striving to a continuous increase in the number of samples and testing prices. To compare, in 1970-1980's the anti-doping control system established by the Medical Commission of the IOC stipulated random testing at the Olympics Games, World and European Championships in the Olympic sports. The annual number of tests did not exceed 1-2 thousand, and in the Olympic years – 3 thousand, and the price of each of these lab tests was about 40 U.S. dollars [50].

At present, the situation has changed dramatically. The number of tests carried out only by WADA accredited laboratories has exceeded 200 thousand in recent years, i.e. their number increased by about 100 times in the given period. And yet WADA constantly insists on the need for further substantial increase of testing volumes [47]. Prices for testing surge as well.

It should also be noted that there is a large number of WADA non-accredited anti-doping laboratories at the national level in the world trying to comply with WADA's criteria both in equipment and in the recommended number of annual tests - not less than 3 thousand. For example, equipping a laboratory in Ukraine only in 2007-2008 cost about 10 million U.S. dollars for the government, and maintaining its activity requires even larger annual costs for testing and constant equipment upgrades. But performance results of this laboratory are insignificant if compared to those funds.

Financial activities of the anti-doping system are not limited to these areas. In many cases there are revenues from consulting services to athletes, from cooperation with pharmaceutical companies, manufacturers of analytical equipment, sports organizations. Thus, the anti-doping activities have turned into a powerful commercial sphere, serious business, which has developed on the grounds of the sport.

When it comes to such huge money (and the modern system of the doping control is mainly privately owned, including by WADA), persistent attempts of WADA's management and of other representatives of the international doping control system to present their activities as altruistic, aimed solely at the fight for the purity of sports ideals and the preservation of athletes' health, seem quite unconvincing.

THE INFLUENCE OF THE ANTI-DOPING POLICY AND PRACTICE ON THE MEDICAL SUPPORT FOR ATHLETES

Analyzing the problem of doping in the modern sports, we cannot omit one very important issue in its medical, legal, moral and ethical aspects, which is the medically substantiated administration of substances defined by WADA as doping.

WADA has developed a special procedure to obtain permission for the use of such substances for medical purposes. Under the procedure, an athlete may file a request for a therapeutic application of a prohibited substance or method through the National Anti-Doping Agency. The request should be complemented with a detailed medical

record or a medical case history of an athlete's disease, as well as laboratory and instrumental test results, proving the need for the use of prohibited substances or methods (e.g. results of X-ray, ECG, blood tests, urine tests, spirometry, bronchial provocation tests, etc.). The same medical records should reflect the state of an athlete's health and the treatment received at the time of the request. The request and the documents shall be considered within 30 days, so an athlete should submit these materials to WADA 30 days before the date when he needs such permission.

A request filed after the use of a prohibited substance or method (a request with a retroactive effect) will only be considered if a prohibited substance or method have been administered for emergency medical aid. An athlete has the right to use substances and methods from the Prohibited List only if there is a permit issued by the Therapeutic Use Exemption Committee (TUEC) of the Anti-Doping Organization. At the same time TUEC may, at any time, initiate a review of its decision on the issue of a permit. WADA via TUEC has the right to check any permit for the therapeutic use issued by a federation or TUEC and to cancel any decision.

The procedure is bureaucratic with a distinct element of subjectivity. First, there is a significant element of subjectivity in the definition of a diagnosis: one may always refer to the lack of lab or instrumental methods' results, that does not allow considering the diagnosis as determined and confirmed. Second, the question of the effectiveness and appropriateness of this or that substance for the treatment of a particular disease and an individual patient remains disputable. However, a common sense suggests that a doctor standing at the bedside of an individual patient may be more accurate in deciding on these issues than some TUEC members. Even if they are experts in the field of sports medicine, they have not examined a patient and study his clinical case only at a distance, and, in addition to that, it is quite possible that they may have no experience in treatment of that particular disease [3].

In other words, obtaining permission for the therapeutic use largely depends on subjective factors. This equally applies to the retroactive application for the therapeutic use in cases of emergency: saving a human life can be classified as doping with corresponding consequences for both a doctor and an athlete [14].

In urgent cases (a traumatic shock, sunstroke etc.) a prohibited substance may be applied, however, neither a doctor nor an athlete has guarantees that the use of a medication will be justified and will not be regarded as a violation of the anti-doping rules. All of the above contradicts to both: common sense and moral principles as well as legal norms regulating activities of health care workers in all civilized countries. An approach when a doctor who has saved a person's life can be charged of an illegal activity seems absurd and immoral. As for the legal aspects, failure to provide medical assistance is undoubtedly an unlawful act.

Legislations of any civilized countries recognize human life and health as objects of crime and stipulate the order of fulfillment of professional duties for medical and pharmaceutical workers [3, 41].

However, even in cases when the therapeutic use of doping agents is not an emergency, the official term of a request consideration (up to 30 days) is not acceptable in any way from the point of view of a treatment process. Any sane person understands that treatment of any disease should begin immediately after its diagnosis and not in some time. Otherwise, severe and sometimes irreversible consequences may take place, and moral and legal responsibility shall be borne by a health care worker who allowed such a situation.

The current practice implemented by WADA is in contrast to the basic principles of the medical duty, for example, to the principle of confidentiality, obligations to act exclusively in a patient's benefit. Physicians guided by these principles are at risk of being accused of aiding and abetting the doping use, and the most effective prevention and treatment substances prescribed by them are often considered as doping [41]. A doctor experiences difficulties in bypassing contradictions between WADA's requirements and his professional knowledge, experience and responsibilities, which guide him in the interests of a patient in accordance with the Physician's Oath, which is largely due to WADA's woeful ignorance in terms of medicine and physicians' duties [18].

Thus, WADA has turned into a wrapper around the official medicine in terms of athletes' health and medical care, violating basic rights of athletes, rights and duties of doctors. And in this case, as in many others, we may observe the consequences of removing experts and transferring rights to "universal managers".

The involvement of leading research centers working on ergogenic substances and methods would dramatically strengthen a methodological basis for anti-doping activities, separate harmful and strictly prohibited substances from rational and useful ones, and would ultimately turn the fight against doping in sports into a positive stream. Such a shift in the fight against doping would become a significant contribution to the development of this important area of sports science, which would transform it from a somewhat shadowed one to the most widely and openly promoted,

covered by the scientific media, discussed at scientific forums, delivering recommendations for practical activities, including those to improve the anti-doping system.

The administration of pharmaceuticals in sports should be reserved to doctors, physiologists, pharmacologists, and not to lawyers and managers. Then, no one will be able to claim that the issues of the use of medical substances by athletes are solved by people, not knowing a thing about sports or sports medicine.

SCIENTIFIC RESEARCH

WADA invested about 5 million U.S. dollars from its annual budget in research programs. However, all studies funded by WADA, focus on developing new and improving existing methods of detection of the growing list of drugs, and on improving the reliability of the tests. Collaboration with academic and research institutions is also limited to the same field.

In recent years, WADA's Health, Medical and Research Committee has focused its efforts on the improvement of the system of detection of the following five groups of substances and methods:

- substances and methods used to increase blood oxygenation (erythropoietin, hemoglobin-based oxygen carriers, transfusion, etc.);
- exogenous and endogenous anabolic steroids;
- factors that regulate and enhance growth;
- gene technologies;
- various projects related to the list of prohibited substances.

The interests of WADA do not include the major research areas and themes that would allow to analyze huge empirical material, perform additional research, and to propose on this basis an effective system for the use of ergogenic aids in Olympic sports (taking into account the specifics of individual sports, age and gender related characteristics of athletes).

Currently, most major scientific centers in many countries conduct research of substances and methods (including pharmacological) that will improve sport performance of athletes, enhance adaptive and recovery responses, prevent overstrain, overuse and over-adaptation of the most loaded organs and systems of the body and links of the loco-motor system, accelerate rehabilitation, and avoid the risk of sudden death. However, this important and noble area of research, which of course may involve shortcomings, as any other complex undertaking, is surrounded by suspicion and secrecy and has a criminal connotation due to formed anti-doping policy.

Moreover, the concentration of scientific interests of WADA solely on improving the system of detection of the use of prohibited substances has led to a situation, when, unlike in the past, even the most authoritative publications [32, 56] began to look at the application of ergogenic aids of pharmacological, hormonal, or physiological nature through the prism of the provisions of the Anti-Doping Code, but not from the position of scientific validity and the interests and rights of an athlete.

It should be noted also that anti-doping activities of the IOC and WADA has led to the termination of many studies aimed at identifying the effectiveness of the use of medicinal substances in the system of training athletes. Work in this area frequently becomes closed from public; studies often involve the use of the substances purchased from "black market", whereas the practical implementation of obtained results is carried out by corruption schemes without proper scientific argumentation and with impermissible independent actions of athletes, doctors, and trainers. There are more than enough factors supporting this point of view in modern sport.

As a result of the restriction of scientific research, lack of information about ergogenic aids, and disregard for educational activities, athletes have begun to use aids that may negatively impact muscle activity instead of enhancing performance. Only some substances of the very long list of prohibited items have ergogenic effect, whereas the rest of them are either not effective or even may have an adverse effect; that is, they are ergolytic substances [32].

The issue of doping in sport is a strong concern for scientists of different disciplinary backgrounds. A number of publications offer various recommendations to improve the methodological, organizational, and administrative foundations of anti-doping activities [11, 40, 52, 54]. Serious attention is paid to the moral, ethical, psychological, preventive, and educational aspects of the issue, and to building the appropriate attitudes of athletes, coaches, doctors and other professionals involved in the preparation of athletes [22, 24, 45, 53].

There have been also examined the sanctions against athletes and other professionals related to their preparation [11, 39, etc.], violations of their rights [25, 38, 59, etc.], as well as the use of civil courts for resolving conflicts [20, 37, 40, etc.]. A number of special topics were addressed regarding to the inadmissibility of the abuse of administrative power when forming and correcting the Prohibited list [40], the impact on health of athletes of prohibited substances and other risk factors typical of modern sport [13, 26, 59], and many other aspects of the issue of doping in modern sport.

It's amazing that all of this information do not affect in any way the policies and practices of WADA, which only has been bureaucratized, but remains unchanged since the establishment of the Agency.

NUTRITIONAL SUPPLEMENTS

In recent years, anti-doping control system is faced with another issue: intensive growth of the industry of nutritional supplements and their implementation in practice of athletes' preparation. The labels on the supplements do not always reflect their actual content; there are cases of inconsistency between the label information and real composition.

Nutritional supplements industry is constantly growing, with the number of supplements, which are currently on the market, running into the thousands. To gain control over their content and production is almost impossible, while studies show that 20-25% of nutritional supplements contain the substances included in the Prohibited list. The supplements may contain anabolic steroids, ephedrine, and other drugs currently banned in sport.

Consumption of nutritional supplements in Olympic sports has reached huge proportions. A study conducted as far back as at the Sydney 2000 Games of the XXVII Olympiad and involving 2758 athletes (over 25% of all participants) showed that 2167 athletes (78.6%) were using various nutritional supplements, 542 athlete (19.7%) were using 6-7 supplements, and one of the athletes were taking 26 supplements [21]. There is no reason to believe that the consumption decreased in subsequent years. For example, the well-known American exercise physiologists W. Larry Kenney, Jack H. Wilmore, and David L. Costill gave evidence that 94% of college coaches in the U.S. encourage the athletes to use dietary supplements [32].

The WADA finds the solution to this issue in the typical way. The official bulletin of the Agency states "WADA believes that elite athletes can and should meet the requirements of exhausting training schedule solely through a correct dietary and nutritional regime. There is no convincing scientific evidence that dietary supplements bring significant benefits to elite athletes".

It is clear that such a statement can be done only by people who do not have any basic idea about the real situation about the issue of nutritional supplements. Apparently, there is another reason. The growth of huge nutritional supplements industry is governed by the legislation on foodstuffs that considerably hinders the control of their composition. Manufacturers of supplements often do not provide sufficient information about the supplement composition on the label. WADA is naturally unable not only to influence the production of nutritional supplements, but even to obtain the information about their composition, and thus places full responsibility for their use on the athlete.

Many nutritional supplements can enhance the sport performance of an athlete without a negative impact on their health, delay the fatigue, contribute to effective recovery and adaptation, and prevent overstrain of functional systems and sports injuries [17, 29, 32]. Every nutritional supplement should not be indiscriminately declared as ineffective, as it does the WADA. It is necessary to encourage the extensive study of their potential for the use in sports to improve sports performance of an athlete and protect his health. A very significant number of supplements may prove to be ineffective and even harmful to an athlete; however, deceitful advertising contributes to their promotion in the market, whereas the absence of comprehensive research and objective information often leads to the use of these supplements by athletes [33, 48].

ANTI-DOPING ACTIVITIES, PHARMACOLOGICAL SCIENCE, AND PHARMACEUTICAL INDUSTRY

Multi-year anti-doping activities of the IOC and WADA had demonstrated the extreme imperfection of the anti-doping tests and failure of anti-doping laboratories to compete with pharmaceutical science and pharmaceutical industry, which produce new substances and technologies that are not possible to identify [39, 55]. If look at the history of the use of the most effective drugs, it turns out that for many years they allowed athletes to improve

performance before the prohibition of these drugs, and then have long been used with impunity after the prohibition due to the impossibility of reliable proof of their application [13, 40]. And only later the period has begun, when started the real competition between the violators and anti-doping services with regard to well-known drugs, which are subject to identification.

Extremely low scientific potential of anti-doping laboratories is more than amply illustrated by the annual summaries of their activities. The percentage of positive results of testing, especially of blood samples, is negligible and clearly does not correspond to the actual extent of doping [13, 44], whereas a large part of the total number of so-called successful tests is questionable. For example, out of almost 210 thousand tests made by all accredited anti-doping laboratories in 2013, less than 1% gave a positive result and a little over 1% gave uncertain result. Out of 6689 blood samples, doping was detected in only one (!) case and in 11 cases, the results were uncertain. If look at these data, a reasonable question arises: why do we need activities of WADA and the numerous anti-doping laboratories at all if they provide void and unreliable results, which are clearly not relevant to the actual dissemination of substances stimulating the effectiveness of competitive and training activities in the Olympic sport. After all, there are many major publications, which show that in various sports, from 5% to 80% of athletes participating in the Olympic Games in the past two decades have taken different medications, which enhance the effectiveness of training and competitive activity [13, 21, 57, 60, etc.].

Generalization of the information from numerous disparate data sources reflecting the use of prohibited substances in sports in the United States indicates that 20 to 90% of athletes use anabolic steroids depending on the specific features of a particular sport. Even young athletes studying in high school use anabolic steroids: from 4 to 11% of males and 3 % of females were reported to use these drugs [32]. A study of this issue in the sport of Eastern European countries showed that, for example, prohibited substances have been used by 20 to 30% of athletes in handball and gymnastics, more than 70% in athletics, and more than 90% in weightlifting [11].

The rapid development of pharmacological science and pharmaceutical industry makes hopeless any current efforts of WADA. For over the years, the potential of modern molecular biotechnology to synthesize hormones identical to natural analogues, development of low molecular weight doping substances, pharmaceutical products for the treatment of serious diseases and prevention of aging, and to perform gene manipulations has remained an insurmountable obstacle for the Agency. As experts say and as is confirmed by many years of experience in providing anti-doping service, WADA, in most cases, is doomed to fall 10-20-years behind, especially considering that athletes often begin to use new substances before they have passed clinical trials. The failure of the anti-doping system to compete with the developers of new ergogenic aids repeatedly drew the attention of the IOC and WADA experts of different countries, who deeply understand the issue rather than address it only partially or from mercantile positions. For example, John Lucas, a prominent American expert in Olympic sports, whose studies are distinguished by an integrated approach to the problems in their entirety and complex relationships, noted the obvious one-sidedness and inadequacy of the IOC anti-doping policy many years ago. In particular, he wrote in the chapter "The Olympic Drug Crisis: Seeking a Level Playing Field" of the book "Future of the Olympic Games" [36] that modern doping is nothing compared to the new approaches to creation of efficient athlete that will be brought by modern biotechnology, molecular biology, and genetics in the coming decades". Currently, there are many cases that confirm this prediction.

WADA replaces the failure of the anti-doping services to objectively identify doping by frankly illegal activities, unacceptable ways of identifying perpetrators, initially representing athletes like criminals, which can be subjected to humiliating harassment and which privacy can be unceremoniously interfered. If add to this the closeness and virtually uncontrolled and independent activity of the anti-doping services, their taste for provocation, traps, denunciations, as well as no guarantee of loss and tampering of samples, adherence to storage conditions, inadequate reaction to criticism, and other such attributes of WADA activities, the reasons become clear for constantly growing worldwide resistance to the methods of work of the Agency and doubts about its existence.

In a hopeless race for advances of pharmacological science and pharmaceutical industry, WADA uses absolutely unacceptable methods. For example, a very specific dimension of the anti-doping activities of WADA has emerged following the Tour De France 2008, where Italian cyclist Riccardo Ricco has tested positive for new version of erythropoietin (CERA), which could not be identified properly by the anti-doping services before this time. According to the head of WADA John Fahey, the doping was revealed because of innovation in anti-doping policy,

according to which the Agency began active cooperation with pharmaceutical firms for labeling of prohibited substances.

In our view, such an approach is the most dangerous and unlawful precedent, which will result in a huge number of people suffering devastating diseases forced to use drugs with slow clearance from the body and unknown pharmacological action, and all this for the sake of facilitating the activities of WADA. Today it is difficult to predict the legal and ethical implications of such innovations, but it is obvious that they do not add credibility to the Agency, but will add even more discredit to its policy.

PROSPECTS OF FINDING A SOLUTION TO THE DOPING PROBLEM IN SPORT

The cited materials clearly indicate that an organization such as WADA fails to solve the issue of doping on the basis of a document like the World Anti-Doping Code. This is more than amply demonstrated by the views of experts, who claim that the use of doping in sport is constantly increasing, while WADA and persistent doping scandals provide a powerful means of indirect advertising, which demonstrates that high sports performance cannot be achieved without doping and stimulates the development of increasingly complex, costly and dangerous to the health drugs and means of concealing their use.

Therefore, if the task is really to fight doping in the Olympic sport, rather than to strengthen WADA and maintain the initially defective World Anti-Doping Code, it is necessary to take a radically other way than the one chosen for the Olympic movement by WADA and representatives of various international organizations, who support its policy.

Now, this is much harder to do than at the turn of the century, when after a serious doping scandal at the Tour de France in 1998 Juan Antonio Samaranch called for a change in the anti-doping policy in Olympic sports. And if the fight against doping had followed the line proposed by him, the line that takes into account the objective realities of sports and the need for a scientific approach to the issue, without its excessive dramatization, the situation with doping in Olympic sports certainly would have been different.

We would have even more significant results and very different, infinitely more healthy atmosphere in Olympic sports, if the IOC was inclined to respond seriously to the position of scientists, who, as early as 20-30 years ago, gave evidence based recommendations on the prevention of doping in sports and the fight against doping. But the IOC preferred to take the way of unsophisticated administration that exacerbated the problem in the 1990s. Actual crisis that may not only to discredit the Olympics, but also may lead to the collapse of the Olympic movement, began with the establishment of WADA and isolation from the anti-doping fight of authorities in the field of sports and health science and assigning responsibilities to deal with the problem on "effective managers" [47]. The inadmissibility of this situation finds a convincing confirmation in the writings of many authoritative experts seriously concerned about the critical situation in Olympic sports with regard to the WADA's methodology and practice in the anti-doping fight [4, 27, 28, 31, 40, 49].

It is necessary to realize that if, in the 1980s and 1990s, one of several issues of Olympic sports was the issue of doping, then now, after many years of activities of WADA, the issue has become a major and the most acute, and did not approached to, but moved away significantly from its decision.

Suddenly a new, no less serious issue raised in Olympic sports: the existence of WADA, organization, which has managed to almost get out of the control of the international Olympic system, become over Olympic sports, over athletes, coaches, and researchers. By means of political slogans, manipulations and maneuvering, the Agency has managed to gain the support of authoritative international organizations, governments of different countries, political leaders, who did not think through the approaches and methods recommended to fight against doping, while were enthusiastic about the general noble idea: the eradication of one of the manifestations of fraud in sports (especially dangerous for the health of athletes).

However, WADA has very peculiarly taken advantage of this support and the trust and created around the issue of doping the atmosphere of subjectivism, voluntarism, and chaos, thereby becoming a convenient tool for all sorts of political and other manipulations on the basis of material and at the expense of Olympic sports.

Specifics of sport and its focus on achieving the highest results, winning, setting the record, suppressing rivals, and on the exceptional mobilization of physical capabilities stimulate athletes, coaches, doctors, and managers to find and use all possible means to achieve the desired result. These means include also doping, violence, and cheating.

Exceptional politicization and commercialization of Olympic sports not only provoke athletes, doctors and coaches to use banned substances, but also are often manifested in a policy of double standards at the level of national Olympic committees, national and international sports federations, and governmental organizations responsible for sport in different countries.

Therefore, not only athletes should be liable for doping and other negative phenomena in sports, but also the IOC, ISFs, NOCs, and governmental bodies. In this regard, the policy of the IOC and WADA is certainly correct: to involve in the anti-doping fight not only sports structures, but also reputable international organizations (UN, Council of Europe, UNESCO, etc.) and the governments of member countries of the Olympic movement. However, this activity and its coordination will be successful only if the approach to the issue of doping and its organizational framework are radically revised.

It should be brought to the public consciousness that, on the one hand, the definitions of terms such as “doping”, anti-doping rules, and the list of prohibited substances and methods are in flagrant contradiction with the achievements of science, medicine, sports practices, and, on the other hand, the activities of WADA flagrantly violate the provisions of the UN Declaration on human rights and universally accepted legal standards, and are based on the methods unacceptable in any area of human activity.

Today it became clear that the IOC and UNESCO that have rightly sought to eradicate doping in sports and to involve into anti-doping fight the governmental bodies of member countries of the Olympic movement, have made three fundamental mistakes. First, they entrusted anti-doping fight to private commercial organization, which eventually has become completely uncontrolled. Second, the system of personnel management of WADA and WADA-accredited laboratories was not subjected to analysis and control that has led to the excess in these organizations of experts in various areas far from understanding of the issues of sports and sports medicine. And, third, they allowed to adopt very imperfect World anti-doping code, which is focused not on finding an objective solution to the problem of doping in sport, but on satisfying political and commercial interests of WADA and accredited laboratories. This ultimately resulted in the sad situation that came about in Olympic sports during preparing and holding the 2016 Olympics in Rio de Janeiro. Instead of combating doping in World sport, the Agency, under the pressure from all sorts of external forces, has started to implement own discriminatory policy against athletes and sports of individual countries, which is capable of causing irreparable harm to the Olympic movement.

At the final stage, two weeks before the games, the IOC President and Executive Board members sharply rejected demands of WADA, demonstrating by this decision unsatisfactory and disruptive for the Olympic movement activities of this agency.

However the reaction of the leadership of WADA proved to be paradoxical. Apparently believing in their exclusiveness, infallibility, and overindulgence, the current head of WADA Craig Reedie and its former head, whose views and perseverance had led WADA to the current sad state, and even the heads of the national anti-doping agencies intended to deal with the issue of doping solely within their own countries have started to strongly criticize the IOC instead of recognizing their own egregious errors and demonstrating the desire to proceed with activities of the anti-doping system in a positive way. They apparently forgot that the members of the IOC are outstanding representatives of the world's sports community, internationally recognized experts in this area, that the IOC is the founder of WADA, provides funding for its activities and, of course, has every reason for understanding and strict implementation of made decisions. This reaction alone is more than enough for radical restructuring of the system of anti-doping fight in Olympic sports.

It would seem that absolutely unexpectedly the International Olympic system was confronted with many problems and contradictions that have arisen within the IOC, ISFs and national Olympic committees, as well as in its environment including governmental and political figures from different countries, sponsors, media representatives, and broad segments of the world community. We can safely say that Olympic sport went into severe crisis comparable with those that emerged in the 1980s and resulted in mass boycotts of the Moscow (1980) and Los Angeles (1984) Olympics, which had been managed to overcome only at the Seoul 1988 Summer Olympics largely due to the extremely professional and tireless activities of a prominent figure of the international Olympic movement, IOC President Juan Antonio Samaranch.

If in the near future the IOC does not take drastic measures to restructure the system of the anti-doping fight and to limit the role of WADA-accredited laboratories to solely technical functions, and to devolve all the remaining

rights and duties to the IOC and ISFs, then Olympic movement, which has been transformed into a global positive phenomenon by the efforts of the vast number of outstanding people from various countries, will suffer more losses. The way to overcome the current crisis will also be difficult and long. And it was to be hoped that the IOC and other representatives of the International Olympic system would be able to pass this way with dignity and professionalism.

Conclusion

In the following, we briefly delineate the areas of activities, which could normalize the situation with doping and resolve the contradictions in this matter between representatives of different structures of the international Olympic system.

- Implementation of extensive educational programs among all participants of the Olympic movement, starting from children's sports schools and sports clubs and finishing with the IOC and national Olympic committees, international and national sports federations, and national governing bodies of sports.
- Substantial revision of the World Anti-Doping Code on the basis of the methodology grounded on the achievements of the advanced sports and health sciences and generally accepted international legal framework; realization of the fact that anti-doping activity is one of the many activities in the field of sport, but is not the superstructure over sport.
- Transition of the fight against doping into one of the areas of sports medicine and medical care of athletes; application of medicinal substances in accordance with the requirements of legitimate medical practice with exclusion of emotional and subjective criteria.
- Change of the status of WADA and anti-doping laboratories by removing their rights as independent institutions, standing above sports and reorganization of these institutions into technical subdivisions of the international Olympic system with the methodological guidance of the IOC Medical Commission with the crucial role of experts in sports medicine and high performance sport.
- Conducting extensive research to develop a system of aids and methods allowed for the use in sport, to minimize the number of prohibited substances and methods, to define clear boundary between allowed and banned items with consideration of the specifics of different sports and in partnership with experts in the fields of organization and management of sport, theory and methodology of athlete's training, medicine, pharmacy, jurisprudence, etc.
- Providing athletes with opportunities to use all of the advances in modern medicine, not interfering and not restricting them in applying the most effective medicines for therapeutic purposes; bringing athletes' rights in full compliance with the rights of employees of dangerous occupations.
- Providing physicians with the ability to use for the medical care of athletes (including preventive) the entire range of legal drugs in accordance with the drug regimens that are evidence-based and recommended by medical science.
- Establishment of alternative anti-doping laboratories and centers applying various approaches to solve the issue of doping in sport
- Providing ISFs with an ability to engage in the delivery of services for sporting events and sports those anti-doping laboratories and centers, whose activities can best meet the specific needs of a particular sport, sport federation, etc.
- Recruitment and promotion to decision-making positions in the overall anti-doping system of experts in the field of sports medicine, who have a deep understanding of the specific features of modern sport and the system of athletes' training. As for the "effective executives/managers", their role should be limited to the implementation of policies adopted by the experts of sports and sports medicine.
- Democratization of the fight against doping from the side of the IOC: support of alternative approaches to combating doping, promotion of the activities of anti-doping laboratories, which use different approaches to combating doping, shift in emphasis in the fight against doping into the scope of the activities of federations, etc.

Our criticisms in no way call into question the need for the continuous fight against doping, its aim is only to indicate a way out of the impasse, where the solution of this issue has been trapped by the modern practice of WADA and the applicable legal instruments in this area. And this should be done not only in the interests of the Olympic movement and Olympic sports, in the interests of sound preparation and the protection of the health of athletes, but also for the maintenance and fruitful development of the anti-doping system, its efficiency and credibility.

The provided proposals for improving the system of anti-doping fight are principal, but also in line with traditional approaches to the issue of doping. At present, however, the proposals have been made that are aimed at fundamental change in the approach to the issue. In particular, regarding the anti-doping fight, experts have reinforced the view that the issue of doping in sports should be resolved with due consideration of the development and introduction of biotechnologies aimed at improvement human being and its modification to counteract negative environmental factors, to increase resistance to stress and diseases, the risks associated with lifestyle factors, etc. [30, 42]. Modern biology has consistently delivered technological advancements extending the capabilities of the human body, which spread rapidly not only in sports environments, but also among the general population, seeking to use them to enhance resilience and enhance their capabilities. In this regard, there is a natural question: why cannot athlete use substances to improve their capabilities, if every member of society does the same thing? [8].

Experts note that both high performance sport and biotechnology have a common value: striving for excellence. When developing and introducing the biotechnologies to improve the human body, it is necessary to take into account the full range of possible positive and negative social, moral, ethical, and health impacts. And it is only logical to consider in this context the issue of allowed and prohibited items in sport, especially when you consider the tremendous intellectual and financial capacity of organizations working in the field. In this regard, it seems logical the emergence of the issue of the appropriateness of the existence of an organization such as WADA [8]. This point of view may seem radical, but it is quite explicable, as it reveals the opportunities for progress and for the fight against doping in terms of prospects of the development of science of human abilities.

In this regard one further point should be mentioned. Supporters of the fight against doping as one of the main arguments often refer to the fact that doping comes down to cheating. However, numerous surveys of spectators and fans in both Olympic and professional sports indicate that most of them want to see the bright spectacle, records, fierce competition, sensational victories, and they demonstrate lack of concern about the factors that allow them to achieve success: effective training, natural talent, doping, food, or equipment. Moreover, they are less outraged by the instances of the use of doping by athletes of doping than by the fact of the disqualification and overthrowing of their idols. It's hard to argue what might be the result of such combination, especially considering that there are two opposite positions regarding to the modern sport. Supporters of one of them think that it is virtually impossible to avoid the introduction of technologies that are able to enhance athletic performance, to make a sporting spectacle more vivid and exciting, and thus development in this direction should be legalized. Opponents, by contrast, argue that modern biotechnologies are contrary to the spirit of sport, violate the principle of "fair play", and replace the natural human abilities by the artificial ones. Each of these views has the right to exist just because there are a large number of respected professionals and many sports fans among their supporters. However, to examine the issue and find compromise solutions it is certainly necessary to bring together the efforts of experts in the field of sport and anti-doping fight and experts in the field of biotechnology, high performance sport and sports medicine. Isolation of anti-doping fight both from the issues of high performance sport and advances of biotechnology, along with the blanket ban on anything that may contribute to achievements in sport is a dead end.

The whole history of the Olympic movement, its influence and appeal to the world community are associated with moral and ethical values, concentrated in the ideals of Olympism, including such concepts as fair game and the unity of the human spirit, body and mind, etc. So when it comes to such values, they can only be developed on the basis of the humanistic system of education that applies to all issues of Olympic sports, including anti-doping fight. It is impossible to instill these values (commitment to which is emphasized in the World anti-doping code) through general mistrust, total control, threats, sanctions, human rights violations, disregard for the interests of the athletes, including those related to the protection of their health.

There is a need for extensive educational and training programs imbued with the respect for the personality of an athlete, his rights, views, ethical principles, and moral values. It is this approach that will be consistent with the philosophy of Olympism and the principles of fair play. It is this approach that was advocated by the founder of the modern Olympic movement, Pierre de Coubertin. This was also pointed out by equally distinguished leader of the International Olympic movement Juan Antonio Samaranch before leaving the post of IOC President, which he held for more than 20 years.

Conflict of interests

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