



Conditions of training activity and health in complex coordination sports

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Abstract

Objective of the study was to identify the conditions of training activity and the health status of high-class athletes in complex coordination sports in order to justify appropriate measures to monitor their health and complete medical rehabilitation.

Methods and structure of the study. An analysis of the hygienic indicators of the conditions of training activities in complex coordination sports was carried out using the example of gymnastics classes by high-class athletes from the School of Higher Sports Excellence of the Republic of Bashkortostan. The state of health and functional disorders of women, representatives of artistic gymnastics, was analyzed based on the results of an in-depth medical examination performed by specialists of the Republican Medical and Physical Education Dispensary of the Republic of Bashkortostan.

Results and conclusions. Analysis of scientific literature and the authors' own research indicates that in the process of sports activity, athletes are or can be influenced by a complex set of factors in the working environment and the labor (training) process, similar to those when working in harmful and/or dangerous working conditions. According to the authors, the systematic impact of unfavorable factors in sports activity against the background of chronic fatigue, characteristic of highly qualified athletes, is accompanied by cumulative effects in the form of functional changes of both an adaptive and maladaptive nature, and can cause the occurrence of somatic pathology.

Keywords: *high achievement sport, increased physical activity, body adaptation, chronic fatigue.*

Introduction. With the recognition of the status of professional sports, the Federal Agency for Physical Culture and Sports in the Russian Federation has formed the foundations of the regulatory framework for sports activities in elite sports at the level of federal laws, but this mainly applies only to athletes of elite professional clubs [1]. Certain types of social protection and social assistance are recognized in case of damage to the health of athletes and loss of their professional ability to work [4]. However, there is practically no corresponding system of by-laws that fully guarantees the rights of athletes who are not representatives of elite clubs.

Characteristics of the professional sports activity of high-class athletes according to the principles of the occupational medicine system, first of all, should include an assessment of the severity of the professional activity of athletes, characteristic of various

sports. Determining the level of severity of the training process and its possible impact on the body of athletes in complex coordination sports can fully justify the appropriate measures for the social protection of athletes, their recovery in cases of disability, which will significantly optimize the medical and biological support for the training of various categories of athletes, both in The federal center and in the regions, with the aim of preventing any professional or professionally caused pathology [3].

Objective of the study was to identify the conditions of training activity and the health status of high-class athletes in complex coordination sports in order to justify appropriate measures to monitor their health and complete medical rehabilitation.

Methods and structure of the study. A study was carried out of the hygienic conditions of training sessions in the gyms for aerobics and gymnas-



tics of the School of Higher Sports Excellence of the Republic of Bashkortostan (SHSE RB). Indicators of microclimate, illumination, and microbial contamination were determined. The features of the training process and the severity of physical activity in complex coordination sports were studied using the example of artistic gymnastics when performing various types of exercises and working on apparatus [2]. Some psychological characteristics were determined in female athletes of complex coordination sports, indicating the level of anxiety, fatigue, stress resistance, which are indicators of stress of any etiology - mental, physical, etc., using standard methods of Luscher and Cattell [5].

Based on the results of an in-depth medical examination performed by specialists of the Republican Medical and Physical Education Dispensary of the Republic of Bashkortostan, an analysis was carried out of the health status and functional disorders of 33 women, representatives of artistic gymnastics, who had the high titles of “Master of Sports”, “Honored Master of Sports”, “Master of Sports of International Class”.

Results of the study and discussion. In the process of conducting hygienic research when studying the conditions of training activities for complex coordination sports, the gymnastic halls of the School of Higher Sports Excellence of the Republic of Bashkortostan were examined (Table 1).

It was found that for all hygienic indicators in accordance with Sanitary Rules and Standards (SanPiN) 2.2.4.548-96, the premises for practicing complex coordination sports at the School of Higher Sports Excellence complied with accepted standards (Table 1).

According to the level of exposure to dust during training sessions in complex coordination sports, working conditions (training activities) can be classified, according to the Guidelines for the hygienic assessment of working environment factors and the labor process (G 2.2.2006-05), to class 2.0. The level

of pollution is quite low: before training it was 1.5 ± 0.5 mg/m³, after training – 2.6 ± 0.5 mg/m³, which allows us to classify them as “clean” [6].

To assess the severity of work in complex coordination sports, the training process in artistic gymnastics was analyzed. In general, from 4 to 5.5 hours a day, athletes perform a series of exercises included in their personal program of sports performance on gymnastic apparatus, with the development of coordination and technique of movements associated with lifting their own body. That is, the weight of the load being lifted, on average, can be 60-70 kg with a total number of lifts on average from 60 to 90 times.

It was determined that the average total value of the dynamic load (with regional load with the predominant participation of the muscles of the arms and shoulder girdle and moving the load over a distance of up to 1 m) was 14205.0 kg*m (working conditions class 3.2). The magnitude of the static load, involving the muscles of the body and legs and an uncomfortable working posture, was 300-150 kgf*s (class 3.2). Taken together, this determines the classification of the training activities of athletes in complex coordination sports in terms of severity to the class of working conditions 3.3 (Table 3).

Training sessions both in the warm and cold periods of the year, in complex coordination sports, were classified as category III, as work with an energy intensity of more than 250 kcal/h (more than 290 W), associated with constant movements, moving and carrying significant (over 10 kg) heavy and requiring great physical effort [SanPiN 2.2.4.548-96].

Analysis of psycho-physiological indicators in female athletes according to the Luscher and Cattell test revealed the following levels of the studied qualities: in most cases, the studied indicators (anxiety, conflict, emotional instability, self-control) corresponded to an average and below average level. However, the indicators of anxiety and conflict according to the Luscher

Table 1. Indicators of the microclimate of gyms for aerobics and gymnastics

Complex coordination types (gyms for aerobics and gymnastics SHSE RB)		
Cold period of the year	Air temperature, °C	18,7±1,3
	Relative humidity, %	43,0±1,1
	Surface temperature, °C	17,2±1,2
	Air speed, m/s,	0,3
	Illumination, lux	200
Warm period of the year	Air temperature, °C	23,5±1,2
	Relative humidity, %	52,7±1,1
	Surface temperature, °C	0,3
	Air speed, m/s,	21,2±1,5
	Illumination, lux	200



Table 2. Microbial contamination of the air in sports halls of SHSE RB

Kind of sport and sports structures	Number of microorganisms in 1 m ³				
	Total	of them:			
		Staphylococci	β -hemolyte. streptococcus	Yeast-like mushrooms	Mold mushrooms
Difficult coordination (gyms, aerobics, gymnastics)	841,3 \pm 73,7	0	25,7 \pm 8,4	45,6 \pm 13,4	61,1 \pm 24,6
	2024,8 \pm 312,3	0	7,1 \pm 16,3	20,6 \pm 3,4	50,3 \pm 10,6

Note. The numerator is the warm period, the denominator is the cold period of the year.

Table 3. Assessment of the severity of work (training process) of high-class athletes in complex coordination sports

Ergometric assessment of operations				
Type of operation (physical exercise)	Weight cargo, kg (average weight of female athletes)	Travel distance, m	Number operations per shift	Physical activity, kg*m
Exercises on the «horse» (the average weight of the athlete)	66,7	2	30	4002
Crossbar exercises (average weight of an athlete)	66,7	2	15	2001
Exercises on bars and rings (average weight of an athlete)	66,7	2	30	4002
Squats with a barbell	50	2	15	1500
Working on a hand simulator	20	2	30	1200
Working on a hand simulator	50	2	15	1500
Total	320,1	12	135	14205
Lifting your own body during floor exercises	66,7	25	2 hours in a day	1667,5
Assessing the severity of work				
Physical dynamic load (units of external mechanical work per shift, kg*m)				
Indicators of the severity of the labor process according to G 2.2.22006-05	Magnitude indicator		Class of working conditions according to G 2.2.2006-05	
With regional load (with the predominant participation of the muscles of the arms and shoulder girdle) when moving the load over a distance of up to 1 m (class 3.2 >7000 kg*s)	14205,0		3.2	
Static load (static load value per shift when holding a load, applying force, kgf*s)				
Involving the core and leg muscles (class 3.2. >200000 kg*s)	300150 kgf*s (weight 66.7; 75 operations of 60 s)		3.2	
Working posture				
Periodically, more than 50% of the shift time, being in an uncomfortable and/or fixed position; being in a forced position (kneeling, squatting, etc.) for more than 25% of the shift time. Being in a standing position for more than 80% of the shift time.			3.2	
General assessment of working conditions by severity			3.3	

test were significantly different from the indicators in the control group ($p < 0.05$). The indicators of self-control and tension also differed, and the indicators of tension had statistically significant differences with the control ($p < 0.05$).

The prevalence of chronic pathology and functional disorders was analyzed based on the results of an in-depth medical examination performed by specialists of the Republican Medical and Physical Education Dispensary of the Republic of Bashkortostan in 33



Table 4. Level of psycho-physiological indicators of female athletes in complex coordination sports

Kinds of sports	Indicators in the walls (M±m)					
	Luscher color selection test			Cattell Questionnaire		
	Performance	Anxiety	Conflict	Emotional stability	Self-control	Tension
Complex-coordination	4,8±1,4	7,5±1,4*	7,2±1,4	3,8±1,5	7,2±1,6	7,6±1,5*
Control	5,8±1,4	3,4±1,4	3,9±1,8	5,7±1,4	4,3±1,5	3,2±1,1

Note. * – The differences are statistically significant in relation to the control group, $p < 0.05$.

Table 5. Prevalence of chronic non-infectious diseases in female athletes of complex coordination sports

Kinds of sports	Number of inspections	Cases per 100 inspection	MS and PNS	CNS	RO	DGS	DO	Other
Complex-coordination	33	84,8	33, 3*	27,3*	12,1*	3,0	6,1	3,0
Control	50	52,0	8,0	7,0	3,0	2,0	3,0	3,0

Note. * – The differences are statistically significant in relation to the control group, $p < 0.05$.

Table 6. Some indicators of the health status of athletes in complex coordination sports (cases per 100 inspection) with experience of up to 5 years and more than 5 years

Observation groups	Chronic overstrain of the circulatory system (dystrophic changes in the myocardium)	Arrhythmic syndrome
Стаж – до 5 лет		
Complex coordination sports	20,0	-
Control	16,0	1,7
Стаж – более 5 лет		
Complex coordination sports	61,1*	5,6*
Control	16,0	1,7

Note. * – The differences are statistically significant in relation to the control group, $p < 0.05$.

representatives of artistic gymnastics. Designations of diseases: musculoskeletal (MS), peripheral nervous system (PNS), deviations from the center. nervous system (CNS), respiratory organs (RO), diseases of the genitourinary system (DGS), digestive organs (DO).

Conclusions. The severity of the training activity of athletes in complex coordination sports belongs to class **3.3.** according to G 2.2.2006-05, this necessitates increased health control measures, full medical rehabilitation and additional social protection measures.

The increased severity of training activity may cause an increase in the prevalence of chronic non-infectious diseases in high-level athletes of complex coordination sports.

The high severity of the training activity of athletes in complex coordination sports can reduce the level of adaptation of the athletes' body and have an adverse effect on the central nervous system and circulatory system, especially after 5 years of professional sports activity.

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