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PESHKOVA O.*Kharkiv State Academy of Physical Culture*

A set of exercises hopping pattern for the initial diagnosis of the degree of overtraining syndrome in athletes involved in cyclic sports

Abstract. *In the article the author presents data on the method of diagnosis of the initial degree of overtraining syndrome in athletes involved in cyclic sports. **Purpose:** to develop and assess diagnostic tests to detect early signs of overtraining syndrome in athletes involved in cyclic sports. **Material and Methods:** developed by the author was applied a set of jumping exercises in 42 athletes with an initial degree of overtraining syndrome in age from 21 to 27 years old male, who were engaged in cyclic kinds of sports (athletics, skiing, cycling, swimming). To control the data obtained were compared with the same athletes before their clinical and functional signs of overtraining syndrome were identified. **Results:** using the jumping exercises on track kinematometra control and the expectation of landing an athlete with a spade to the side, front and rear walls of the rectangular contour of the rotation at the time of jumping on 90° and without it as a set of available physical exercise greatly simplifies the identification of the main indicators characterizing changes in the central nervous system in the early stages of overtraining syndrome.*

Keywords: *the central nervous system, chronic overvoltage, test jumping motor tasks.*

Introduction. Overtraining is a pathological state which develops at sportsmen as a result of chronic physical overstrains which clinical picture is defined by functional violations in the central nervous system [2].

The disease is the cornerstone of an overstrain of exciting, brake processes or their mobility in bark of big cerebral hemispheres. It allows to consider pathogenesis of overtraining similar to pathogenesis of neuroses. The essential value in pathogenesis of a disease has the endocrine system and, first of all, hypophysis and bark of adrenal glands [2; 5]. So, according to G. Selye (1960), the general adaptation syndrome develops at an action of a strong irritant (stressor) in an organism, whether a stress in the course of which activity of forward part of a hypophysis and bark of adrenal glands amplifies. These changes define the development of adaptation reactions in an organism to the intensive muscular activity in the endocrine system in many respects. However the chronic physical overstrain can lead to exhaustion of bark of adrenal glands and by that to violation in an organism of the developed earlier adaptation reactions. It is necessary to emphasize that the central nervous system includes and regulates stressful reactions in the development of overtraining. The violation of processes of a pith neurodynamics is the cornerstone of pathogenesis of overtraining how it takes place at neuroses [7].

The functional state of the belowstated departments of the central nervous system changes at neurosis. Thus visceral frustrations which are observed often at overtraining, it is possible to consider as a result of changes of a functional condition of an interweft brain which regulates neurohumoral processes in an organism and controls vegetative, hormonal and visceral functions.

As a result of the above-mentioned reasons the main motive qualities of the trained person, that is at first high-speed, then exact and rough coordination of movements, then power indicators, and, in the last turn, endurance, are broken [3; 4; 8].

Thus, apparently from the aforesaid, the problem is very big and needs a careful approach to studying of such questions, as early diagnostics of a peretrenovanost overtraining at sportsmen, for the purpose of finding of rational ways of treatment and renewal of the trained persons at emergence already of the first symptoms of a disease, the development of methods of timely prevention of this state. However the existing approaches concerning diagnostics of overtraining at sportsmen are based on a reconstruction of physiologic indicators which define a functional condition of a sportsman, and their comparison, with premorbid indicators [9]. Hormonal indicators of blood (the increased level of an epinefrin and norepinefrin, cortisone, adrenokortikotropny hormone) and immunological indicators of blood (lymphocytosis, quantity of the circulating immune complexes, phagocytosis, etc) are used as physiologic indicators of a functional condition of a sportsman. However these indicators aren't specific in diagnostics of overtraining because shifts of the above-mentioned indicators of blood can be observed at other pathological states, for example, diseases of blood (leukosis), autoimmune diseases (rheumatism, tireoidit, allergic states), psychoemotional tension and stressful states. Difficult equipment and reactants are necessary for studying of these indicators which stand much that considerably increases a cost of diagnostics. Sportamen, as a rule, not really favorably treat blood sampling from a vein which leads often to negative consequences and considerably complicates process of carrying out diagnostics. Besides, these indicators of a functional condition of a sportsman find only collateral signs of the developed overtraining when the neurologic state at a sportsman while they don't fix violation of coordination opportunities of sportsmen and calculation by their amplitude of movements which are prints of the main changes at function of the central nervous system is considerably broken is characteristic at initial stages of overtraining at sportsmen. It reduces reliability of diagnostics because thus the possibility of definition of overtraining isn't provided at initial stages of a disease [6].

Communication of the research with scientific programs, plans, subjects. The problem is developed according to the priority direction, the determined Law of Ukraine "About the priority directions of the development of science and technique" by the number 3.5. "Sciences about lives, new technologies of prevention and treatment of the most widespread diseases" within the priority thematic direction 3.5.29. "Creation of standards and technology of introduction of a healthy lifestyle, technology of improvement of quality and safety of food", by the subject "Traditional and nonconventional methods of physical rehabilitation at diseases of different systems of an organism and damages of the musculoskeletal device at persons of different degree of fitness". Number of the state registration – is 0111U000194.

The objective of the research: to develop and to estimate diagnostic tests for the identification of early signs of overtraining at sportsmen who are engaged in cyclic sports.

Materials and methods of the research. 42 male sportsmen from 21 till 27 years old were under our supervision who were engaged in cyclic sports (track and field athletics, skiing, cycling, swimming) and in which the initial degree of overtraining was found. From them are masters of sports – 24 persons, candidates in the master of sports – 18 persons.

The developed by us complex of jumping exercises on a path of a kinematometer with control and calculation of a landing of a sportsman with a spade on side, forward and back walls rectangular to a contour with rotation at the time of a jump on 90° in the complicated conditions of a performance of exercises and without a rotation – in the simplified conditions was applied as methods of the research [1].

For control the obtained data were compared to data of the same sportsmen to identification in them clinical-functional signs of overtraining.

Processing of the obtained data was carried out by means of a method of mathematical statistics of S. N. Lapach, A. V. Chubenko, P. N. Babich (2000).

Results of the research and their discussion. The processes of storing and storage in memory of information on the structure of carried out and learned physical actions which comes to the central nervous system from different receptors is a psychoneurological basis of study of the trained persons to new exercises and accumulation at them motive experience in the process of renewal of the broken motive stereotype under the influence of overtraining. Volumes and durability of this storing belong to quantitative characteristics of motive memory. A performance of the above-mentioned group of motive tasks aims to find out that remembers, analyzes and reproduces abilities of the central nervous system at initial degrees of overtraining at sportsmen.

Thus, the research was conducted by us. The starting line is carried out on a path to a kinematometer from a linoleum of dark color 8 m long and 1,5 m wide, at distance of 3,5 m from its first line from which sportsmen (after warm-up) do two jumps from a place in succession on range taking into account their results. Then 50% of the longest of them undertake and it is noted from the starting line towards a first line of a kinematometer. The investigated stands on marks 1,5 sm farther, connected feet. The rectangular contour with its distance to feet on 1,5 sm is drawn by a chalk round them by means of a ruler. Then the investigated jumps from a place by a push of both feet from the starting line, trying to get by feet to a contour, not taking up its sides – back, forward and side. Jumps repeat with intervals 30–60 s, every time measures thus landing accuracy in a rectangular contour. Thus, jumping exercise are carried out in the simplified conditions, that is without rotation of the sportsman during a jump, and in the complicated conditions, that is with its rotation on 90°. The predicted number of possible attempts when performing of the noted exercises in the simplified conditions, makes 10 attempts. Next day the same repeats, but jumps are carried out in the complicated conditions, that is with rotation of the sportsman on 90°. The predicted number of possible attempts when performing exercises thus makes already 20 attempts. In case of overtraining sportsmen have outstanding changes in function of the central nervous system which are characterized by violation of their coordination opportunities and calculations of amplitude of movements by them when performing these exercises that is fixed by the accuracy of a landing of sportsmen after a jump in a rectangular contour.

In the analysis of the obtained data it was established that sportsmen with initial degrees of overtraining have the speed of storing, an exception from memory and a reconstruction of the correct structure of jumps were authentically below, than at healthy sportsmen were (tab. 1).

Table 1

Average number of attempts which is the share of one sportsman with initial degree of overtraining and the healthy sportsman for the achievement of a stable exact performance of a jump in a rectangular contour

Type of a jump	Average number of attempts in jumps on accuracy		t	p
	Sportsmen with initial degree of overtraining	Healthy sportsmen		
	$\bar{X} \pm m$	$\bar{X} \pm m$		
From a place without a turn in a flight on 90 degrees	10,00±0,35	6,00±0,15	10,52	<0,0001
From a running start without a turn in a flight on 90 degrees	14,00±0,53	9,±0,24	8,62	<0,0001
From a place with a turn in a flight on 90 degrees	17,00±0,57	13,00±0,28	6,25	<0,0001
From a running start with a turn in a flight on 90 degrees	19,00±0,61	15,00±0,32	5,80	<0,0001

All this testified what deteriorations of the impressed and reproductive ability of the nervous system in the conditions of study to jumping exercises of different coordination complexity occur even at initial degree of overtraining. The correctness of this conclusion is validated by that a bigger number of attempts was necessary for sportsmen with signs of overtraining, than healthy for the achievement of a steadily exact performance of each of jumps (tab. 1, 2).

Sportsmen with the initial degree of overtraining performed all four tasks with big mistakes in comparison with healthy persons; distinctions had a significant character (tab. 3).

Upon a completion of exercises we defined an index of mistakes by the following ratio:

$$Ind = \frac{n \cdot 100}{m} \%,$$

where: Ind – an index of mistakes when performing of the noted exercises of %; n – a number of the executed attempts without mistakes when performing exercises (number of times); m – we offer a number of possible attempts when performing exercises (number of times) (tab. 4).

Table 2

Average number of attempts after the first successful attempt which is the share of one sportsman with the initial degree of overtraining and the healthy sportsman, to stabilization of an exact landing in a rectangular contour

Type of a jump	Average number of attempts after the first successful attempt to stabilization of an exact landing in jumps		t	p
	Sportsmen with initial degree of overtraining	Healthy sportsmen		
	$\bar{X} \pm m$	$\bar{X} \pm m$		
From a place without a turn in a flight on 90 degrees	6,00±0,12	3,00±0,13	16,67	<0,0001
From a running start without a turn in a flight on 90 degrees	9,00±0,18	5,00±0,12	18,18	<0,0001
From a place with a turn in a flight on 90 degrees	11,00±0,25	8,00±0,15	11,11	<0,0001
From a running start with a turn in a flight on 90 degrees	12,00±0,25	9,00±0,21	7,89	<0,0001

Table 3

The average size of mistakes during a landing in different jumps counting on one sportsman with initial degree of overtraining and one healthy sportsman

Type of a jump on landing accuracy	Side rectangular to a contour	Average size of mistakes, mm		t	p
		Sportsmen with initial degree of overtraining	Healthy sportsmen		
		$\bar{X} \pm m$	$\bar{X} \pm m$		
From a place without a turn in a flight on 90 degrees	distant	16,50±0,95	11,81±0,76	3,88	<0,0001
	near	20,80±1,01	16,50±0,83	3,28	<0,001
	at the left	12,60±0,67	9,70±0,42	3,67	<0,0001
	on the right	12,10±0,64	10,10±0,54	2,96	<0,01
From a running start without a turn in a flight on 90 degrees	distant	18,30±1,10	14,60±0,83	2,68	<0,005
	near	26,80±1,30	19,90±1,05	4,13	<0,0001
	at the left	11,90±0,58	10,20±0,48	2,27	<0,05
	on the right	12,00±0,61	10,50±0,61	1,74	>0,05
From a place with a turn in a flight on 90 degrees	distant	21,80±1,19	15,40±0,89	4,29	<0,0001
	near	34,50±2,31	24,60±2,11	3,10	<0,005
	at the left	17,40±1,04	13,20±0,53	3,59	<0,0005
	on the right	12,50±0,72	11,10±0,59	1,51	>0,05
From a running start with a turn in a flight on 90 degrees	distant	21,60±1,19	17,50±0,91	2,87	<0,005
	near	34,50±2,31	24,60±2,11	3,10	<0,005
	at the left	17,40±1,02	13,20±0,97	2,98	<0,005
	on the right	18,10±1,01	16,10±0,86	1,50	>0,05

Table 4

The size of an index of mistakes which is the share of one sportsman with initial degree of overtraining and one healthy sportsman of %

Type of a jump	Size of an index of mistakes	
	Sportsmen with initial degree of overtraining	Healthy sportsmen
	$\bar{X} \pm m$	$\bar{X} \pm m$
From a place without a turn in a flight on 90 degrees	76	95
From a running start without a turn in a flight on 90 degrees	58	95
From a place with a turn in a flight on 90 degrees	67	92
From a running start with a turn in a flight on 90 degrees	55	90

As a rule, premorbid indicators in relation to an index of mistakes at healthy sportsmen this index made 100–95% in the simplified performance conditions of jumping exercises, and in the complicated conditions – from 100% to 90%. In the

presence of an index of mistakes from 95% to 50% in the simplified performance conditions The first stage of overtraining was diagnosed for the studied sportsmen and from 90% to 40% – in the complicated conditions of a performance that was confirmed by the data of clinical-functional inspections.

Conclusions:

1. The use of jumping exercises on a path of a kinematometer with control and calculation of a landing of the sportsman with a spade on side, forward and back walls of a rectangular contour with rotation at the time of a jump on 90° and without it as to a complex of available physical exercises considerably simplifies definitions of the main indicators which characterize shifts in the central nervous system at initial stages of a disease.

2. The application as physiologic indicators of a functional condition of the sportsman of accuracy of a performance of a complex of available physical exercises in the simplified and complicated conditions, the definition of an index of mistakes at execution of these exercises and the comparison of it with premorbid indicators according to the above-mentioned ratios allows defining violation of coordination opportunities and calculation of amplitude of movements at the sportsmen that characterize changes in his central nervous system already on initial degrees of overtraining and to increase thus the reliability of identification of signs of initial degrees of overtraining.

Carrying out the joint application of immunological, hormonal inspections and motive tasks is a **perspective** for the definition of overtraining of the second degree at sportsmen taking into account their sex.

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Olga Peshkova: PhD (Medicine), Professor; Kharkiv State Academy of Physical Culture: Klochkivska 99, Kharkiv, 61058, Ukraine.

ORCID.ORG/0000-0001-6098-3844

E-mail: olsikp@gmail.com