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EFFECTIVE LONG TERM ADAPTATION AND METABOLIC STATE REGULATION OF SKI-RACERS

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South Ural State University Institute of Sport, Tourism and Service.

Abstract. *Purpose:* to scientifically substantiate effective mechanisms of organism's bio-chemical adaptation of ski-racers in competition period with the help of lipid peroxidation indicators, oxidative modification of proteins and activity of hypothalamus pituitary adrenocortical system. *Material:* in the research 14 sportsmen of 18-25 years' age (combined team of university) with different level of sportsmanship participated. Assessment of free radical oxidation, anti-oxidant system, cortisol level was fulfilled with the help of indicators' quantitative analysis by bio-chemical methods applied to blood serum samples. *Results:* it was found that in the basis of bio-chemical changes under intensive physical loads is increase of catabolic processes' speed. Change of organism's metabolic orientation of ski racers at optimal level results in working muscles' energy supply improvement, increase of energy systems' power and sports efficiency. *Conclusions:* Application of interval trainings at stages of preparation to special significant competitions results in expected adaptation and increase of sports efficiency. We also showed their effective role in ensuring long term reactions, conditioning high sports efficiency.

Key words: lipids peroxidation, oxidative modification of proteins, sports efficiency, cortisol, effective adaptation.

Introduction

Since the time of Soviet Union and up to the present in ski racings, the models of excessive loads have been used, which brought high sports results. However, to day, in connection with application of new technologies in ski racers' training the role of special endurance and sports efficiency increased. According to modern tendencies special endurance of ski racers is determined by aerobic and anaerobic processes in muscles, which permit to generate high strength and power in upper and lower limbs [21, 23, and 24].

In our previous researches we determined excretion of creatine and non organic phosphorus as indicator of Judo wrestlers' metabolic state. Bio chemical basis of Judo wrestlers' special endurance is connected with high level of creatine phosphate track of bio-energetic. General endurance is connected with priority presence of lipid metabolism in energy supply of motor functioning [10]. In assessment of ski racers' metabolic state in conditions of concentrated development of local-regional muscular endurance in basic period of training we found variability of products in heptanes phase of lipid extracts. It results in increase of aerobic share of energy supply [4].

At present time physiology of sports have great scope of information on researches of cardio-pulmonary system. There is much less researches on long term bio-chemical adaptation, whose regulation and phases, nevertheless, are under attention of researchers [5, 13, 20]. With it, it is necessary to note that there is a lot of works, devoted to lipids peroxidation, stress indicators, allostasis. A little bit less there are works on protein synthesis, which is of great importance in plastic and energetic processes as well as in buffer component, which maintain the level of cations and reduce elastic viscous properties of skeletal muscles. Very important direction is connected with study of contracting muscular proteins' metabolism's molecular properties. First of all it is necessary to study the processes in cell membrane and membranes of self-plasmatic reticulum (SPR), mechanisms of receptors' functioning, which are located in membranes of glucoses transportation proteins.

As on to day, in informational field of sports physiology and motor functioning there exists a contradiction between volume characteristics of positive and negative influence of physical exercises on ski racers' psycho-physiological (in wide sense) potential. Such situation conditioned the choice of the subject of our research.

Hypothesis: it is assumed that sportsmen organism's integrative functioning in extreme environmental conditions is manifested in combined reflection of free radical lipids' oxidation, antioxidant activity of blood plasma and protein synthesis. All these in total determine energy supply, plastic and defensive functions of the tested sportsmen's organisms.

The purpose of the research is to study indicators of bio-chemical processes in ski racers with high sports efficiency.

Material and methods

Participants: the contingent to be researched consisted of ski racers (male), members of combined team of university of age 18-25 years old. The first group included sportsmen with higher sports efficiency (1st group, n=5); the second consisted of sportsmen with weaker sports efficiency (2nd group, n=9). The research was conducted in competition period of training (February).

Organization of the research: we fulfilled laboratory testing of free radical oxidation, antioxidant system; we estimated activity of hypothalamus pituitary adreno-cortical system (determination of cortisol level). For this purpose we used quantitative analysis of indicators with bio-chemical methods, applied to blood serum samples. The object of

laboratory testing was heparinized blood taken from cubital Vienna in the morning at empty stomach. All tested gave their consent for taking blood that does not contradict Declaration of Helsinki.

Assessment of condition of lipids' peroxidation processes included quantitative determination of primary, secondary and final peroxidation products in blood plasma with separate registration of lipid peroxides in heptanes and isopropanol phases of lipid extract [6, 11, 12, and 22].

Assessment of condition of proteins' oxidation modification included estimation of carbonyl products' content of blood plasma proteins' oxidation modification by their reaction to 2,4 – dinitrophenylhydrozine with further spectral-photometric registration of interacting products –dinitrophenylhydrozones [2, 7, and 8]. The content of carbonyl products' content of blood plasma proteins' oxidation modification was registered in 5 (five) samples of blood serum.

Spectral photometric detection of lipid peroxidation products in heptanes and isopropanol blood serum extracts as well as level of carbonyl proteins was fulfilled with the help of spectrometer «SF-56» (LOMO - Spectr, Sankt Petersburg, Russia).

Estimation of cortisol content was realized with fluorometric micromethod [3]. Cortisol content was determined in 5 (five) blood serum samples. Determination of fluorescence intensity for quantitative detection of cortisol level was carried out with the help of bio-liquids' analyzer «Fliorat – 02 ABLFT » (Lumax, Sankt-Petersburg, Russia) with wave length of fluorescence excitation of 405 nm and emission 546 nm.

Statistical analysis: statistical processing of the research's materials was fulfilled with the help of Statistica 10.0, SPSS 17 programs on bases of key methods. Confidence of differences between groups was determined with Manna-Whitney criterion.

Results of the researches

It is known that processes of lipid peroxidation in blood plasma is one of criteria of sportsman's special endurance and condition of aerobic energy supply mechanisms' objective assessment (see table 1).

Table 1. Content of lipid peroxidation molecular products at competition stage of training in both groups (M±m)

Group	Isopropanol-solved			Heptanes-solved		
	Primary (DC) E ₂₃₂ /E ₂₂₀	Secondary (KDsCt) E ₂₇₈ /E ₂₂₀	Final (SB) E ₄₀₀ /E ₂₂₀	Primary (DC) E ₂₃₂ /E ₂₂₀	Secondary (KDsCt) E ₂₇₈ /E ₂₂₀	Final (SB) E ₄₀₀ /E ₂₂₀
1	0.45±0.01	0.25±0.07	0.02±0.002	0.63±0.01	0.12±0.02	0.06±0.09
2	0.43±0.02	0.18±0.05	0.02±0.002	0.48±0.02	0.19±0.03	0.17±0.04
p	> 0.05	< 0.05	> 0.05	< 0.05	< 0.05	< 0.01

Notes:

DC – diene conjugates;

KDsCt – keto-diene and coupled trienes;

SB - Schiff bases.

By results of the research (see table 1) it is clear that in group 1 there is increased content of LPP in heptanes ($p > 0.05$) and in isopropanol phases ($p > 0.05$) of lipid extract. It is known that at the account of accumulation of primary LPP diene conjugates polarity of hydrophobic carbohydrate tails of fat acids, which form a layer of cell membranes, increases. The parts with increased polarity are displaced from membranes. It makes easier self-renewal of membrane structures, increases intensity of electronic transportation in respiratory chain and facilitates steady hyper functioning of myocardium under hypoxia [9, 17]. At the same time in group of leaders we observed reduced content of secondary ($p < 0.05$) and final ($p < 0.01$) heptanes solved. This fact says that in competition period sportsmen-leaders have increased glucose content, which, in its turn, results in braking of fats disintegration (as less effective source of energy supply with competition speeds).

Intensification of lipids peroxidation processes in leaders' group was accompanied, at the same time, by increased level of antioxidant activity, determined by content of peroxidation secondary products, after induction by ascorbate (see fig. 1).

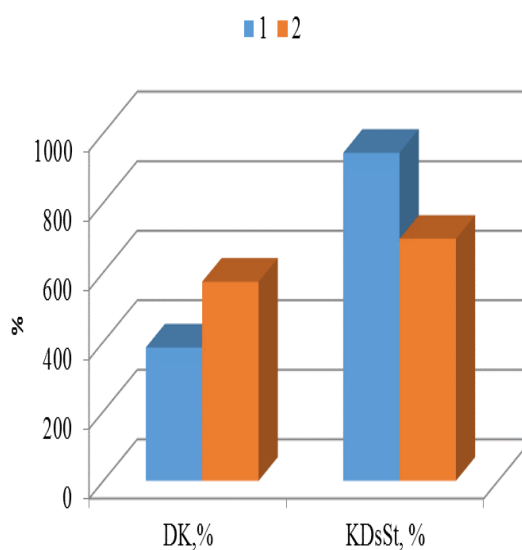


Fig.1. Indicators of induced lipids' peroxidation (DC – diene conjugates; KDsCt – keto-diene and coupled trienes in both groups (group 1 (1), group 2 (2), %

It is known that under oxidation stress cell proteins (together with lipids) undergo radical attack of activated oxygen metabolites. One of promising directions in science is practical study of proteins' oxidation modification in biological material in pathological state. Results of proteins' oxidative destruction is damage of proteins; native structure (see fig. 2).

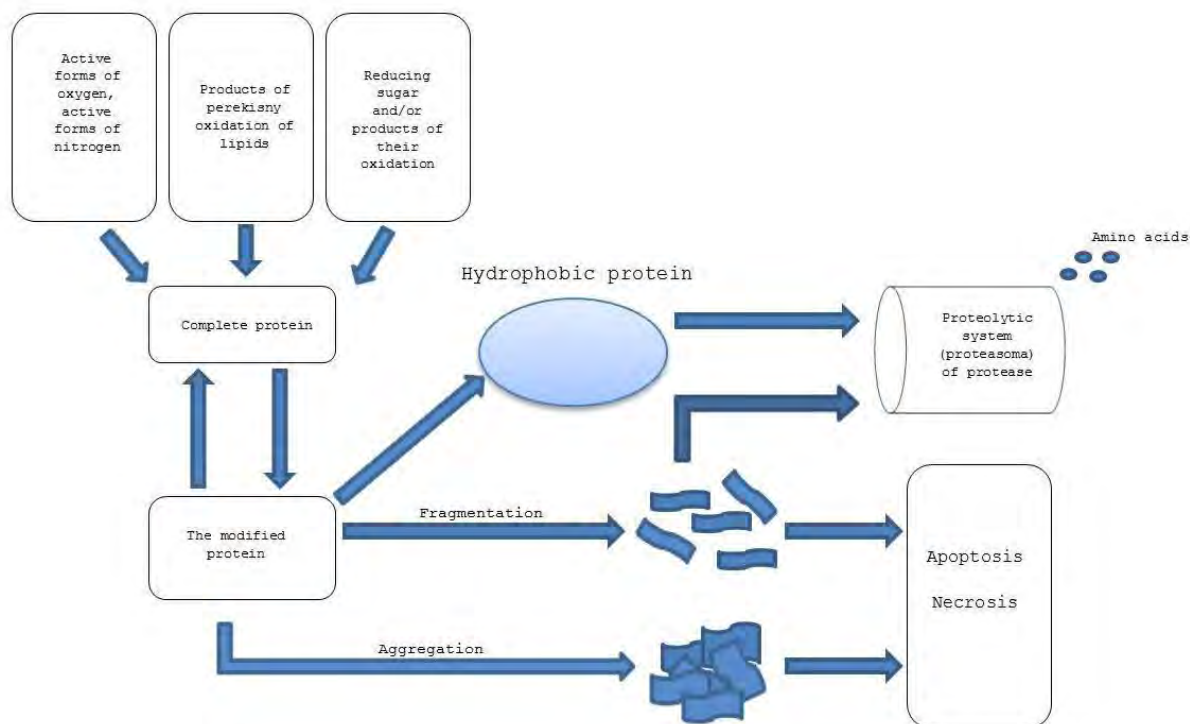


Fig. 2. Ways of formation and utilization of modified proteins by Davies, K.J. [18]

Under effect of oxygen active forms two processes can take place: fragmentation of proteins, whose markers are aldehyde dinitrophenylhydrozones (ADNPH); aggregation of proteins, whose markers are ketone dinitrophenylhydrozones (KDNPH) [15].

Products of proteins' oxidation, formed spontaneously and in induced way in Fenton's reaction [1] shall be measured. It is considered that indicators of proteins' spontaneous oxidative modification characterize organism's

general physiological condition, while indicators of proteins' oxidative modification characterize reserve adaptation potentials of organism [15].

Table 2. Content of carbonyl proteins (CP) (level of proteins' oxidative modification) in both groups (M±m)

Group	Spontaneous			Induced		
	CP1, EDop/g of protein	CP2, mc.mole/g of protein	CP3, mc.mole/g of protein	CP1, EDop/g of protein	CP2, mc.mole/g of protein	CP3, mc.mole/g of protein
1	5.82±1.25	0.43±0.21	0.54±0.21	92.03±1.74	3.21±1.12	1.55±0.17
2	1.11±0.47	0.26±0.17	0.30±0.15	76.21±1.43	3.03±1.11	1.27±0.11
p	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Notes:

CP1 - a ADNPH – aliphatic aldehyde-dinitrophenylhydrozones ($\lambda_{\max} = 270$).

CP2 - a KDNPH n - aliphatic ketone-dinitrophenylhydrozones of neutral character ($\lambda_{\max} = 370$).

CP3 - a KDNPH main - aliphatic ketone-dinitrophenylhydrozones of main character ($\lambda_{\max} = 430$).

EDop/g of protein – units of optical density per 1g of protein.

mc.mole/g of protein - mc.mole/g per 1 g of protein.

At early stages of oxidative stress aldehyde-dinitrophenylhydrozones (ADNPH) prevail and at later stages - ketone-dinitrophenylhydrozones (KDNPH).

Higher values of proteins' oxidation modification in group of leaders ($p < 0.05$) point at intensification of oxidation processes. Intensity of induced oxidation of proteins' modification in group 2 is much less ($p < 0.05$). It witnesses about less proteins' reserve for oxidation. At the same time, induced oxidative modification of proteins permitted to register higher resistance of system to peroxidation in leaders' group.

Therefore, intensive loads in competition period increase sportsmen organism's demand in proteins. Proteins fulfill plastic and energetic functions, which is glucose transportation in anaerobic conditions of motor functioning [26].

V.A. Rogozkin [13] found that increase of glucose supply to muscular cell takes place at the account of increase of proteins' transporters quantity and owing to increase of these proteins metabolism. Glucose transportation into muscular cell is closely connected with presence of specific proteins transporters in it and their mobilization. Reduction of glucose level helps to slow down production of amino acids in liver [5]. It stimulates glycogen and cortisol [16].

Analysis of results of general proteins and cortisol content in blood plasma of ski racers showed multidirectional dependence of these indicators on each other (see table 3). Indicators of cortisol in leaders' group were lower by 113.2 nmole/l ($p < 0.05$). Content of general proteins in this group prevailed by 9.64 g/l ($p < 0.05$) in contrast to ski racers with lower sports efficiency.

Table 3. Content of general proteins and level of cortisol in blood of both groups' ski racers (M±m)

Group	General proteins, g/l	Cortisol, nmole/l
1 (leaders)	81.61±8.47	367.3± 54.14
2	71.97±8.12	480.5±32.17
p	< 0.05	< 0.05

Cortisol is a hormone, which increase intensity of proteins' decay and amino acids' release from them. It ensures the presence of initial compounds for glucose synthesis. Thus, in this case we observe reduction of metabolism's intensity in leaders' group. It witnesses about economizing of organism's work in state of rest.

Discussion

The main target of training process in sports is achievement of the highest cumulative adaptation effect, which shall reflect in increment of workability indicators and improvement of sports results [27].

In connection with changes in modern ski racing, new means of ski trail's preparation, introduction of sprinter disciplines in competition programs, the scientists all over the world review morphological functional characteristics of elite skiers. Besides, means of technique's and special workability assessment are perfected [21, 19, and 25]. Most of researches in conditions of mobilization stress with indicator of lipids' peroxidation and antioxidant activity were fulfilled on animals [6]. Researches in sports on studying of stress-tension indicators relate to the end of the last century and were connected with assessment of metabolic and cardio-vascular states.

The progress of sports efficiency in present researches is conditioned by application of training loads with concentrated development of local-regional muscular endurance in aerobic mode at stage of basic training. In this case

organism's vegetative systems are not limiters of workability [14]. Introduction of interval trainings at stages of preparation to special important competitions brought the expected effect of adaptation and increase of sports efficiency. We showed their effective role in ensuring of long term reactions, conditioning high sports efficiency (second place of male combined team of LURSU in ski racing at 4th All-Russian winter Universiade, 2016).

Conclusions

1. Higher sports efficiency in leaders' group is characterized by prevalence of values of lipids' peroxidation primary products (diene conjugates) in heptanes and isopropanol phases of extract; by less level of secondary heptanes solved products of lipids' peroxidation (ketodienes and coupled trienes).

2. In leaders' group we observed higher level of antioxidant activity: reduced – of cortisol; increased of general proteins, comparing with group of lower sports efficiency.

3. Intensification of proteins oxidation processes in leaders' group results in increase of glucose content and glycogen accumulation – main source of energy supply in anaerobic conditions of motor functioning.

5. The work of energy supply mechanism in leaders' group is characterized by more effective combination of aerobic and anaerobic abilities.

4. Increase of reserve-adaptation potential's share in leaders is characterized by increased content of aldehyde and ketone-dinitrophenylhydrozones of main character and ketone-dinitrophenylhydrozones of neutral character.

Conflict of interests

The authors declare that there is no conflict of interests.

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UBIQUITY AND FORMATION OF CHRONIC FATIGUE IN QUALIFIED SPORTSMEN

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Abstract. *Purpose:* estimation of ubiquity of chronic fatigue among qualified sportsmen of Ukraine in different kinds of sports and determination of specificities of chronic fatigue syndrome's formation among them. *Material:* in the research qualified sportsmen of different kinds of sports (n=286) participated. For determination of chronic fatigue degree we used the questionnaire of Leonova. *Results:* in 104 sportsmen we registered symptoms of chronic fatigue of different degree. Among women symptoms of chronic degree were registered oftener (47.0%), than among men (29.2%). Most of chronic fatigue cases were noticed in swimming, light athletics and football. Formation of chronic fatigue was preceded by certain stages: overtiredness, over tension, over training. In 36.4% of the questioned sportsmen we registered chronic fatigue symptoms of different degree. We offered a model of chronic fatigue and syndrome of chronic fatigue formation in qualified sportsmen. *Conclusions:* progressing of sportsmen's chronic fatigue and chronic fatigue syndrome are characterized by gradual appearing of stable or relapsing significant tiredness or by quick tiredness. As a result we can observe reduction of usual activity during long period of time (more than one month).

Key words: sportsmen, overtiredness, over tension, over training, chronic fatigue.

Introduction

Modern elite sports are a sphere of activity, in which sportsman's organism endures extreme physical and psychological impacts. Unlimited increase of sports loads in elite sports is irrational, because it negatively influences on sportsman's health. Unjustified high volumes of fulfilled work and wish to increase fitness result in progressing of distress. In its turn, it results in "fluctuations" of immune system, progressing of pre-morbid states and diseases. And more, than 50% of sportsmen have deviations in health [4, 6].

According to the conducted research qualified sportsmen form special group. The sportsmen of this group can have over tension of functional systems in conditions of training and competition loads. Further, favorable adaptive reactions can transform into pre-pathological and even pathological changes in organism [10, 14]. In opinion of a number of scientists syndrome of chronic fatigue can form in such conditions [4, 6, and 24].

In our previous works we stated that chronic fatigue of different degree is very often diagnosed in qualified sportsmen of different kinds of sports. It is connected with progressing worsening of their functional, psycho-physiological status and physical condition indicators. In such conditions there is a risk of different pre-pathological and pathological states' formation [1, 6]. In connection with great urgency of this problem, in the present work we continued the research of ubiquity and formation of chronic fatigue in qualified sportsmen of Ukraine.

Hypothesis: it is assumed that qualified sportsmen can endure impact of unfavorable factors in the process of their professional functioning. These factors are connected with non compliance of physical and psychological loads with their functional potentials, chronic diseases, irrational eating, ecology and etc. It can result in progressing of chronic fatigue and chronic fatigue syndrome in sportsmen.

The purpose of the work is to estimate ubiquity of chronic fatigue among qualified sportsmen of Ukraine in different kinds of sports and determination of specificities of chronic fatigue syndrome's formation among them.

Material and methods

Participants: in the research 286 qualified sportsmen, members of combined teams of Ukraine participated. The age of sportsmen was from 16 to 37 years. They were from such kinds of sports as: light athletics bicycle racing, wrestling, swimming, hockey, football, freestyle, academic rowing, sport dances and rock climbing.

Organization of the research: the researches were conducted on the base of SRI* (University of physical culture and sports of Ukraine), center of Olympic training (Concha Zaspá). For determination of chronic fatigue degree (CF) we used the questionnaire of Leonova [8].

Statistical analysis: we used well known methods of transformation of questioning data [13]. With the help of logically meaningful procedures we found correlations of the tested variables.

Results of the research

Analysis showed that 182 (63.6%) of sportsmen had no symptoms of chronic fatigue. In 66 (23.1%) sportsmen we found symptoms of chronic fatigue's initial degree. In 22 (7.7%) we found expressed symptoms of chronic fatigue. In 16 sportsmen (5.6%) we registered strong degree of chronic fatigue. We also found that among women symptoms of chronic degree were registered oftener (47.0%), than among men (29.2%), (see fig.1).

- SRI – scientific research institute

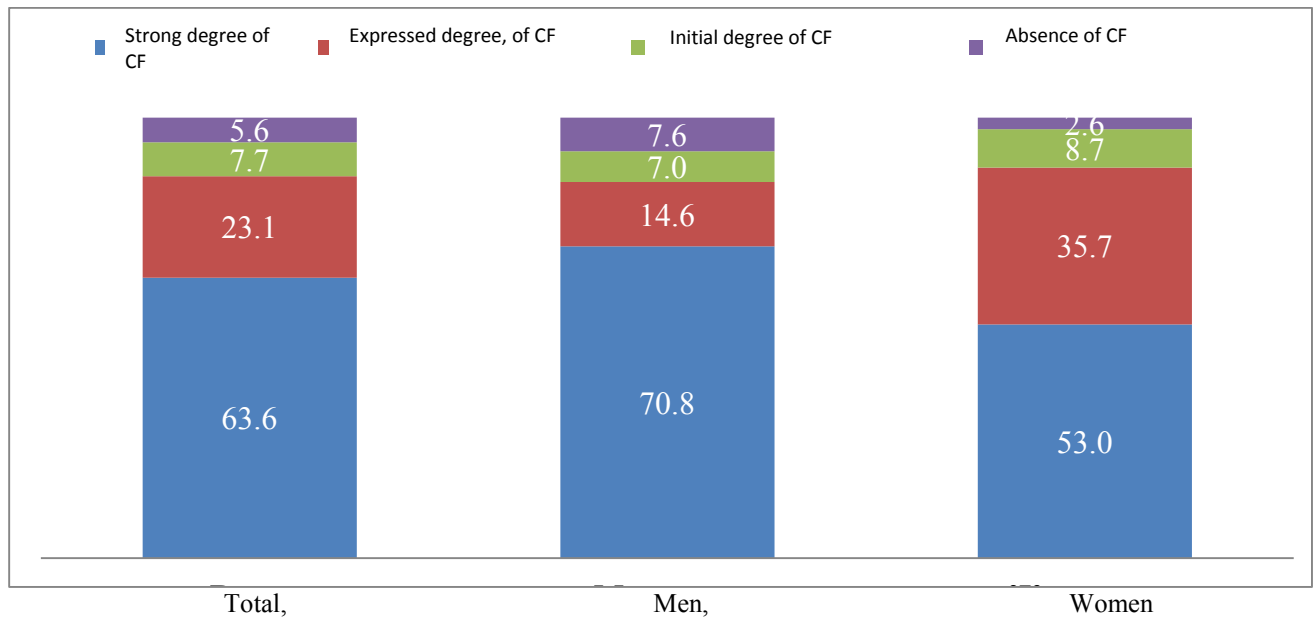


Fig. 1. Symptoms of chronic fatigue of different degree in the questioned sportsmen in general and separately among men and women

This fact complies with literature data [11, 26]. At the same time we found that strong degree of chronic fatigue in men is met oftener (7.6%), than in women (2.6%). May be it is connected with the fact that men represent “heavier” kinds of sports: wrestling, football, hockey.

Analysis of frequency of chronic fatigue symptoms’ manifestation in different kinds of sports showed that the most often these manifestations take place in swimming (71% of all questioned swimmers), in light athletics (62%) and in football (54%). In football, light athletics, wrestling and bicycle racing there were more sportsmen with strong degree of chronic fatigue (16%, 12%, 8% and 7% accordingly). In such kinds of sports as freestyle and rock climbing syndrome of chronic fatigue was rather rare, (see fig. 2).

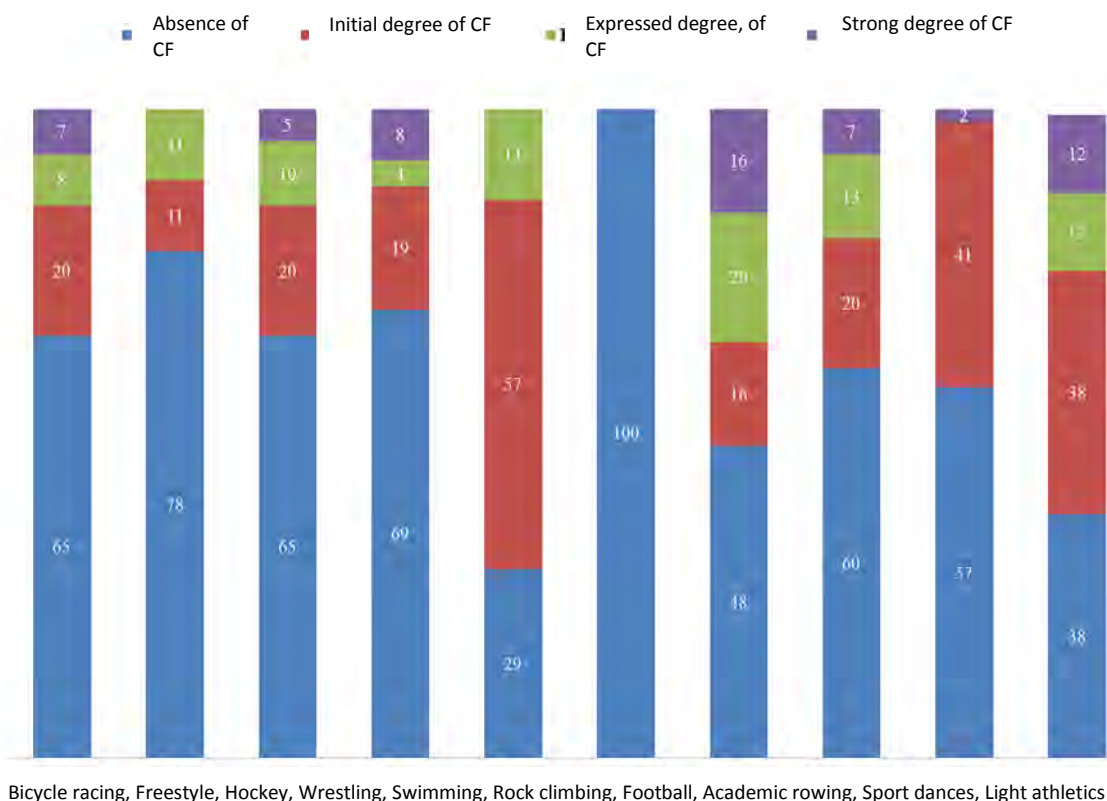


Fig 2. Symptoms of chronic fatigue of different degree in the questioned sportsmen of different kinds of sports

The received data can witness that in football, light athletics, swimming, wrestling and hockey training and competition loads are too high for some sportsmen and restoration processes in their organisms are inhibited. It is necessary to pay attention of coaches, methodic specialists and medical personnel to the demand in correction of trainings' building and character for such sportsmen. Besides, it is necessary to pay attention to full and consequent application of sports workability restoration methods and means (day regime, control over functional systems' state and so on) in kinds of sports, in which manifestations of chronic fatigue is the most frequent. Besides, it is important to use means, oriented on increase of organism's non specific resistance at all stages of training and competition processes [15]. Recreational means shall be included in general plan of sportsman's training in close connection with general organization of training regime [2, 5].

Basing on our own and literature data [9, 10, 14, 17, 23] we offer the following model of chronic fatigue and chronic fatigue syndrome's formation in qualified sportsmen, (see fig. 3).

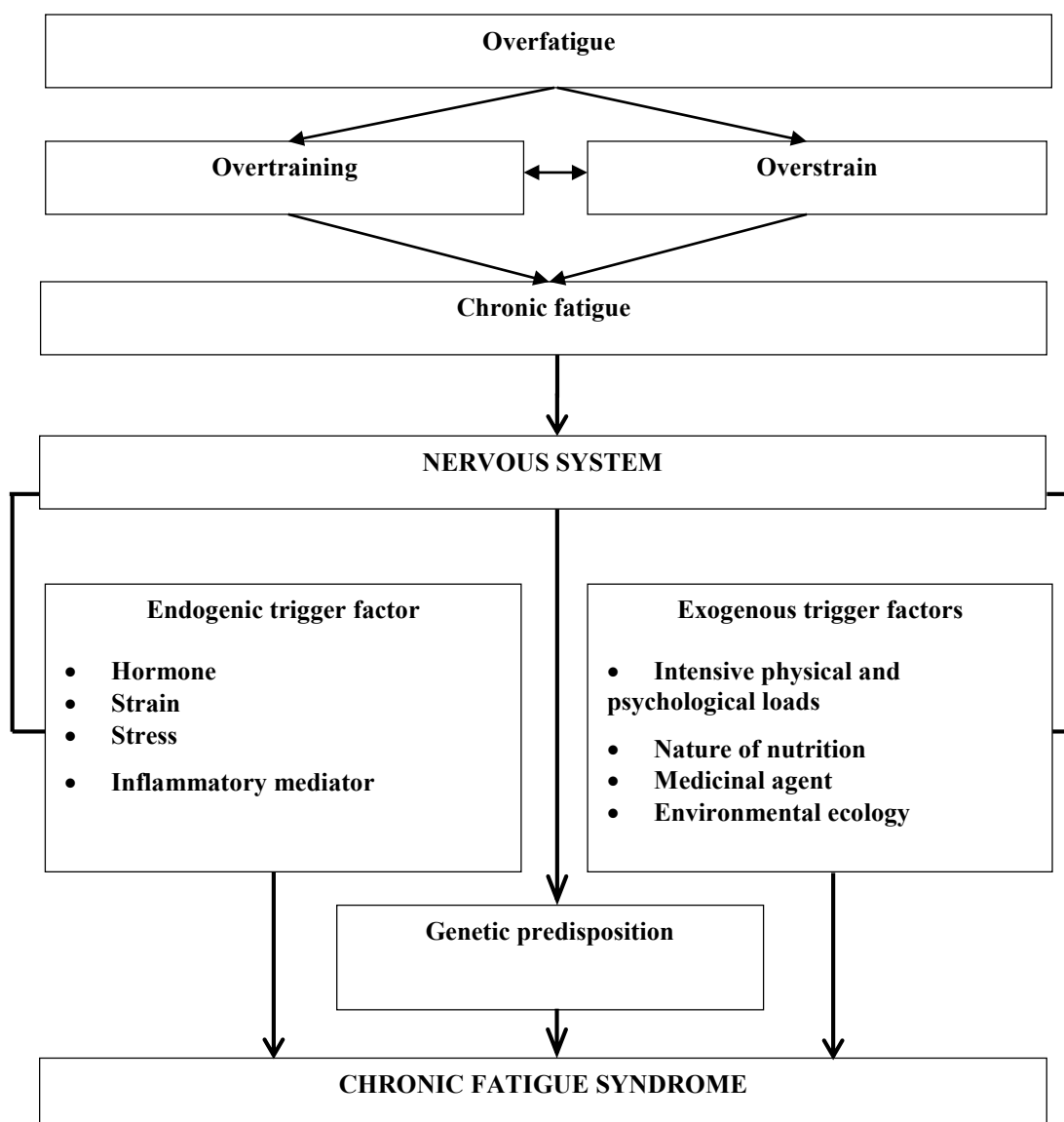


Fig. 3. Model of chronic fatigue and chronic fatigue syndrome's formation in qualified sportsmen

Appearing of chronic fatigue syndrome in qualified sportsmen can be preceded by certain stage, specific for elite sports: tension, tiredness, overtiredness, over tension, over training, chronic fatigue from initial to strong degree [12, 14]. Tension and tiredness are normal functional states, which accompany physical loads. Overtiredness appears as a result of irrational regime of work and rest, resulted from overlapping of following loads on not recreated previous. In some cases overtiredness can be additional stimuli for mobilization of hidden reserves and development of training effect [14]. Over tension results from obvious non compliance of physical loads with sportsman's functional potentials and can progress in pathological changes in different organs and systems. Over training is regarded as a state, caused by over tension of nervous humoral regulation mechanisms. Such over tension results in violation of adaptation processes and favorable changes' in organism transformation in pre-pathological and pathological states [10]. For over tension also gradual progressing is characteristic – from initial to stable degree. This state is closely connected with progressing of sportsmen's chronic fatigue and chronic fatigue syndrome. Over training state is similar to definite nosological form of disease, pathological-physiological basis of which are functional disorders of nervous system [14]. Symptoms of over training are rather similar to symptoms of chronic fatigue. The border between them is rather thin.

Thus, progressing of chronic fatigue and chronic fatigue syndrome in sportsmen are characterized by gradual appearing stable or relapsing significant tiredness or quick tiredness, which do not disappear during usual recreation period after training loads or, even, after full rest. It results in reduction of usual activity during long period of time

(more than one month). In sportsmen with increasing chronic fatigue indicators of their functional and psycho-physiological statuses worsen as well as physical condition. However, syndrome of chronic fatigue can not form in sportsman, if he has no genetic aptitude to it and has no trigger endogenous and exogenous factors. Such factors are realized through nervous system and result in appearing of clinical symptoms [9, 17, and 23].

Formation of chronic fatigue and chronic fatigue syndrome can result from the following:

- Irrational application of physical loads (trainings), which can result in functional over load of muscular skeletal apparatus's tissues;
- Excessive physical loads at trainings in midlands and in hot and wet climate, which result in worsening of chronic diseases or over tension of cardio respiratory system,;
- Sharp increase of energetic losses in conditions of muscular work, in connection with which oxidation in muscular tissues goes more intensively and oxygen transportation to skeletal muscles increases.

If oxygen for oxidation of substances is not enough, then oxidation goes partially. In such case, in organism great quantity of not completely oxidized product accumulates: lactic and pyruvic acids, carbamide and so on. It results in deviation of a number of important constants of organism's internal medium that do not permit for organism to continue muscular functioning (work). With it, it appears:

- Overtiredness and over training (symptoms of neurosis, characterized by presence of somatic and vegetative disorders);
- Neurotic reactions, usually appearing with monotonous long term trainings (2-3 times a day). Such reactions result in constant emotional tension, worsening of nervous-psychic and physical state, weakening of sport and general workability.

In most cases overtiredness and over training are overlapped, resulting in complex of symptoms of organism's disorders. Overtiredness violates coordination between cortex, lower sectors of nervous system and internal organs.

Discussion

The received by us results about frequency of chronic fatigue manifestation in qualified sportsmen of Ukraine prove and supplement the data of other authors about ubiquity of chronic fatigue and chronic fatigue syndrome among sportsmen from different countries [4, 18, and 24]. Increased tiredness, constant feeling of tiredness, sleep disorders, irritability, worsening of memory, attention, difficulties in perceiving information are the most spread complaints of sportsmen at doctors' examinations [16, 24]. The quantity of sportsmen with such complaints in different kinds of sports (by data of different authors) varies within 10-20% from general population. Chronic fatigue influences on physical and intellectual abilities and reduces quality of life.

Results of our work also well correlate with the data, received, when studying sportsmen's over training [3, 14]. With over training the same symptoms that with chronic fatigue are observed: apathy, tension, uncertainty, irritability, ungrounded flashes of anger, sleep disorder, absence of wish to train [18, 22]. Over training precedes chronic tiredness and is one of main reasons of chronic fatigue's progress. It is proved by results of our research: ubiquity of chronic fatigue among the tested sportsmen is 36.4% or nearly coincides with ubiquity of over training (35%) [14], or is close to it (21-28%) [21, 22].

Many authors showed that chronic fatigue and chronic fatigue syndrome develop gradually and are the basis for consultation with doctor. It happens already after clear manifestation of main and a number of additional syndromes, which worsen life quality [7, 19, 20, and 25]. Etiology of these states is multi factor. Among main reasons medical workers mark out the following:

- Violation of work-rest regime during long period of time;
- Chronic deficit of sleep;
- Frequent and long lasted stresses;
- Demand in taking difficult decisions and find way out from difficult situations;
- Physical over tiredness;
- Excessive intellectual loads.

Under impact of listed above factors a chain of consequent pathological processes is started: disorders in metabolism happen. As a result there happens self intoxication with organism's reaction to it in the form of allergy. The accumulated in tissues, under such changes, lactic acid provokes progress of myalgia (pain in muscles). The changed up to pathological state nervous system negatively influences on functioning of endocrine and immune system. Besides, we could not but underline the role of inflammatory diseases (especially chronic outbreaks of infections) in development of chronic fatigue syndrome.

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Conclusions

Appearing of chronic fatigue in qualified sportsmen is preceded by certain stages: tension, tiredness, over tiredness, over tension, over training. Progressing of chronic fatigue syndrome in sportsmen is characterized by gradual appearing of stable or relapsing significant tiredness or by quick tiredness. Such states do not disappear after recreational period after trainings or even after full rest; the tiredness becomes frequent or constant “satellite”. At the same time chronic fatigue syndrome can not form, if there is no genetic aptitude to it, endogenous or trigger exogenous factors. Such conditions can realize through nervous system and result in clinical symptoms.

It is assumed that further research of appearing and the course of chronic fatigue in elite sportsmen shall be conducted for the following purpose: determination of its ubiquity in different kinds of sports; improvement of control system of chronic fatigue estimation; prophylaxis of chronic fatigue syndrome on the base of assessment of sportsmen’s physical fitness, physiological and psycho-physiological statuses.

Conflict of interests

The authors declare that there is no conflict of interests.

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PERFECTION OF BADMINTON PLAYERS' SPEED-POWER FITNESS WITH THE HELP OF TRAINING MEANS' VARIABLE MODULES

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Lviv State University of Physical Culture

Abstract. *Purpose:* to determine effectiveness of badminton players' speed power fitness program's perfection at stage of specialized basic training with different variants of training means modules' combination. *Material:* in experiment badminton players of 15-17 years' age (from 1st sports grade to master of sports) participated. The sportsmen were divided into three experimental groups (10 persons in each). The trainings were being conducted during 24 weeks by different variants of program. *Results:* we created different complexes of exercises, combined in three modules (every of each lasted eight week micro-cycles). Every module has more expressed meaningful parts (1 – speed, 2 – power, 3 – jumping). All modules were combined in program of badminton players' speed power fitness perfection. For every experimental group we worked out distinguishing variant of modules' combination in program (first variant – 1-2-3 modules; second – 2-3-1; third – 3-1-2). General duration of program was 24 week micro-cycles. *Conclusions:* we recommended some variants of variable modules' combination for badminton players' speed-power fitness perfection. With it, we can regard total influence on the following: speed-power endurance, work with support on own body, quick movements of different body links.

Key words: testing, program, combining, result, increment, comparison.

Introduction

Perfection of structure and content of competition functioning in badminton points at increasing importance of sportsmen's speed-power fitness, which influences on efficiency [7, 8, 10, and 11]. Specialists note that speed-power abilities are decisive factor in fulfillment of technical-tactic actions and their efficiency [1, 3, 6, 9, and 12].

Recent time there have been fulfilled a number of researches on badminton sportsmen's training [6, 12, 13]. Among them there are works, devoted to methodic of attacking strike training; control over sportsmen's special motor fitness with the help of flexible automatic system (on example of badminton); increase of speed characteristics, considering lability of nervous system and speed power fitness of junior female badminton players (12-16 years' age) [2, 4, 5, 13, 15]. Analysis of literature sources permitted to determine that elucidation of speed-power training problems does not meet modern requirements to badminton players' fitness [2, 3, and 6].

It permitted to say about contradiction between modern requirements to speed-power fitness in badminton and insufficient substantiation of theoretical and methodic principles of elite badminton players' special physical fitness. All these witness about importance of the offered by us research.

The purpose of the research: is to determine effectiveness of badminton players' speed power fitness program's perfection at stage of specialized basic training with different variants of training means modules' combination.

Material and methods

Participants: in experiment badminton players of 15-17 years' age (from 1st grade to master of sports) participated. The sportsmen were divided into three experimental groups (10 persons in each) according to localization of training functioning. The sportsmen's parents gave written consents for their children's participation in the research. The program (protocol) of the research was approved by outdoor games department of the university.

Organization of the research: the researches were carried out on the base of CJSSOR¹ "Meteor" (Dnepropetrovsk), CJSS² at Pedagogic state academy of building and architecture (Dnepropetrovsk), Kharkov regional higher educational establishment of physical culture and sports (Kharkov) and SHS³.

For verification of variable modules we conducted comparative pedagogic experiment. Different complexes of exercises, combined in three separate modules (each of eight weekly micro-cycles' duration) were created. Every module has more expressed meaningful parts (1 – speed, 2 – power, 3 – jumping). All modules were combined in program of badminton players' speed power fitness perfection. For every experimental group we worked out distinguishing variant of modules' combination in program (first variant – 1-2-3 modules; second – 2-3-1; third – 3-1-2). General duration of program was 24 week micro-cycles. Control measurements of speed-power fitness were fulfilled at the beginning and after trainings in every module. For control we used means, tested at previous stages of the research [5]. In the present article we give only changes in fitness according to the results of the whole program (24 micro-cycles).

¹ – CJSSOR – children-junior sports school of Olympic reserve; ² – CJSS – children-junior sports school;
³ – SHS – school of highest sportsmanship (note of translator)

Statistical analysis: processing of empirical data was conducted on the base of determination of normal distribution by Shapiro-Wilka criterion (n=10). It permitted to use Manna- Witny criterion (n=10) for determination of distribution's confidence with critical level of confidence $p \leq 0.05$.

Results of the research

At previous stages of the research it was fulfilled the following: 1) substantiation of complex control of badminton players' speed-power fitness at stage of specialized basic training; 2) pedagogic observation over the level of speed-power fitness; 3) theoretical substantiation of pedagogic experiment program [3, 4, 5, 6, 19].

In this article we present substantiation of effectiveness of the offered by us approach to perfection of badminton players' speed-power abilities. It envisaged determination of effectiveness of training modules' previously substantiated combinations. Objective duration of badminton players' speed power fitness perfection included 24 training micro-cycles. These micro-cycles were combined in 6 meso-cycles (2 meso-cycles for realization of one training module) in preparatory period of training macro-cycle.

The need in implementation of variability in badminton players' training process is connected with two main factors. The first is beginning of special purpose training influences and demand in response (adaptation) of organism. The second is connected with provisioning of comprehensive training influences on sportsmen's organism. Its purpose is avoiding of training process's monotonous character.

Let us regard effectiveness of all variants of training modules' combinations (see table 1). The first variant of program envisaged the following combination of modules: module 1 ("speed"), module 2 ("power"), module 3 ("jumping"). Such combination of modules, in general, pointed at the following results. By majority of control exercises there were positive shifts in badminton players' speed-power fitness from 6.27 to 15.06% at $p \leq 0.05-0.01$. Such positive changes happened by results of control exercises "Skipping (times)", "Moving between two lines 2x5 meters, face forward, back – backward (sec.)", "Pressing ups in lying position during 15 sec. (times)", "Throwing of filled ball (2 kg) from standing initial position, by one arm (m)". For other variant of variable modules' combination distinctions were found (see table). By most of exercises we found increments of mean group results. For this group of program's variant we determined the highest level of confidentiality ($p \leq 0.01$) – control exercise "Skipping" (7.10%).

By results of this variant's realization we found no confident distinctions in three control exercises. Control exercises "Long jump from the spot by two legs", "Torso rising in sitting position during 30 sec." and "Change of feet position in lunge during 15 sec." resulted in positive but not confident changes (2.26–6.24% at $p > 0.05$).

The highest increment in this variant of program was observed in exercise for speed-power endurance (Pressing ups in lying position during 15 sec.) – 17.23% ($p \leq 0.05$).

The last variant of training means' combination envisaged the following series: module 3 ("jumping"), module 1 ("speed") and module 2 ("power") (see table).

Realization of third variant of modules' combination showed that their combination, volume and intensity manifested in different ways.

Table. Effectiveness of first variant of training means' modules combination for badminton players' speed-power training at stage of specialized preparation (n=30)

Control exercise	Variant 1 (n=10)				Variant 2 (n=10)				Variant 3 (n=10)			
	Initial data	Final data	Difference between indicators absolute	p (U)	Initial data	Final data	Difference between indicators absolute	p (U)	Initial data	Final data	Difference between indicators absolute	p (U)
Skipping (times)	51.2	55.9	4.7	≤ 0.01 (16.5)	48.6	52.0	3.4	≤ 0.01 (17)	51.5	52.7	1.2	> 0.05 (39.5)
Moving between two lines 2x5 meters, face forward, back –	3.28	3.05	0.23	≤ 0.05 (25)	3.16	3.01	-0.15	≤ 0.05 (24)	3.36	3.17	-0.19	≤ 0.01 (24.5)
	± 4.48	± 5.62			± 2.08	± 1.6			± 2.9	± 2.7		
	± 0.27	± 0.10			± 0.12	± 0.122			± 0.19	± 0.09		

backward (sec.)												
Long jump from the spot by two legs (cm)	244.8 ±7.0	250.1 ±6.9	5.3	>0.05 (32.5)	235.5 ±8.9	240.6 ±4.84	5.1	>0.05 (38.5)	232.8 ±8.56	246.3 ±6.7	13.5	≤0.01 (16.5)
Moving on court during 15 sec. (quantity of passed points)	12.9 ±0.9	13.9 ±0.74	1.0	≤0.05 (24.5)	13.1 ±0.92	14.1 ±0.36	1.0	≤0.05 (23.5)	12.2 ±0.52	13.5 ±0.5	1.3	≤0.01 (10)
Pressing ups in lying position during 15 sec.	19.6 ±2.68	22.3 ±2.18	2.7	≤0.05 (22)	19.4 ±1.72	22.8 ±2.92	3.4	≤0.05 (23)	19.8 ±2.44	22.0 ±2.2	2.2	>0.05 (28)
Throwing of filled ball (2 kg) from standing initial position, by one arm (m)	12.93 ±1.15	13.75 ±0.82	0.82	>0.05 (31.5)	12.61 ±1.43	13.33 ±1.00	0.72	≤0.05 (26.5)	12.07 ±0.59	13.36 ±0.68	1.29	≤0.01 (12)
Torso rising in sitting position during 30 sec. (times)	26.7 ±3.3	28.9 ±2.72	2.2	>0.05 (33,5)	28.0 ±3.0	29.5 ±1.6	1.5	>0.05 (37)	25.2 ±1.88	26.8 ±1.64	1.6	>0.05 (30)
Change of feet position in lunge during 15 sec. (times)	31.7 ±2.44	33.7 ±1.58	2.0	>0.05 (30)	33.5 ±2.6	34.7 ±2.1	1.2	>0.05 (39)	37.6 ±2.72	39.8 ±1.76	2.2	≤0.05 (25)

Notes: $p \leq 0.05$ at $U_{cr} \leq 27$; $p \leq 0.01$ at $U_{cr} \leq 19$.

By results of third program's variant we found positive confident increment of mean group result of control exercise "Change of feet position in lunge during 15 sec." (6.37%, $p \leq 0.05$). In most of control exercises this variant showed its effectiveness by results' increment in the range of from 5.30 to 10.76% ($p \leq 0.05-0.01$). It permits to recommend it for application in practice of badminton players' training: solution of tasks of speed-power fitness perfection.

One of the most important components of our research was formation of possibility of our program different variants variable application. That is why, for achievement of it we conducted comparative analysis of all such modules (see fig.).

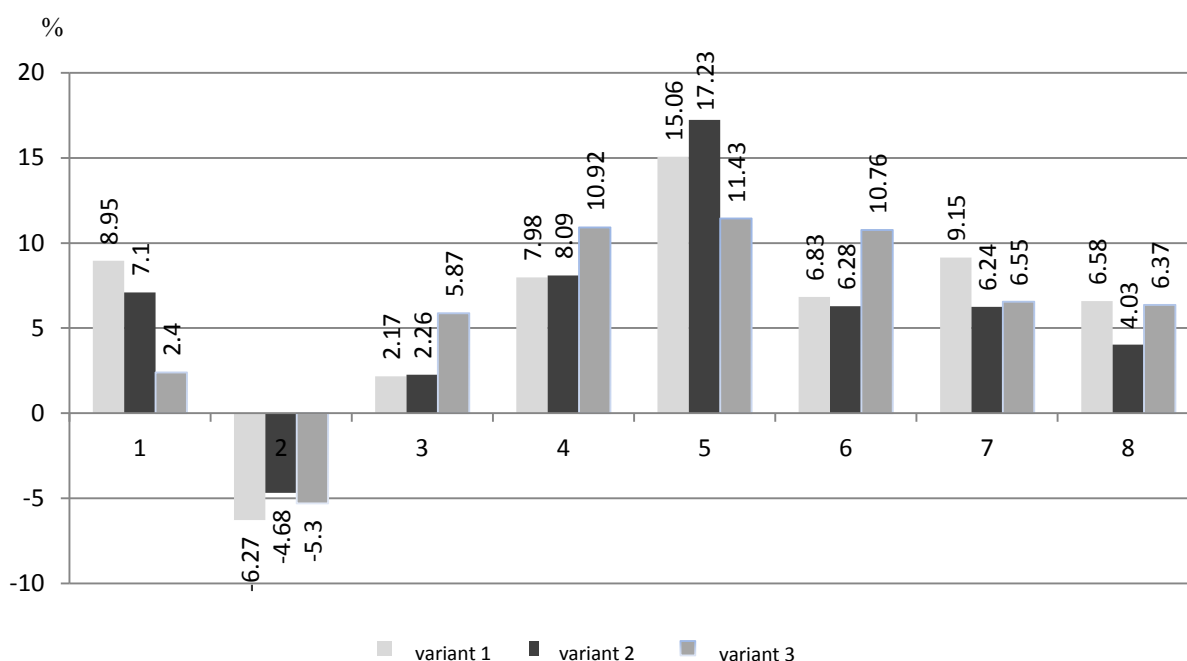


Fig. Comparative effectiveness of combination variants of speed-power training means' modules in badminton players' training process at stage of specialized basic training (%):

- 1 – Skipping (times);
- 2 – Moving between two lines 2x5 meters, face forward, back – backward (sec.);
- 3 – Long jump from the spot by two legs (cm);
- 4 – Moving on court during 15 sec. (quantity of passed points);
- 5 – Pressing ups in lying position during 15 sec.;
- 6 – Throwing of filled ball (2 kg) from standing initial position, by one arm (m);
- 7 – Torso rising in sitting position during 30 sec. (times);
- 8 – Change of feet position in lunge during 15 sec. (times).

By indicators of control exercise “Skipping” in first and second variants we observed to some extent higher effectiveness (8.95 and 7.1%) comparatively with third variant of variable modules' combination. It should be noted that advantage of the first variant has more expressed positive increments of results in exercises “Moving between two lines 2x5 meters, face forward, back – backward” (6.27%), “Torso rising in sitting position during 30 sec.” (9.15%).

The second variant of variable modules' combination more expressively influenced on muscles, involved in work. By structure and meaning such work corresponds to control exercise “Pressing ups in lying position during 15 sec.” (17.23%). In other cases effectiveness of this variant is connected with average indicators of more expressed signs of pluses or minuses of training effect.

Third variant of variable modules' combination influenced most of all on indicators in control exercises “Moving on court during 15 sec.”, “Throwing of filled ball (2 kg) from standing initial position, by one arm” (10.92 and 10.76% accordingly). Separately it is necessary to note resulting influence in exercise “Change of feet position in lunge during 15 sec.”. In this exercise positive shifts approximately of the same level were achieved by two program variants (first– 6.58% and third – 6.37%).

Discussion

The received data permit to speak about obtaining of new scientific result in realization of sportsmen's training system's principles [7, 9, 10, 14, and 18]. It concerns variability principle of training loads' content in training process at stage of specialized basic training.

The received data also supplement the available in scientific literature information about orientation of different speed power training means' groups' influence and their combination in appropriate programs [16, 17, 20, 22, and 23]. For example the accents in the first program variant ensure perfection of muscle groups, which are involved in work with little amplitude. With it, quick change of sportsman's position on court takes place, involving alternate work of upper and lower limbs.

It was found that in a number of exercises (“Long jump from the spot by two legs”, Throwing of filled ball (2 kg) from standing initial position, by one arm”, “Torso rising in sitting position during 30 sec.”, “Change of feet position in lunge during 15 sec.”) there were no confident positive results. The determined results showed that in this variant muscles’ work with loads is unsatisfactory. But it means that it is possible to change loads in realization of first program variant [7, 9].

It can be assumed that second variant of variable modules’ combination did not result in adequate adaptive changes in functional provisioning of sportsmen’s muscular work [2, 8, 12].

Realization of the third program variant proved some scientific data about high effectiveness of the program, providing optimal selection of training means [1, 9]. However, combination of variable modules by this variant witnessed the absence of confidence increments in the following control exercises: “Torso rising in sitting position during 30 sec.”, “Pressing ups in lying position during 15 sec.”, “Skipping” (2.40–11.43% at $p > 0.05$).

The received results also proved specialists assumption that different combinations of training means have different localization of training effect [9, 12, 13, 21].

Thus, the received results permit to recommend some variants of variable modules’ combination for solution of training process’s targeted tasks oriented on perfection of badminton players’ speed-power fitness. With it, general influence on speed-power endurance, work with support on own body, quick movements of separate body links can be regarded.

Conclusions

1. Realization of our program showed that in most of control exercises all variants gave positive increment ($p \leq 0.05-0.01$). Though, first variant of variable modules’ combination (1–2–3) influenced better in exercises “Skipping” (8.95%); “Torso rising in sitting position during 30 sec.” (9.15%). Second variant (2–3–1) showed the best results in exercises “Pressing ups in lying position during 15 sec.” (17.23%). Third variant (3–1–2) was the most efficient in exercises “Moving on court during 15 sec.” (10.92%), “Throwing of filled ball (2 kg) from standing initial position, by one arm” (10.76%).

2. Some variants of variable modules’ combination can be recommended for perfection of badminton players’ speed-power fitness. With it, general influence on speed-power endurance, work with support on own body, quick movements of separate body links can be regarded.

The prospects of further researches imply determination of changes’ dynamic in badminton players’ speed-power fitness indicators at stage of specialized basic training.

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Conflict of interests

The authors declare that there is no conflict of interests.

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OPTIMIZATION OF SPECIAL PHYSICAL FITNESS OF SPORTSWOMEN - SUPER LONG DISTANCES RUNNERS BY MEANS OF RUN TRAINING

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Abstract. *Purpose:* improvement of special physical fitness of sportswomen – super long distances runners by means of run training. *Material:* in the research 6 elite sportswomen of 25-27 years' age participated. We analyzed documents of training proves planning; analyzed sportswomen's diaries. *Results:* three cycle system of annual macro cycle's construction was put in the base of modern training system for elite marathon sportswomen. We found general and partial volumes of run load of different orientation in annual macro cycle. Optimal duration of maximal load's segments during anaerobic training was from 30 sec. to 3 minutes. Rest between segments was slow run during 3 – 8 minutes. With it, sportswomen fulfilled repeated run at segments of 15x200 m, 15x400 m, 12x600 m. *Conclusions:* effectiveness of system of sportswomen's special physical fitness improvement is determined by rational correlation of differently oriented run means, which were directed at increase of special fitness level in marathon.

Key words: marathon, elite sportswomen, macro cycle, training process, training load.

Introduction

Modern system of elite sportsmen's training is characterized by exclusive complexity. Every of its various structural components can substantially influence on sports result

In light athletics improvement of modern sports training is especially difficult. On the one hand we observe quick increase of sportsmanship, which characterizes modern competitions. On the other hand, sports training continue to become still more intensive and complex. Run at super long distances is the hardest kinds of light athletics. It requires high aerobic abilities of sportsmen's organism, formation of which takes very long period of time. That is why their first high results sportsmen began to achieve after 5-6 years of hard training. For this period of time they master rational technique and tactic of run, increase motor skills and improve organism's functional systems [8, 17, 22].

One of requirements of elite sportsmen's training system's improvement (for super long distances) is increase of training process's effectiveness at the account of optimization of total volume and intensity of differently oriented training loads; as well as owing to formation of training process's effective building in the frames of annual macro cycle structural elements [11, 15].

In our previous works we regarded rational building of training process in respect to the strongest sportswomen in conditions of Midlands and Highlands [5], effectiveness of speed-power training in marathon [6], specificities of cardio-respiratory system's functional state in super long distance' sportswomen's organism [7].

Nowadays, the problem of training loads' optimal distribution at annual macro cycle separate stages is rather urgent. Besides, the problem of importance of different energetic orientation loads and their contribution in sports results' change is still discussable.

Hypothesis: effectiveness of special physical fitness improvement of super long distances' sportswomen – runners is determined by selection of certain correlation of differently oriented run training means.

The purpose of the research: is improvement of special physical fitness of sportswomen – super long distances runners by means of run training.

Material and methods

Participants: elite sportswomen of 25-27 years' age, who specialize in marathon distance run (n=6). Three sportswomen were the members of light athletics combined team of Ukraine.

Organization of the research: in the frames of experiment we questioned (in the form of talks) leading coaches and sportswomen [1, 6, and 15]. The topic of talks was problems of training process planning in annual macro cycle. Analysis of individual training plans and sport diaries permitted to determine general and partial volumes of differently oriented run loads and their dynamic in the frames of preparatory and training meso cycles. Analysis of competitions' records [19, 20] permitted to find sportswomen's results in marathon. We made a model of training process for marathon within annual macro cycle.

Statistical analysis: all received data as well as experimental data were processed with the help of statistical package of Microsoft Excell with calculation of the following indicators: mean arithmetic (\bar{X}); mean square deviation (σ); variation coefficient (v).

Results of the research

At the beginning of the research we determined construction of training process's structural elements for sportswomen within the frames of annual macro cycle (see table 1). Annual macro cycle was divided into autumn –

winter preparatory period (September – November); winter competition period (December); spring preparatory period (January – March); spring - summer competition period (April – November); transitive period. Spring- summer competition period was divided into first competition meso cycle (csportswomen participated in control starts); pre-competition meso cycle; second competition meso-cycle (sportswomen started in main competitions).

Table 1. Structure of training process's construction and parameters of differently oriented training loads' volumes in annual macro cycle

Periods	Autumn-winter preparatory period (months) (3)	Winter competition period (month) (1)	Spring preparatory period (months) (3)	Summer competition period			General volume of run, km
				CM 1 1 month	PCM 4 months	CM 2 3 month	
Loads of aerobic character (km)	1622.2	248.0	1391.8	384.0	1886.0	1449.2	6981.2 (0.85%)*
Loads of mixed aerobic-anaerobic character (km)	411.5	62.0	311.0	91.0	423.0	319.0	1617.5 (1.46%)
Loads of anaerobic character (km)	54.6	8.0	43.4	31.3	92.3	49.1	278.7 (2.16%)

Notes: CM 1 – first competition meso cycle; PCM – pre-competition meso-cycle; CM 2 – second competition meso-cycle; * – variation coefficient in brackets (v).

Analysis of correlations of different character run means during annual cycle permitted to determine:

- Volume of aerobic character run load – 6981.2 km (that was 78.6 % from general volume in annual training cycle);
- Volume of aerobic-anaerobic character run load –1617.5 km (that was 18.3 % from general volume of run);
- Volume of anaerobic character run load – 278.7 km (that was 3.2 % from general of run).

Detail analysis of structure of partial run loads volumes' distribution in preparatory and competition periods permitted to determine their wave-like dynamic (see fig.1). Different fluctuations of volumes were characteristic for every period of macro cycle. Sportswomen's training was based on model of three cycle system of annual cycle construction. In this connection the highest reduction of run loads' volumes was determined in competition periods (December, April, September and November). In these periods sportswomen started at international and Ukrainian competitions.

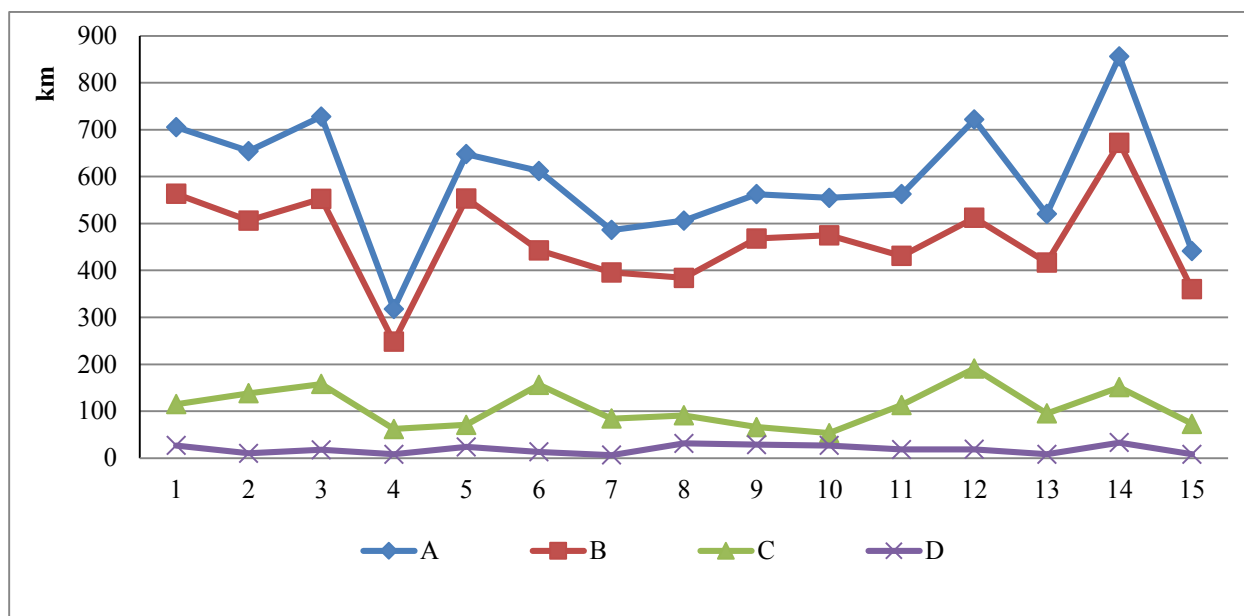


Fig.1. Distribution of differently oriented run loads' partial volumes in annual training macro cycle
Notes: 1-15 – months of macro cycle (September-November); km – kilometers; A – general volume of run; B – volume of aerobic loads; C – volume of aerobic-anaerobic loads; D – volume of anaerobic loads.

Significant increase of run loads' volumes was realized in November (autumn-winter preparatory period); in January (second preparatory period); in August and October (summer-autumn competition period). After significant volume it was planned to gradually reduce loads. These data are explained by the fact that before competitions sportsmen followed such correlation of differently oriented run loads. The found correlation of training run means for increase of special physical fitness permitted for sportswomen to achieve high sports results at competitions from 2.31'30" to 2.40'20" [19, 20].

Discussion

The fulfilled researches [3, 4, 9, 21] determined that effective control over super long distances sportswomen's physical training can be realized only under conditions of rational content and construction of annual training cycle.

The conducted research permitted to substantiate demand in further improvement of sportswomen's special physical fitness by means of differently oriented run training. A number of authors [8, 18] note that composing of optimal training program in marathon run is possible only with knowledge of organism's energy supply principles. The work of marathon runner is ensured by aerobic energy by 95% and by anaerobic energy – by 5%. Such correlation of training run loads of different orientation is explained by the fact that endurance of marathon type is conditioned to large extent by organism's aerobic potentials. That is why the highest volume of run load (6981.2 km) was realized by sportswomen at the accounts of aerobic means. The main means of aerobic trainings during annual cycle were:

- Durable, continuous run from 20 km to 50 km in even and variable temp (heart beats rate – HBR - 140-150 bpm⁻¹ in preparatory period and 160-170 bpm⁻¹ in competition period) in training and extensive zones of loads;
- Slow run in recreational zone of loads.

When realizing such means organism's ability for complete realization of aerobic potentials in competition functioning is increased and improved.

For training of organism's anaerobic potentials we used means of simultaneous anaerobic glycolytic and aerobic influence. Lactate system is better trained by interval method. Maximal lactate concentrations are achieved at distances from 400 m to 800 m. Thus, optimal duration of maximal load's segments at anaerobic training was from 30 sec. to 3 minutes. The rest between these segments was slow run during 3-8 minutes. With it, sportswomen fulfilled repeated run at segments 15x200 m, 15x400 m, 12x600 m.

Sportswomen also used anaerobic-aerobic loads: temp run, fartlek – “speed game”. By character of energy supply temp run is the most close to competition. In opinion of most of specialists temp run is the main mean of specific endurance training. Temp run was fulfilled in variable and continuous ways. Temp runs were realized at distances from 20 to 40 km and more. Speed of such run was 80-90% from competition marathon speed.

Run with acceleration at short distances from 50 to 100 meter in gym took in sportswomen-marathon training process only 3.2% of total run scope. Run with acceleration was fulfilled for training of quickness and speed endurance.

Theoretical analysis of the questioned coaches also permitted to determine that for increase of marathon results it is necessary to have high results at stayer distances. That is why, during annual cycle sportswomen participated in competitions at distances from 6 km to 30 km.

Results of the research supplement also theoretical ideas [13] about organization of qualified super long distances sportswomen's training process at modern stage. Three cycles planning of annual training, completing by main competitions of the cycle is rational structure of training process construction for elite marathon sportswomen. Such planning is conditioned by sportswomen's participation in 4 marathon competitions. It is optimal quantity of performances. Higher quantity of performances at marathon competitions results in over-tension of nervous system and failure of organism's adaptation processes [8, 17]. Specific feature of training process is realization of the achieved fitness level in long term training system (macro cycle), which is concentrated on sportswomen's participation in main starts.

Our own data prove researches of specialists [2, 12, 14] about wave and variable character of loads, which are characteristic for different structural elements of training process. It permits to find dependence between scope and intensity of work, correlation of differently oriented loads, dependence between periods of tensed training and relative recreation. Besides, we supplemented the data of authors [2, 9, 16] about modern approaches to optimization of special physical fitness of elite sportswomen.

Conclusions

On the base of analysis of elite sportswomen's annual macro cycle structure we substantiated conception of sportswomen training process's construction. Such conception was based on main principles of periodization system.

1. We showed that the found correlation of run means for special physical fitness improvement is the main factor of marathon achievements.

2. Increase of effectiveness of sportswomen's special physical fitness improvement is possible at the account of rational correlation of differently oriented run loads' mean. Application of exercises, directed at marathon sportswomen's special endurance improvement will be of first priority.

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Conflict of interests

The authors declare that there is no conflict of interests.

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INTEGRATIVE TECHNOLOGY OF MASSAGE MANIPULATIONS IN PHYSICAL REHABILITATION OF STUDENTS WITH BACKBONE PATHOLOGY

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Abstract. *Purpose:* to analyze effectiveness of massage manipulations' integrative technology in physical rehabilitation of higher educational establishments' students with backbone pathology. *Material:* in the research 195 students of 19-20 years' age participated. All students had periodical initial neurological symptoms of functional pathology and first stage osteochondrosis in different parts of backbone. We conducted a course of 10 sessions of therapeutic massage. *Results:* the sense of massage integrative technology is that every specialist shall have certain optimal set of skills and knowledge in technique of manipulation sessions of massage. Integrative technology of massage manipulations consists of psycho-corrective and manipulation parts. It considers psycho-somatic, mechanical and reflex rehabilitation aspects of patho-genesis of backbone functional disorders and vertebral osteochondrosis. *Conclusions:* depending on pathological process or backbone functional state of every person (peculiarities of his (her) psycho-somatic status or, even, his (her) bents). Individual approach in choice of strategy, tactic and methodological provisioning of massage session shall be used.

Key words: physical rehabilitation, vertebral osteochondrosis, pathology of backbone, massage technologies.

Introduction

Increase of rehabilitation effectiveness with neurological manifestations of vertebral osteochondrosis, which take first places by ubiquity and long term loss of workability in structure of population's neurological morbidity (70–80%), has high social economic significance [2; 9; 12; 15; 19]. Owing to implementation of new, patho-genetically conditioned rehabilitation technologies the situation can be changed to better one. Nowadays, great attention is attracted by quick increase of backbone functional disorders and vertebral osteochondrosis (dorsopathy) morbidity among youth and junior age people, who suffer from vertebral neurological pain syndromes. [7; 13; 14; 16]. Of special trouble are backbone disorders in students. For example, in 70-80% of young people, entering higher educational establishments, there are disorders of carriage, in 20% - different deformations of backbone. During first three years of studying at higher educational establishments the quantity of students, related to main health group, reduces twice [4; 7]. After graduation from HEE most of students' backbone disorders transform into degenerative-dystrophic diseases of backbone. The combination of the outlined realities forces to seek the ways of modernization, optimization of health related technologies and physical rehabilitation of young generation with functional disorders and initial symptoms of backbone diseases, among which massage technologies take important place.

Hypothesis: differential application of different massage techniques within one rehabilitation session shall consider main principles of manipulation, phases of rehabilitation process, character of functional and reflex changes in patients; degree of vertebral pathology's expressiveness and individual features of rehabilitants' psycho-somatic state. Such approach shall increase physical rehabilitation effectiveness of youth with neurological symptoms of backbone first stage osteochondrosis by classification of V.Ya. Fishchenko [12].

The purpose of the works is to analyze effectiveness of massage manipulations' integrative technology in physical rehabilitation of higher educational establishments' students with backbone pathology.

Material and methods

Participants: the research was carried out on the base of problem laboratory of health related rehabilitation technologies of physical culture scientific research institute (Sumy State Pedagogical University A.S. Makarenko). In our research we tested and rehabilitated 195 of 19-21 years' age (the course of 10 therapeutic massage sessions) with functional disorders of backbone and initial symptoms of vertebral osteochondrosis. All students had periodical initial neurological manifestations of functional pathology and first stage osteochondrosis in different parts of backbone (by classification of V.Ya. Fishchenko) [12]. Among symptoms of backbone diseases there prevailed: unexpressed pain syndrome or discomfort in cervical thoracic and lumbar spine.

Organization of the research: all tested were divided into six groups, equal by clinical symptoms and localization of pathological processes. With it 33 students passed rehabilitation by improved rehabilitation methodic with application of integrative massage technology. 34 passed rehabilitation by common rehabilitation therapeutic classic massage. 34 passed rehabilitation with elements of ajurvedic massage. 32 students passed rehabilitation with elements of Chinese massage. 33 students passed rehabilitation with elements of Tibetan massage. 29 students passed rehabilitation with elements of Egyptian massage. Integrative technology of massage manipulation in physical rehabilitation consisted psycho-corrective and manipulation parts. It considered psycho-somatic, mechanical and reflex rehabilitation aspects of backbone functional disorders' pathogenesis as well as vertebral osteochondrosis.

Statistical analysis: for statistical analysis we used commonly accepted methods of received data processing with the help of Fisher-Students' T-criterion and standard package "Statistica" in EXEL 2000 ($M \pm \delta$), non parametrical methods of information processing (determination of Fisher's angle coefficient).

Results of the research

Integrative massage technology was oriented, first of all, on fighting with functional disorders, which accompany vertebral pathology. In manipulation techniques of complex therapeutic influence on human organism it is purposeful to regard functional disorder, dividing all syndromes into two categories. First category of syndromes (*pressing-tension*) relates to limitation of joints' mobility, determination of joints' functional blocks, hyper tonus of muscles, feeling of psychic tension and fascia restriction, shiver, Yin syndrome. The second category of syndromes (*stretching-relaxation*) relates to non stability and loose of joints, hypotonia of muscles, feeling of psychic rest and relaxation as well as fascia stretching, increase of temperature at local parts of body, Yan syndrome.

The method of differential structural therapeutic massage session's construction was based on careful study of different massage systems and techniques. Its structure includes principles of classic therapeutic massage and main techniques of different western and oriental massage systems. We came to conclusion depending on psycho-somatic state and even bent of every person, individual approach to selection of strategy, tactic and methodological provisioning of massage effectiveness shall be applied. Every session of therapeutic massage by integrative technology correlates with phases of rehabilitation process. The session consists of basic and variable parts.

Manipulation session shall be preceded by certain psychological preparation; with it, this in equal degree concerns both rehabilitant and rehabilitation specialist. Before session and in the process of therapeutic massage session and manual therapy it is necessary to use psycho-correction methods. It can be soulful talk, application of autogenic training methods, body oriented therapy, NLP (neuro-linguistic programming) and Erickson's hypnosis. Depending on rehabilitant's religious belonging, or its passion to oriental philosophy prayers or Indian mantras can be used (as method of psychological preparation and relaxation). One or another psycho-correction method shall be selected, considering individual characteristic features of a person and his (her) wishes [2; 21].

Manipulation part of therapeutic massage is composed with the help of differential structure of therapeutic massage session on the base of classic therapeutic massage and main techniques of different western and oriental massage systems. With it, when practicing massage techniques it is necessary to observe certain rules and principles of integrative technology:

- 1) Consider rehabilitant's psychological state (principle of psycho-somatic orientation);
- 2) Orientation on main syndrome (principles of seeking main syndrome);
- 3) All rehabilitation specialist's manipulations shall be realized in his relaxed state from his mass center (most often from lower part of abdomen) (principle of relaxation);
- 4) All manipulations shall be spiral-like (principle of spiral-like movements);
- 5) Session shall always be started from surface acting techniques and their action on tissues shall be gradually deepened (principle "from surface to depth");
- 6) Principle "from periphery to center" shall always be observed: i.e. first mechanical actions shall be fulfilled on painless zones and then, gradually be approached to pain epicenter;
- 7) Special attention shall be paid to transitive parts of backbone; manipulations on these parts shall be longer and more intensive (principle of special attention to transitive parts of backbone);
- 8) Principle "exclusion of static-dynamic loads on affected part of vertebral motor segment (VMS) shall always be observed;
- 9) It is necessary to stimulate activity of backbone muscles, which ensure defensive function of affected VMS;
- 10) It is necessary to ensure rehabilitation influence on vertebral and extra vertebral affected zones, considering reflex interconnections (principle of reflex chains);
- 11) It is necessary to use techniques of perinatal relaxation, imitation of breathing and movements, characteristic for perinatal states (principle of perinatal states' searching);
- 12) It is necessary to use effect of actions' summarizing, i.e. actions of targeted influences on skin, muscles or joints for fighting with functional disorders (principle of summarizing of techniques, based on adaptation theory, actively used in Spain massage system). It is necessary to ensure gentle character of therapeutic actions.

In our opinion, manipulation part of every massage session shall have four or five structural parts.

1. *Therapeutic massage* (surface acting with Zakhar'in – Ged's correction of skin parts). "Dry" massage or massage with application of little quantity of baby powder (talc, massage creams) is fulfilled. If the procedure is of cosmetic character cleanings can be used. Main physiological influence of this part of rehabilitation session envisages improvement of patient's skin, calming impact on nervous system, release of fatigue and slight nervous reflex influence on all systems of human organism.

2. *Therapeutic massage* (deep massage with correction trigger and periosteal zones). This massage (as a rule with oil) implies detail work with the so-called trigger zones (hyper-tonus, muscular contractions). Specific feature of

this part is also careful work with ligaments and joints. Accordingly it is normalization of muscular tonus and joints' work. This part of massage is mainly of prophylaxis and therapeutic character.

3. *Reflexive massage* can include techniques of classic massage, oriented on more intensive influence on reflex zones, according to certain diseases. Besides, it includes: techniques of segment-reflex, combined tissue-periosteal massage; acupressure reflexology massage in compliance with oriental massage systems (Chinese, Indian, Tibetan, Thai and other). This is the most variable part of massage session, which, in many cases, depends on specificities of rehabilitant's disease, his (her) backbone functional state, experience and special knowledge of rehabilitation specialist.

4. *Elements of manual correction*: are not compulsory part of therapeutic massage, but its application is rather popular and purposeful in therapeutic and prophylaxis influence on human muscular skeletal apparatus in one rehabilitation session. Practically there is no clear difference between passive movements of some therapeutic massage methodic and manual therapy elements. In our opinion all techniques of examination, mobilization and manipulation are taken from manual therapy methodic. They shall be fulfilled in spiral-like way and be gentle. Main purpose of manual therapy application is release from functional blocks and restoration or improvement of joints' mobility.

5. *Relaxation* is a finalizing part of therapeutic massage session. This part is oriented on ensuring of pleasant for rehabilitant rest. It is composed from intermittent and continuous vibrations' techniques, surface stroking, calming procedures. Finalizing part is recommended by us to include elements of cosmetic massage and elements of autogenic training.

According to mentioned above recommendations and peculiarities of psycho-somatic state and morphological functional changes of rehabilitant's tissues certain set of massage techniques shall be used. The basis of massage session shall be classic therapeutic massage. We think that special attention in therapeutic massage session shall be paid to main techniques of classic massage. When training massage specialists, classic techniques shall be mastered up to automatic level. Concerning additional techniques, certain variable set of techniques can be applied. Among them additional techniques of classic therapeutic massage can be used as well as basic and supplementary methodic of different oriental and western massage systems. Selection of additional massage techniques for application to every definite rehabilitant is realized as per parameters of rehabilitant's somatic state [7; 18; 20]:

a) constitution of rehabilitant: it is recommended to use differentiated approach to intensity massage procedures and massage oils' usage, depending on types of personality; it is used in ajurvedic and Tibetan medicine (type of constitution: *vata dosha* – wind, *pitta dosha* – bile, *kapha dosha* – mucus). For constitution *vata dosha* more calming, surface oil massage is used; for *pitta dosha* – harmonizing; more intensive (deep) with less quantity of oil is used for *kapha dosha* [11; 22];

b) Characteristics of backbone functional state, character of pathological process (if it takes place), character of clinical symptoms of backbone disease (for example pain syndrome of para vertebral segment has reflex or spine character), stage of pathologic process and etc. shall be considered.

c) The following changes of rehabilitant's muscular system shall be considered: increased or reduced muscular tonus, presence of muscular contractions and their characteristics by size, pain, density and so on;

d) Changes of mobility in separate joints and vertebral motor segments, presence of functional blocks (their localization, expressiveness and other characteristics) shall be considered.

In general changes of dynamic motor stereotype are assessed. Besides, there continues search of those techniques, which would be the most physiological, gentle and rational. They will correspond to the most effective and bio-mechanically based influence on soft tissues' state and muscular skeletal apparatus. The purpose of such influence is liquidation of pathologic changes and improvement of backbone functional state.

Selection of massage techniques depends also on subjective factors: ability to use certain set of methodic and techniques; any habits or bents to use certain massage techniques by rehabilitation specialist. Alongside with it every rehabilitation specialists shall have skills in classic therapeutic massage and have arsenal of techniques of oriental and western massage systems. Every massage session shall be a kind of creative process, a kind of litmus test – check up of rehabilitation specialist's knowledge and skills. In every session of therapeutic massage there is basic part which is composed of classic therapeutic massage techniques. To some extent it is both unchangeable and variable. It can include supplementary techniques of classic massage and other oriental and western systems. Variable part is composed, depending on objective factor (rehabilitant's constitution, his (her) psycho-somatic state, functional state of backbone) and subjective factor: knowledge and skills of rehabilitation specialist (see table 1). In our own practice we rather often supplement classic therapeutic massage techniques with techniques of Chinese, ajurvedic, Tibetan and Egyptian massage [1; 5; 6; 10; 11; 22].

For reflex influence and manual correction with appropriate indications we use elements of Thai massage [8]. The most often they are different rotations in vertebral motor segments, fulfilled against the background of tractions. As a rule they are fulfilled in spiral-like way.

Among techniques of Chinese massage we used often such techniques as: strokes (*tui*), pressure (*an*, *tsia*), pinching (*nye*, *na*), rotation (*ju*), tapping and clapping (*shui*, *na*, *tsu*), stretching with rotation (*yao*), vibration (*zeng*)

[10]. We determined certain techniques of ajurvedic massage (in particular such as ab'yanga and marma-massage), which were used in integrative technology of massage:

- 1) differentiated application of massage oils;
- 2) application of certain ajurvedic techniques of massage on back and back part of upper and lower limbs (specific techniques such as rotational stroking, deep palpation of soft tissues, pressure);
- 3) acupressure of marma zones (parts with increased reflex sensitivity) [1].

Besides, we used in our practice Tibetan massage techniques [5]: surface “brushing away” (*shud nye*); surface longitudinal stroking (*thil nye*); rotational stroking (*kor nye*); pressure (*non nye*); “digging” (*shog nye*); stretching (*then ded*); acupressure (*sang nye*); slight tapping (*ded nye*); sliding and pinching (*pag nye*); five fingers’ technique (*sor nye*).

Specificity of Egyptian massage is variety of massage manipulations, which include tender touches by finger tips, deep sliding by palms and many other [10]. There is an assumption that first massage techniques resulted from watching over animals. By the way, this assumption is confirmed by names of some Egyptian techniques, associated, to some extent, with natural phenomena, animals’ movements or myth heroes [6]. For example, different stroke techniques have rather exotic names: “waves”, “crab”, “Lotus branch”, “bird’s paw”, “cat’s paw”. Not less original names rubbing techniques have: “seashell”, “scarab”, “crocodile”. Some rubbing techniques resemble animals’ movements: “goose”, “worm”. Some names of massage techniques are connected with mythology. Linear stroking by both hands, starting from foot fingers, along all body and finishing on hands’ fingers and in reverse direction, is called (stroking Isis). Technique, which in classic massage is called single kneading, in Egyptian massage is called “Delight Thoth”, double kneading – “Double delight Thoth”, pressing out - “Seth girth”. Undoubtedly, in the given below table we showed only the most frequently used methodic (see table 1).

Table 1. Therapeutic massage with integrative technology

Basic part of therapeutic massage techniques						Additional variable part of western and oriental therapeutic massage systems					
<i>Main techniques of classic therapeutic massage</i>	<i>Kinds of main massage techniques</i>	<i>Kinds of Chinese massage techniques</i>	<i>Kinds of ajurvedic massage techniques</i>	<i>Kinds of Tibetan massage techniques</i>	<i>Kinds of Egyptian massage techniques [6]</i>						
1	2	3	4	5	6						
<i>Stroking: surface; embracing</i>	Stroking: comb-like; pinching-like; cross-like; smooth	Stroking techniques (tui)	Specific rotational stroking	Surface “brushing away” (shud nye) Surface longitudinal stroking thil nye); rotational stroking (kor nye)	Stroking techniques with exotic names: “waves”, “crab”, “Lotus branch”, “bird’s paw”, “cat’s paw”						
<i>Rubbing: “sawing”, rake-like</i>	Rubbing: comb-like, pinch-like, cross-like; rubbing by palm, by thumb, (by 2 nd -4 th fingers, by palm base,				Rubbing techniques: “seashell”, “scarab”, “crocodile”						

	by fists, forearm; by thumb with load)					
<i>Kneading: longitudinal, cross-directed</i>	Kneading: single kneading, drugging, shifting, pressing out, clips-like, clench-like, pressing, pulling	Pressing (an, tsia), pinching (nye, na), rotation (ju), Stretching with rotation (yao)	Pressing, deep palpation of soft tissues, acupressure of marma zones	Pressing (non nye); “digging” (shog nye); stretching (then ded); acupuncture (sang ney).		Kneading techniques, resembling animals’ movements: “goose”, “worm”, “Delight Thoth”, “Double delight Thoth”, pressing out – “Seth girth”
<i>Vibration, “hewing”</i>	Vibration , shaking, strong shaking	Crossing over	Tapping and clapping (shui, na, tsu), vibration (zeng)		Slight tapping (ded nye); sliding and pinching (pag nye); Five fingers’ technique (sor nye)	

Besides, some techniques of Sweden massage can also be included – stroking and rubbing in spiral like way (effleurage, petrification) as well as lymph drainage massage of Pascal- Caushet with specific pressing along all body in direction of lymph nodes. In this list we can include certain specific techniques of Vietnamese massage, Turkey massage, Bali, Spain, French wave-like massage. Recent times even Ukrainian and Russian spa massages have been mentioned.

We tried to mark out the most ancient and wide spread massage techniques. Alongside with it we think that every rehabilitation specialists shall have his (her) own tables. In these tables, alongside with already mentioned techniques, there shall be columns with techniques mastered personally by rehabilitation specialist. The sense of integrative technology is that every specialist shall have certain optimal set of knowledge and skills in massage manipulation techniques. It will permit for rehabilitation specialist to realize differentiated approach to functional disorders, accompanying vertebral pathology.

Effectiveness of rehabilitation will, to some extent, depend on rehabilitation specialist’s professionalism. Alongside with it, accurate application of manipulation therapeutic principles and certain algorithm of rehabilitation actions will inevitably facilitate increase of rehabilitation effectiveness.

At second stage of our research we analyzed effectiveness of integrative massage technology.

Psychological status of the tested was assessed on the base of talks with students. The talks were oriented on determination of students’ responding, character of attitude to surrounding, presence of psycho-traumatic situations, attitude to disease, psycho-diagnostic methods. Study of positive influence on rehabilitants’ psycho-emotional state with the help of different massage techniques was practiced before, in the middle and after rehabilitation course (10 massage sessions). Psycho-emotional sphere was tested with Luscher’s test. It gives valid analysis of human psycho-emotional sphere and is often used for determination of psycho-emotional state with vertebral pathology [2; 21]. When interpreting Luscher’s test results we analyzed location of main and auxiliary colors, considered the data of talks with the tested (see table 2).

Table 2. Dynamic of testing indicators (by Luscher) in rehabilitation of students with neurological symptoms of vertebral osteochondrosis of first stage, different technologies and therapeutic massage methodic being used

Rehabilitation groups	Period of testing	Total deviation from autogenic norm (mean indicators in points)	Vegetative coefficient (mean indicators in points)
Rehabilitation with integrative massage technology (n=33)	Before rehabilitation	16.7±1.04	0.62±0.08
	In the middle of rehabilitation course	8.45±0.55	1.25±0.07
	After rehabilitation	*3.1±0.54	*1.49±0.05
Treatment with commonly accepted techniques of therapeutic massage (n=34)	Before rehabilitation	16.42±1.21	0.71±0.06
	In the middle of rehabilitation course	12.65±0.82	0.92±0.09
	After rehabilitation	*9.35±1.02	*1.03±0.07
Improved massage methodic elements of traditional Chinese massage (n=32)	Before rehabilitation	16.6±1.38	0.65±0.07
	In the middle of rehabilitation course	9.3±0.92	1.19±0.06
	After rehabilitation	*7.6±0.81	*1.42±0.07
Improved massage methodic elements of traditional ajurvedic massage (n=34)	Before rehabilitation	16.64±1.28	0.7±0.09
	In the middle of rehabilitation course	10.44±0.84	1.19±0.07
	After rehabilitation	*5.23±0.64	*1.49±0.05
Improved massage methodic elements of traditional Tibetan massage (n=33)	Before rehabilitation	16.2±1.18	0.72±0.07
	In the middle of rehabilitation course	10.3±0.92	1.04±0.08
	After rehabilitation	*6.5±0.72	*1.45±0.08
Improved massage methodic elements of traditional Egyptian massage (n=29)	Before rehabilitation	16.48±1.26	0.68±0.08
	In the middle of rehabilitation course	9.59±0.82	1.19±0.07
	After rehabilitation	*5.68±0.95	*1.47±0.07

* Confident difference of indicators between groups “before” and “after” rehabilitation ($p < 0.05$)

This testing showed that at the beginning of the research psychological state in all groups had negative tendencies: 82.4% of the questioned had expressed reduced mood, feeling of aggression, uncertainty in own actions.

We considered mean indicators of total deviation (TD) from autogenic norms in points in control and main groups, as well as vegetative coefficient (VC) at the beginning, in the middle and at the end of rehabilitation course. Practically in all groups we received positive confident changes ($p < 0.05$). After rehabilitation, rehabilitants were in state of satisfaction, relaxation, had wish to communicate. Though, indicators of groups differed greatly. Indicators of psycho-emotional sphere after rehabilitation course by integrative technology (TD – 3.1±0.54; VC – 1.49±0.05) were better than indicators of other groups. In other groups other different massage methodic were used: (Chinese -TD– 7.6±0.81; VC – 1.42±0.07; ajurvedic: TD– 5.23±0.64; VC – 1.49±0.05; Tibetan: TD – 6.5±0.72; VC – 1.45±0.08;

Egyptian massage: TD – 5.68±0.95; VC – 1.47±0.07) (table 2.) We analyzed results of massage methodic influence on rehabilitants' psycho-emotional state by complex of psycho-diagnostic tests. It was found that in 30 rehabilitants of main group (90.9%) significant positive influence on psycho-emotional state was achieved. With it TS indicators after rehabilitation course were from 0 to 10, and VC – 1<VC<1.5. This fact witnesses about optimal level of activity. Analogous results were achieved only in 18 students (52.94%) after course of commonly accepted methodic of therapeutic massage (difference between main and control groups – 37.96 %; difference is statistically significant, p<0.01); in case of Chinese elements' application – in 23 students – 71.87% (difference between indicators – 19.03%; difference is statistically significant, p<0.05), ajurvedic – 25 (73.53%) (difference of indicators – 17.37%; difference is statistically significant, p<0.05), Tibetan – 24 (72.73%) (difference between indicators – 18.17%; difference is statistically significant, p<0.05), Egyptian – 21 (72.41%) (difference between indicators – 18.49%; difference is statistically significant, p<0.05).

For integrative assessment of students' backbone functional state we found expressiveness of vertebral pain syndrome (pain index) by criteria of Institute of rheumatology RAMS; we used visual analogous scale (VAS) of pain; kinesthesiologic assessment of muscular syndrome (index of muscular syndrome) by Salkhanov-Khabirov's scale [7] (see table 3).

Table 3. Dynamic of integral indicators of backbone functional state (M±m)

Rehabilitation groups	Period of testing	Pain (points)	index Vas test (points)	Muscle index (points)	syndrome
Rehabilitation with integrative massage technology (n=33)	Before rehabilitation	1.24±0.05	3.01±0.05	9.56 ±0.08	
	After rehabilitation	0.15±0.04	0.25±0.05	1.25±0.04	
	p	<0.05	<0.05	<0.05	
Treatment with commonly accepted techniques of therapeutic massage (n=34)	Before rehabilitation	1.23±0.05	3.05±0.11	9.28±0.17	
	After rehabilitation	0.59±0.05	1.23±0.08	2.78±0.1	
	p	<0.05	<0.05	<0.05	
Improved massage methodic elements of traditional Chinese massage (n=32)	Before rehabilitation	1.22±0.05	3.02±0.56	9.45±0.15	
	After rehabilitation	0.34±0.04	0.59±0.06	1.52±0.06	
	p	<0.05	<0.05	<0.05	
Improved massage methodic elements of traditional ajurvedic massage (n=34)	Before rehabilitation	1.27±0.04	3.04±0.06	9.35±0.16	
	After rehabilitation	0.31±0.04	0.62±0.07	1.56±0.08	
	p	<0.05	<0.05	<0.05	
Improved massage methodic elements of traditional Tibetan massage (n=33)	Before rehabilitation	1.25±0.05	3.04±0.06	9.35±0.16	
	After rehabilitation	0.27±0.04	0.61±0.05	1.53±0.04	
	p	<0.05	<0.05	<0.05	
Improved massage methodic elements of traditional Egyptian massage (n=29)	Before rehabilitation	1.15±0.06	2.75±0.05	9.46±0.12	
	After rehabilitation	0.26±0.05	0.51±0.06	1.57±0.09	
	p	<0.05	<0.05	<0.05	

Comparative analysis of positive influence of backbone functional state indicators before and after rehabilitation by therapeutic massage means of different methodic permitted for us to supplement the data about effectiveness of rehabilitation by integrative massage technology. Changes of pain index were as follows:

- Integrative massage technology – $87.9 \pm 2.15\%$;
- Commonly accepted methodic – $52.01 \pm 2.36\%$;
- Application of Chinese massage elements – $72.13 \pm 2.14\%$;
- Application of ajurvedic massage elements – $75.59 \pm 2.26\%$;
- Application of Tibetan massage elements – $78.4 \pm 2.54\%$;
- Application of Egyptian massages elements – $77.39 \pm 2.46\%$.

Indicator of VAS test improved after application of:

- Integrative massage technology – 12.5 times;
- Commonly accepted methodic – 3 times;
- With application of oriental massage systems (Chinese, ajurvedic, Tibetan, Egyptian) – 5 times.

With rehabilitation by integrative massage technology index of muscular syndrome reduced nine times. With application of commonly accepted methodic it reduced three times. The same index reduced six times with application of oriental techniques' elements (Chinese, ajurvedic, Tibetan, Egyptian).

In main group of the tested indicators of backbone functional state improved (with application of integrative massage technology) as well as percentage. For example, in 29 (87.88%) main group students we observed stability of received positive results (absence of pain syndrome; total index of muscular syndrome by Salkhanov – Khaboriv – from one to seven points; absence of functional blocks, which cause discomfort and pain in separate backbone sections or limitation of mobility in certain vertebral motor segments). In control groups the same positive effect was found only in 19 (55.88%) students. It is by 32% less than results of main group (difference is statistically significant, $p < 0.01$). With application of massage methodic such effect was observed in the following:

- Application of Chinese massages elements – in 21 students (65.63%) (difference of indicators – 22.25%; difference is statistically significant, $p < 0.05$).
- Application of ajurvedic massage elements – 23 (67.64%), (difference between indicators – 20.24%; difference is statistically significant, $p < 0.05$);
- Application of Tibetan massages elements – 23 (69.7%) (difference between indicators – 18.18%; difference is statistically significant, $p < 0.05$);
- Application of Egyptian massages elements – 20 (68.96%) (difference between indicators – 17.92%; difference is statistically significant, $p < 0.05$).

Thus, analysis of dynamic of backbone functional state indicators witnesses that in the course of rehabilitation be integrative massage technology all changes were the most substantial. In general analysis of the research's results permits for us to say that rehabilitation with the help of integrative massage technology more effectively influences on general psycho-emotional state of young people and facilitates improvement of backbone functional state.

Discussion

Various massage technologies play important role in physical rehabilitation of young people [1; 5; 6; 8]. Rehabilitation specialists of western and oriental countries achieved noticeable success in creation of new rehabilitation massage methodic, working out of new systemic approaches to rehabilitation [7; 17; 20; 23]. Alongside with it there is an opinion of some rehabilitation specialists that some techniques of diagnosis and treatment in manual therapy, massage osteopathy, applied kinesiology do not principally differ. All specialists "stretch, press, shift, rotate, push and crunch". List of techniques is constantly replenished. With all originality of names, analysis of rehabilitation specialist's movements, when he fulfills massage technique, points at fulfillment of actual (real) stretching, pressing, swinging, shifting and vibration. All they are natural physiological irritators of extra receptors and proprioceptors of different localization [3]. Though, in literature rehabilitation methods, which combine prophylaxis and therapeutic effect of massage techniques of western and oriental systems, are not sufficiently elucidated. Realization of different techniques from different systems is dictated not by their sequence but peculiarities of pathologic process or rehabilitant's functional state.

The fulfilled research witnesses that worked out by us integrative massage technology permits to use positive elements of different systems in one rehabilitation session and is effective. In our opinion application of this technology will facilitate prophylaxis of vertebral diseases and increase of rehabilitation effectiveness.

Conclusions

Thus, we can make conclusion that worked out by us integrative massage methodic facilitates optimization and increase of rehabilitation effectiveness and has practical and theoretical significance.

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Conflict of interests

The author declares that there is no conflict of interests.

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INFLUENCE OF EXTRA TRAINING MEANS ON EFFECTIVENESS OF FENCERS' TECHNICAL TACTIC ACTIONS

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Abstract. *Purpose:* to determine influence of the worked out extra training means' complex on effectiveness of realization of elite sportsmen's competition functioning components. *Material:* in the research 12 fencers participated. The researches were conducted in the morning, against the background of organism's recreation. Before sportsmen's duel we applied two types of pre-competition warming up: traditional and experimental. Video recording was fulfilled with video camera Samsung HMX-S15. *Results:* we calculated volume, effectiveness and efficiency of sportsmen's actions in fights with different opponents and in different situations of duel. We showed possibility of extra training complexes' application, oriented on mobilization of workability in the process of direct pre-start preparation of elite sportsmen. Such exercises considered main actions and organism's typical responses in the process of competition functioning. *Conclusions:* Consideration of typical (for fencing) organism's responses and peculiarities of competition functioning structure influence positively on indicators of sportsmen's competition functioning.

Key words: martial arts, fencing, training, extra training means, competition.

Introduction

Great number of modern researches point at the fact that in constantly increasing intensity of training and competition functioning still greater importance is acquired by extra competition and extra training means of sports training [9, 11, 12, 20-24]. Consequently, the problem of sportsmen's training effectiveness increase at the account of extra training means' application is not new for fencing [5, 10, 17, 24-29]. In the works of different authors there are rather effective approaches to application of extra training means for workability recreation in elite fencers.

In the works by Mirzoyev O.M. theoretical aspects and general principles of recreational means' application in sports training are presented. There it is also noted that preliminary application of recreational means facilitates significant increase of elite sportsmen's pre competition training's effectiveness. The author analyzes influence of different recreational means on elite fencers' special physical fitness and organism's functional state [10].

Tishler D.A. and Mocshovich A.D. studied application of extra training means in sports training in fencing. The authors noted that fencing training and participation in competitions differ by significant specific load on sportsmen's organism. It conditions demand in active application of recreational means and methodic, which consider specific features of kind of sports. The authors give methodic recommendations about peculiarities of extra training means' application, as means of recreation of lost workability after significant physical and mental loads [18, 19]. But these authors do not regard possibility of extra training means' application for workability stimulation during competitions and their influence on effectiveness of technical tactic actions' realization.

Some means of fencers' pre start training effectiveness increase are given in works by Levashov P.N. The author studied influence of typical warming up in combination with massage and mini bath "Termica" on indicators of targeted accuracy and dynamic of fencers' workability indicators [5].

It should be noted to large extent the mentioned approaches are oriented on application of physical and pedagogic recreational methods in period of after effects of great training and competition loads. With it [5] there are nearly no researches of extra training means influence on special workability and effectiveness of elite sportsmen's competition functioning in fencing.

In our previous researches we worked out special complex of extra training means, which were used instead of traditional pre-competition warming up of fencers. The worked out by us complex of extra training means consists, mainly, of exercises with partner, accompanied by special breathing mode. In exercises sportsman overcomes resistance, which can vary in wide range and adapt to potentials of sportsman's muscles. The received in previous researches data witness about positive influence of the worked out complex of extra training means on nervous and cardio-respiratory systems' indicators [6, 7, 8]. This fact served as the basis for checking of experimental complex's effectiveness in conditions, which simulated competition functioning in fencing.

Hypothesis: application of extra training means in pre start training can increase effectiveness of realization of elite sportsmen-fencers' main technical tactic actions.

The purpose of the research was to determine influence of the worked out extra training means' complex on effectiveness of realization of elite sportsmen-fencers' competition functioning components.

Material and methods

Participants: in the research 12 fencers participated (6 international masters of sports of Ukraine, 6 masters of sports of Ukraine in fencing) of age from 19 to 24 years. All sportsmen gave their consent for participation in experiment.

Organization of the research: in the research we used sequential experiment. In this experiment we created conditions, which simulate competition functioning in fencing. In these standard conditions group of sportsmen fulfilled control and experimental program of training. The researches were conducted in the morning, against the background of organism's recreation.

In control part of experiment the fencers fulfilled traditional pre competition warming up. After warming up they conducted two duels for 15 shots with 20 minutes rest intervals between duels. The fight consisted of three periods (of three minutes' duration with 1 minute interval between periods). After three days (before duels) sportsmen, instead of traditional pre competition warming up, fulfilled experimental complex of pre start impacts.

As a result of the researches we assessed effectiveness of fencing competition functioning. Effectiveness of attacking, defensive and counter attacking actions was assessed with the help of registration of all fighting actions. We calculated volume, effectiveness and efficiency of sportsmen's actions in duels with different opponents and in different duels' situations.

To receive objective indicators of competition functioning we used video recording [4]. Video registration of fencers' technical tactic actions was fulfilled with camera Samsung HMX-S15. Video materials were analyzed with the help of computer program Light Allow in slow mode and stop-shot.

Statistical analysis: for determination of statistical significance of distinctions between indicators of fencers' competition actions' effectiveness we used non parametrical criteria for small samples (Wilkinson's test). We adopted level of significance $p = 0.05$ [4]. Statistical processing of data was fulfilled with computer program Stitistica 10.

Results of the research

To determine influence of the worked out extra training means' complex on effectiveness of realization of elite sportsmen's competition functioning we conducted sequential experiment. In experiment we simulated conditions of pre start training and competition functioning with application and without application of extra training means' complex. We calculated effectiveness of attacking, defensive and counter attacking actions of sportsmen in fights with different opponents and in different duel's situations [13].

Analysis of research's results showed (see table 1) that under influence of experimental complex attacking actions' effectiveness increased by 6.8% ($p < 0.05$) in the first duel and by 6.6% ($p < 0.05$) in the second duel. It should be noted that attacking actions' effectiveness in the second duel was by 4.8% ($p < 0.05$) higher than in the first duel after traditional warming up. It witnesses that special workability of fencers after application of experimental complex was higher that after traditional warming up (including in conditions of increasing fatigue).

In duel fencers use great number of fakes and tricks, combined with different maneuvering. It conditions great volume of opponent's defensive actions. Indicators of defensive actions of experimental group sportsmen exceed 50%. Though, effectiveness of such actions is not more than 20%. It witnesses that in responses to opponent's fake or actual actions sportsmen fulfilled defensive actions only to avoid shot in response. In this connection, after exercises of pre start control and experimental complexes we considered effective only those actions, after which responsive shot was realized.

In table 1 we see that application of experimental impacts resulted in increase of defensive actions in first duel by 6.6% ($p < 0.05$) and in the second duel – by 6.8% ($p < 0.05$).

Table 1. Indicators of competition functioning of elite fencers (n = 12)

Kind of competition actions	Effectiveness of fencers' competition functioning, %			
	After traditional warming up		After complex of pre start impacts	
	Duel 1	Duel 2	Duel 1	Duel 2
Attacking actions	29.5	27.7	36.3*	34.3*
Defensive actions	18.4	17.2	25*	24*
Counter attacking actions	50.2	48.5	56.5*	54.6*

Notes: * - distinctions are statistically significant, comparing with data, received after traditional warming up ($p < 0.05$).

Comparative analysis of counter attacking actions' effectiveness showed that after experimental complex the mentioned effectiveness increased by 6.3% ($p < 0.05$) in first duel and by 6.1% ($p < 0.05$) in second duel.

Besides, we analyzed accuracy of shots during experiment. Results of this analysis witness (see table 2) that under influence of experimental complex increase of shot accuracy by 5.6% ($p < 0.05$) during first fight and by 7.5% ($p < 0.05$) in second duel was registered.

We found that after application of pre start impacts' complex, in first duel rapier-fencers made not valid shots by 2.6 less. In second duel sportsmen made not valid shots by 2.9 less than after traditional warming up.

Table 2. Indicators of shots' accuracy of elite fencers

Statistical indicators	Indicators of shots' accuracy, %			
	After traditional warming up (n = 12)		After complex of pre start impacts (n = 12)	
	Duel 1	Duel 2	Duel 1	Duel 2
\bar{x}	65	61.4	70.6 *	68.9 *
S	10.8	13.5	7.7	12.6

Notes: * – distinctions are statistically significant, comparing with data, received after traditional warming up ($p < 0.05$).

It witnesses that after complex of pre start impacts indicators of fencers' special workability were higher than after traditional warming up.

Discussion

As a result of systemizing of scientific-methodic literature data we can conclude: application of extra training means is the most significant reserve of sportsman's new potentials in extreme conditions of motor functioning, typical for elite sports. The main condition of extra training means' application is compliance of its orientation with specificities of training functioning provisioning in this kind of sports [9, 12]. It is directly connected with theory and practice of fencing training, where competition functioning is connected with special fitness's highly specialized components.

At present, in theory of sports certain system of extra training means, oriented on simulation and recreation of workability has been formed. In special literature there are data, showing effectiveness of application of specially worked out stimulating extra training means in different kinds of sports [2, 12, and 14]. Effect of such means' application in a number of kinds of sports creates pre conditions for development and implementation in practice of extra training impacts, oriented on stimulation of special workability and pre start training effectiveness increase in elite fencing.

In the process of our researches we worked out the complex of extra training impacts, oriented on stimulation of special workability and pre start training effectiveness increase in fencing. The complex was developed on the basis of selection and generalization of information about structure, content and orientation of special extra training exercises. Such exercises considered main actions and typical responses of fencer's organism in the process of competition functioning.

The conducted research proved results of a number of authors, who dealt with complex and rational usage of training and extra training means in system of sports training, which result in increase of competition functioning effectiveness in the whole [1, 2, 3, 12, 15].

We supplemented the data about modern approaches to optimization of elite sportsmen's pre start training in fencing with the help of extra training means [5, 17, 18, and 20].

Materials of our research supplement theoretical principles, devoted to rational organization of pre competition and competition functioning of elite sportsmen in martial arts [14, 15].

In our research, for the first time the data about influence of extra training means' complex on effectiveness of elite fencers' technical tactic actions were received.

Besides, when comparing results of the researches, attention should be paid to the fact that under influence of experimental complex means indicators of fencers' competition functioning was higher, than after application of traditional warming up. More over, they were the same even under increasing fatigue. The received results witness

that the offered by us complex of extra training means increases effectiveness of pre start warming up and increase effectiveness of competition functioning in the whole.

The promising direction of our researches is working out of new extra training means, oriented on simulation of workability in fencing (between duels). Besides, it seems to be important to work out recommendations for application of extra training means, oriented on stimulation of workability in training for increase of specific character and depth of load's influence.

Conclusions:

1. We have shown possibility of extra training means complexes' application for mobilization of workability in the process of elite sportsmen's direct pre start training.
2. As a result of the researches we found that consideration of organism's typical (for fencing) responses and specific features of competition functioning structure positively influenced on indicators of sportsmen's competition functioning. With it, confident ($p < 0.05$) improvement of sportsmen's main technical tactic actions and accuracy of shots were registered.

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Conflict of interests

The author declares that there is no conflict of interests.

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JOB SATISFACTION FOR PHYSICAL EDUCATION TEACHERS AND ITS RELATIONSHIP TO JOB PERFORMANCE AND ORGANIZATIONAL COMMITMENT

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Abstract. *Purpose:* this study was to investigate the relation and correlation between job satisfaction, job performance, and organizational commitment among physical education teachers. *Material:* The participants were 100 physical education teachers' male and female from secondary schools. Job satisfaction, job performance, and organizational commitment were measured through a questionnaire has 05 axes. *Results:* The findings indicated that there was a strongly positive relationship between job satisfaction and job performance, and the same relationship between job satisfaction and organizational commitment. *Conclusion:* there is a need to create an appropriate environment to ensure the success of the professors of physical education as well as providing incentives and promotions through clear standards.

Key words: job satisfaction, job performance, organizational commitment, physical education teacher.

Introduction

Physical education teachers, commonly known as Phys Ed or P.E. teachers are responsible for the education of primary and secondary school students in physical activity and psychomotor learning. The physical education class was once little more than an organized recess; however, physical education teachers now engage students in much more than game play. Recent developments have steered the physical education curriculum towards the goal of overall wellness and teachers now incorporate health and nutrition topics into their classes (Shorfi, 2012).

About job satisfaction there has been a lot of researches since 1930. In this study, it is stated that job satisfaction of employees is associated with psychological and physical health. Job satisfaction has been defined by Locke (1976), as "a pleasurable or positive emotional state resulting from the appraisal of one's job or job experience". Similarly, Schultz (1982) stated that job satisfaction is essentially the psychological nature of people toward their work. In addition, Spector (2003) indicates that the job satisfaction expressed feelings about the work of the employees. Building on Locke's conceptualization, Hulin and Judge (2003) noted that job satisfaction includes multidimensional psychological responses to one's job and that such responses have cognitive (evaluative), affective (or emotional) and behavioral components. According to these definitions, people have attitude with high job satisfaction positively, low job satisfaction negatively against their work.

Researchers agree that job performance can be defined on a micro level as actions and behavior of an employee that contribute to the goals of the organization (Campbell, 1990; Murphy, 1989). A wealth of literature speaks to issues surrounding the structure underlying job performance (i.e., those categories of behaviors that are valued by supervisors). A review of this literature indicates that for some time the only behaviors that received attention in the research literature and by organizations were those behaviors associated with the production of a good or the provision of a service, namely task performance. Some researchers propose that employees do not spend all of their time at work performing activities that are strictly related to task performance (e.g., Borman & Motowidlo, 1993; Katz & Kahn, 1978; Organ, 1988). For example, employees help coworkers or volunteer to engage in activities that benefit the organization. These behaviors also contribute to the organization in positive ways and have been given a variety of names (e.g., organizational citizenship behavior, contextual performance, extra-role behaviors).

Organizational commitment is the power of individual's identification with and participation in the organization. Components of such kind of commitment are defined as having strong belief in and adoption of the objectives and values of the organization, willingness to put forth extra effort for the benefit of the organization and being eager and willing to continue organizational membership. In other words, organizational commitment is the strong belief of the employee in the organizational objectives and values, adoption of these objectives and values by the same, intense desire to exert extra effort for organizational objectives and strong wish to stay within and remain a member of the organization (Mowday, Steers & Porter, 1979). Sense of organizational commitment is thought to positively affect organizational performance and, in this framework, it is suggested to decrease undesired results such as tardiness, absenteeism and quitting and to make positive contributions to the product and service quality (Dogan & Kilic, 2007). Employees committed to their organizations are believed to work more and make more self-sacrifice for the achievement of organizational objectives. Organizational commitment issue has been studied from many aspects and this concept has been addressed in the three components of affective commitment, continuance commitment and normative commitment (Meyer & Allen, 1988). Present study also addressed organizational commitment in these three dimensions (Goleman, 2000).

The purpose of this study is study of job satisfactions among teacher of physical educations and its relationship to job performance and organizational commitment.

The task of this study is to answer the following question: What is the relationship between the level of job satisfaction for teachers and physical education, and their performance and their commitment to the organization?

Material and Methods

Participant: we have been relying on a random sample using equation the entrance of the American Association for Education to determine the appropriate minimum sample size. The application got the 135 participants, but after the distribution of questionnaires retrieved 107 of which 7 were invalid. It was determined the final size of the sample to 100 participants. 95 were male physical education teachers and 5 were female physical education teachers from secondary schools (Jijel city).

Research Design: based on the nature of the data to be collected, the most appropriate and effective tool to achieve the objectives of the study are "questionnaire", the questionnaire covered four main axes:

- The axe of Socio-demographic characteristics (8 items).
- The axe of Job satisfaction (25 items).
- The axe of job performance (14 items).
- The axe of organizational commitment (15 items).

Statistical Analysis. The preparation of the questionnaire was relied on Questions enclosed formula. Items 2, 3, and 4 in the questionnaire are in the form of five option Likert type scale. Cranach alpha reliability and Validity were done (table 1).

Table 1. Cranach alpha reliability and Validity of questionnaire

Axes	items	Reliability of axe
Job satisfaction	25	0,990
job performance	15	0,985
organizational commitment	14	0,989
General rate of reliability	54	0,995

Results

Socio-demographic characteristics

The socio-demographic characteristics of the respondents are summarized in Table 2. Among the 100 respondents, 95 were males and 05% were females. They represent a young age group under 31 years with an age range of 31-40 years, another age range of 41-50 years, and last age group over 51 years. the single participants made up 48% while 52% were the married participants. Majority of the respondents had license qualification. Majority of the respondents had permanent work 84% while 15% and 1% had trainee and temporary work, respectively. Majority of the respondents had monthly salary between 32000 and 42000 DA.

72% of respondents had direct registration while others had transfer.

Table2. Socio-demographic characteristics

variable	Variable categories	number	percentage
Gender	male	95	95%
	Female	05	05%
Age (years)	Under 30	55	55%
	31-40	33	33%
	41-50	08	08%
	Over 51	04	04%
Social status	Single	48	48%
	Married	52	52%
	Other	0	0%
Qualification	License	75	75%
	Master	16	16%
	Majister	01	01%
	other	08	08%
Work Experience(years)	Under 5	57	57%

	5-10	28	28%
	Over 11	15	15%
type of work	Permanent	84	84%
	Trainee	15	15%
	temporary	01	01%
monthly salary (DA; Algerian dinar)	Under 32000	13	13%
	32000-42000	67	67%
	Over 42000	20	20%
how to register in Physical Education and Sports Department	direct registration	72	72%
	transfer	28	28%

Determination of the relationship between job satisfaction and job performance to physical education teachers.

As shown in Table 3, there is positive relationship ($r = 0.932$, $p < 0.01$), between type and circumstances of work and job performance. And there is positive relationship ($r = 0.932$, $p < 0.01$), between salary and job performance. and the same results ($r = 0.888$, $p < 0.01$), ($r = 0.887$, $p < 0.01$), ($r = 0.916$, $p < 0.01$), between relationship with colleagues and job performance, incentives (motives) and job performance, and relationship with superior and job performance, respectively.

Table 3. Results Pearson correlation coefficient between Job satisfaction dimensions and job performance

Job satisfaction dimensions	job performance
type and Circumstances of work	0,932
salary	0,829
Relationship with colleagues	0,888
Incentives (motives)	0,887
Relationship with superiors (bosses)	0,916

Sig. at 0.01 level (2-tailed)

As for the nature of the relationship between job satisfaction in general and job performance table 4 shows that there is a positive and significant ($r = 0.936$, $p < 0.01$).

Table 4. Pearson correlation coefficient between job satisfaction in general and job performance

Variables	job performance
Job satisfaction	0.936

Sig. at 0.01 level (2-tailed)

This topic has strong positive relationship because the performance is affected by the satisfaction of the professors for their job. So it can predict the level of job satisfaction by performance of teachers.

Determination of the relationship between job satisfaction and organizational commitment to physical education teachers.

As shown in Table 5, all measured dimensions of job satisfactions has a positive relationship with organizational commitment, ($r = 0.960$, $r = 0.885$, $r = 0.95$, 0.934 , and $r = 0.961$, $p < 0.01$, type and Circumstances of work, salary, Relationship with colleagues, Incentives (motives), and Relationship with superiors (bosses), respectively. if one of dimensions of job satisfaction increases, organizational commitment also will increase.

In table 6 there is positive relationship between job satisfaction in general and organizational commitment ($r = 0.980$ $p < 0.01$), that mean very strong positive relationship.

Table 5. Results Pearson correlation coefficient between Job satisfaction dimensions and organizational commitment

Job satisfaction dimensions	organizational commitment
type and Circumstances of work	0,960
salary	0,885
Relationship with colleagues	0,925
Incentives (motives)	0,934

Relationship with superiors (bosses)	0,961
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Sig. at 0.01 level (2-tailed)

Table 6. Pearson correlation coefficient between job satisfaction in general and organizational commitment

Variables	organizational commitment
Job satisfaction	0.980

Sig. at 0.01 level (2-tailed)

Discussion

Many studies have confirmed that job satisfaction is one of the important factors that maintain a high level of performance. Some researchers have pointed out that the low levels of job satisfaction may lead to lower productivity, associated apathy and loss of interest..., as well as, the low level of organizational commitment, because this relationship affect the quality of education and student achievement levels. Job satisfaction has a clear impact on the level of Organizational commitment to physical education teachers (Narimawati, 2007; Reyes, 1989; Iermakova, 2014; Podstawski et al., 2014; Radchenko, 2015; Nowak et al., 2016).

Other studies, analyzing the dependences between fit and unfit P.E. teachers and the performance of their students did not reveal significant differences (Bischof, Plowman, & Lindenman, 1988). Still other studies revealed that P.E. teachers consider their lessons successful if students are occupied, happy, and well-behaved (Placek, 1983), without giving as much priority to aspects of teaching such as developing a lifelong positive attitude towards physical activity (Hickson & Fishburne, 2002).

This result is consistent with Salama (1999), where the study concluded that there is a correlation between the degree of organizational commitment to the members of the faculty and the degree of job satisfaction. It also noted the results of the study of the El-Dakhil (1995) to the existence of a positive relationship between job satisfaction and organizational commitment in a sample study by members of the teachers at the University of Riyadh in Saudi Arabia.

Finally, it can be concluded that there is a positive relationship between job satisfaction and job performance, and the same relationship between job satisfaction and organizational commitment.

Based on our findings, we recommend that engaging teachers of physical education in the decision-making within the organization, need to create an appropriate environment to ensure the success of the professors of physical education. And providing incentives and promotions through clear standards.

Conflict of interests

The authors declare, that there are no potential conflicts of interest in respect to research, authorship, and/ or publication of this article.

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STUDYING THE RELATIONSHIP BETWEEN LEADERSHIP STYLE OF COACHES AND SPORTSMANSHIP COMMITMENT OF ATHLETES (A CASE STUDY OF PROFESSIONAL ATHLETES IN I.R. I. KARATE SUPER LEAGUE)

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Abstract. *Purpose:* Today, when a group of people trying to reach the goal, manager and leader usually undertake the responsibility of the group. Coach renders influence on team members, while athletes work hard to achieve team goals. The purpose of the present study is relationship between leadership styles of coaches and sports actions of karate athletes. *Material:* The present study involves all active athletes of Super League karate in 91-92 season (N=100). The statistical sample was equal to statistical population (N=n). In order to collect information we used leadership style questionnaire Bos and Avlio (MLQ) and questionnaire of Scanlan & et al (SCMS). Internal validity questionnaire was approved by university professors and its reliability – by Cronbach's alpha test 0.86, and 0.79. Also for data analysis we used descriptive indicators of mean and standard deviation. Preliminary analysis of data proved normal distribution by Kolmogorov-Smirnov test. And then, we used measurements by Pearson, Spearman, Mann-Whitney U, Wilcoxon T, Friedman correlation coefficient of significance level ($P \leq 0.05$). *Results:* there are significant differences between athletes' results and styles of leadership. There is significant correlation between the results with style Attraction (0.000), *Idealized Influence* (0.000), *Inspirational* (0.001), Intellectual stimulation (0.007), Individualized consideration (0.017), Exception Active (0.008) and *Laissez-faire* (0.041) ($P \leq 0.05$). *Conclusions:* for increased of athletes' results coach should use style Attraction, *Idealized Influence*, *Inspirational*, Intellectual stimulation, Individualized consideration, Exception Active and if coach wants to see success of his athletes at athletic fields he should comply the applied styles with sportsmen's results.

Keywords: leadership style, commitment, karate, athletes.

Introduction

In complex today's world, when a group of people try to achieve a goal, usually, there is a person who takes the responsibility of the group as manager or leader. To guide the group towards desired goals, this person must have necessary traits and skills. In sport fields, this role is played assumed by coach, because he guides and leads the players; his effective leadership has an important impact on the group's performance. Basing on the previous studies we can say that an effective coach is a person who can change the result of game, and be able to bring success and positive morale reactions to the team [1]. People involved in professional sports have realized that traditional method of last decades could no longer be relied on, and coaches found, that to participate in sporting events they have to use new scientific approaches to the subject; so scientific management methods have been implemented in order to organize major sporting clubs. Karate, as martial art, is not an exception from this rule. Leadership, due to its influence on effectiveness of individuals and team, is one of important processes in human resources management. An efficient leadership results in better performances, motives creation and team members' satisfaction. Therefore, every coach must have a precise understanding of leadership concept of organization [2]. Leadership is a fundamental process in every organization or team, where failure or success is attributed to its leadership. When an organization, university or a sporting team gains victory, usually all credits and honors go to its manager or coach. Even the subsequent advantages go mostly to managers and coaches rather than to the staff and the players.

Toosi, Rizo and Carol (1986) define the leadership as an art of influencing on followers and making them fulfill instructions and be obedient. They believe that leadership occurs, when an individual can obtain the acceptance of others towards achieving desired goals of an organization [3]. To Yomagogy and Maer, leadership is not only combination of personal characteristic but also a series of concentrated manners on duty and relationship [5].

Coach is the team's leader and leadership is the process of influencing on team members in order to make them to achieve team targets, through hard endeavor, commitment and satisfaction. To render influence on athletes, coaches have to use different leadership methods. At competitions and in professional sports experiences show, that coaches, who are elite in coaching knowledge and related technicalities, render more effective influence on team's success, on performance and players' satisfaction. In the field of coaching and teaching of sports skills to athletes, especially at national levels, recognition of factors, effecting on mental and physical conditions of the athletes, can be a determining factor in their success. Besides, athletes are the most principal human power in sports and they are true producers and consumers in this field. It is necessary that coaches and managers try to form happy and satisfactory experience for the athletes. Athletes should not only get required information about tactics and techniques from coaches, but also

should understand and accept them. Successful coaches are those who help the athletes to achieve high level in new skills, enjoy competitions and feel joy and commitment [8].

Coaching is a type of leadership in sports teams, in which the set goals are followed up purposefully. The main goal of coaching is improving the performance in sports competitions. The role of a coach is management, a process of performance's improvement, which is based on athlete's abilities. The main characteristic of this role is helping athletes to have proper performance at a proper time [9].

Coaching and management of national teams and premium league is more sensitive than that of other levels of competitions, where coaches must be able to utilize different styles of leadership in exercises, tours, camping and sports competition. Especially motives and sportsmanship are most important in such competition levels. Therefore evaluation and studying coaches' position, regarding management of their teams, should not be limited to their technical qualities, but it should consider other factors, which could have effect on team's success and failure. Leadership is a requisite of coaching. Some of important duties in leadership context include creating motive and commitment among the athletes, developing effective relationships with them, making coordination and improving satisfaction of the athletes.

Researchers have consistently showed that coaches' leadership type plays a determining role in sports participation of team members. This is an obvious fact to the coaches that they play a vital and effective role in the field of sports. Also this effective role goes beyond the field of sport and covers other aspects of athletes' lives. It is clear that coaches can have a positive or negative impact on athletes' living environment.

Different models have been presented for style of leadership. Chelladurai's (1990) is the model considered by this research. In this model the initial variables which determine leader's behavior, are divided into three groups: characteristics of members, characteristics of situation and characteristics of leadership, and performance and satisfaction of members are regarded as the outcome.

According to this model, the proper outcome (excellent performance and high level of athletes' satisfaction) is occurred, when there is a balanced relationship among these three aspects. In this model, it is proposed that, when a coach provides suitable environment and considers requirements and interests of athletes, team and individual performance and also satisfaction of athletes would be increased to its highest level. Besides, Chelladurai's model emphasizes on the reciprocal relationship between coach's behavior and performance and satisfaction of athletes. According to this model real behavior of the coach is greatly influenced by satisfaction and performance of the athletes [10].

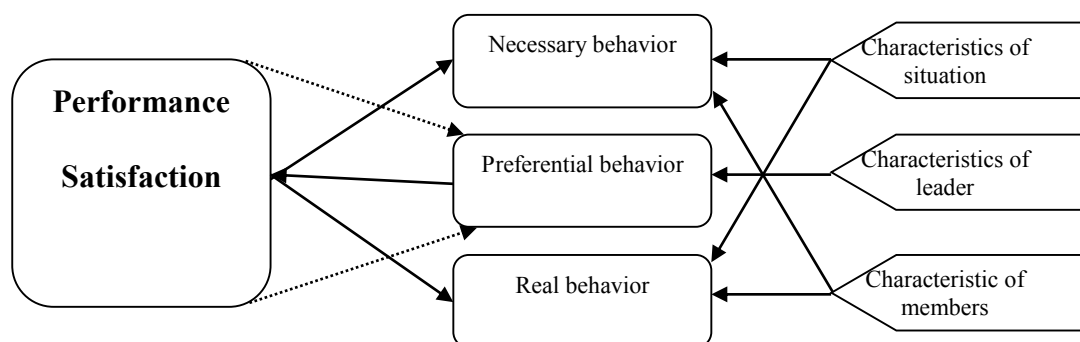


Figure 1. Multi-dimensional model of leadership in sports [2].

Several researchers have supported Chelladurai's multi-dimensional model and also it points that relationship among three types of leadership's behavior, which could lead to a desirable performance and satisfaction of athletes, is well defined. In this model there is a framework for understanding the elements, which could affect the behavior of coach. To his belief behavior of a coach (necessary, preferential, and real behavior) is influenced by three main variables: characteristics of situation, characteristics of members and characteristics of leader. Characteristics of leader such as age, sex, experience, character, etc., characteristics of situation such as condition of organizing of group or team, advantages of team and etc., and also characteristics of members such as age, level of skill, culture and personality. Behavior of coach could be affected by each of these three variables and in general they have a determining part in athletes' performance and satisfaction. One decade after publishing Chelladurai model (1980), many researches were carried out on examining and studying hypotheses of this theory. These examinations have supported the communicational processes among the variables of his model and therefore have endorsed it [10].

As it has been said, besides coach's style of leadership, sportsmanship commitment of the athletes could also be reckoned as a factor in achieving victory. Organizational commitment has been regarded as one of the important concepts in last decades, and has been defined as state of mind or an impulse that connects an individual with purpose and the establishment of an organization. The extent of this definition gives the researchers an opportunity to examine all types of commitments in organizations, their growth and their effects on individuals and organizations [11]. The

main portion of the studies has been concentrated on organizational structure. In fact most of what we know about commitment has come from our studies on organizational behavior [12]. It should be noted that sports teams as organizations are a target oriented structure with a defined sphere, therefore examining the concept of commitment as an effective factor on team's performance is of importance. In view of this, some studies have been done, where organizational commitment models have been used. Since sports environments have their own characteristics, examining the commitment, requires dealing with the matter of athletes' sportsmanship commitment on the basis of Scanlan's sportsmanship commitment model (1993).

Recently, with introducing sportsmanship commitment model, a great achievement has been gained by combination sport with commitment. According to Scanlan's model, sportsmanship commitment is a psychological structure which shows inclination and determination of continuing the participation in sport activities [13]. Sportsmanship commitment model is designed to examine the cause of participation of peoples in some particular sports. This model is a case beyond the general or working commitment and has been formed in the field of sport where there is a little attention to it.

Sports commitment is a psychological structure which shows the inclination and determination of continuing the participation in sport [14]. Scanlan & Carpenter have stated that athlete's behavior is influenced by both psychological factor and other forces .therefore through this model it would be possible to determine the desire of sportsmanship commitment and then measure the relationship between sportsmanship commitment itself and also the quantity of the relationship between these variables and psychological case of sportsmanship commitment [14].

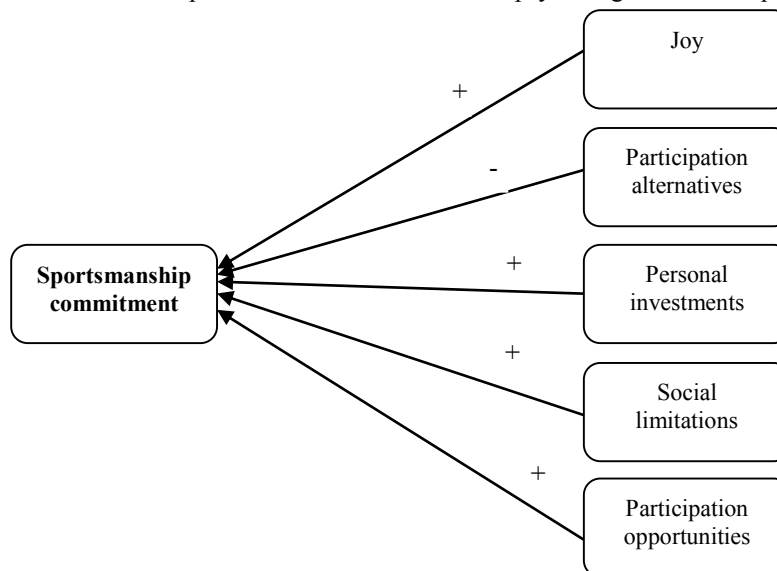


Figure 2. Sports manship commitment model [14].

There are many studies about style of leadership and organizational commitment which we refer to some of them. Mount (1981), in a research entitled "application of situational leadership in sport" describes a leadership style model and concludes that a coach should consider the goals of the team and individuals and also the degree of players majority, when choosing his style of leadership. Case & Fisher (1984) in a study entitled "leadership in sport" dealt with the application of condition based theory in sports, and concluded that in condition based theory for achieving maximum effectiveness of leadership and management, there is non-concurrence in management behavior with prevailing conditions in the sport. Kellett (1999) in his research under the title of "Understanding coaching and managing behaviors of the coaches in Australia Football super league" concluded that creation of a supportive environment means provision of learning atmosphere for developing skills and team work in players, where opportunities should be provided for players to develop, and the coach should interfere only when there is possibility of a danger to happen for learning atmosphere. Serpa (1999) in a study related to athletes' perception and self perception of coaches showed that in general, exercise and teaching behaviors and positive feedback are the most important dimensions of leadership measure in sport. Bucher (2003) studied leadership style of university's female coach of lawn hockey and showed that coaches regarded their behavior towards the players as democratic. On this point there was a significant difference between the perceived behavior of athletes and that of the coaches.

Andrew (2004), in a research named "effect of harmony in leadership behavior on the motivation, commitment and satisfaction among tennis players" found that perceived and preferred harmonies of leadership behavior could affect the sportsmanship commitment and enjoyment. Sermones (2004) studied the effect of harmony in leadership behavior on the motivation, commitment and satisfaction of the athletes and concluded that harmonies of leadership

behavior perceived and preferred by the athletes are cause of an internal motive for learning, sportsmanship commitment, enjoyment of the sport, satisfaction from personal and team performance and also satisfaction from exercises and educations.

Kent & Sullivan (2008) have compared behavior of American and Canadian coaches. The result showed that Canadian coaches have significant level of democratic behavior, instruction, exercises and positive feedback, if compared with American coaches. Garcia et al (2010) have studied the effect of the joy of motivation and commitment on young players in competitive football. Results showed a clear paradigm of enjoyment from sport influenced by motivation and commitment, the outcome of which was a positive share of joy from internal and external motivation and the commitment. In general (Bass, 1985), (Hater and Bass 1988), (Morris and Sherman (1981), have shown in their research that style of leadership is an organizational feature whereby commitment is foreseen. Also Andrew states that studies on athlete's commitment and leadership is very rare to a point where he claims, have not seen any (Andrew 2004), (Glisson and Durick (1988). There are many studies on coaches' style of leadership, where relationships between coaches' styles of leadership and different team and individual outcomes like harmony and satisfaction, have been studied. But there is not much research on the relationship between coaches' style of leadership and athletes' sportsmanship commitment, and where there is such a research, organizational commitment have been considered instead of players' commitment. Since Iranian Karate has a good ranking in Asia and the world, therefore the findings of this research could be used by different parties concerned, such as clubs, coaches and all who are active in the field of sports at country level and karate federation, specially karate teams. Therefore this research answers the question whether there is a relationship between coaches' style of leadership and athletes' sportsmanship commitment in Islamic Republic of Iran Karate super league.

Research methodology:

The present research is of descriptive and correlation type, in which its data have been collected at the field of research. The field, in which this data have been gathered, consists of all karate athletes and coaches of country Karate Super league including 100 athletes. In this research statistical sample is equal to statistical society (N=n). Only 75 out of 100 athletes have completely answered the questionnaires. After studying reliable sources and various scientific papers and also after consultation with experts in sports management, Scanlan's commitment questionnaires (1993) and Chelladurai's questionnaires of leadership measurements in sports or understanding coach's behavior by athletes (1978) were chosen and translated.

Table 1. Reliability of questionnaires

Cronbach's alpha	questionnaire
0.79	sportsmanship commitment (SCMS)
0.86	leadership style (MLQ)

In this research descriptive and inference statistics have been used in order to organize and summarize the raw points and explanation of samples' sizes.

Cronbach's alpha data analysis method has been used for determining the degree of questionnaires' reliability. For determining that whether the distribution of data is normal Kolmogorov-Smirnov test, and for research hypotheses, correlation tests of Pearson, Spearman, Mann-Whitney U, Wilcoxon T, and Friedman have been used. Statistical operation has been done by SPSS software version 18 at the significance level of ($p \leq 0/05$).

Result and finding of the research:

Before testing research hypotheses Kolmogorov-Smirnov test has been used to verify that the distribution is normal.

Verifying that the distribution of sportsmanship commitment variable and its components is normal:

Table 2. Results of Kolmogorov-Smirnov test on sportsmanship commitment and its components

Participation opportunities	Social limitation	joy	commitment	
4.32	3.14	3.87	3.9	mean
0.77	0.96	0.86	0.75	Standard deviation
1.73	0.95	1.07	1.10	Z
0.005	0.32	0.20	0.17	Sig
normal	abnormal	abnormal	abnormal	condition of variables

Verifying that the distribution of leadership style variable and its components is normal:

Table 3. Results of Kolmogorov-Smirnov test on leadership style and its components

unrestrained	Inactive exception	Active exception	Conditional reward	Personal consideration	Sectional attitude	inspirational	Moral effect	attraction	
2.26	3.11	3.82	3.45	3.72	3.60	3.93	3.81	3.73	mean
0.91	0.89	0.85	0.86	0.84	0.83	0.98	0.83	0.68	Standard deviation
0.86	0.69	1.41	0.75	0.93	1.13	1.44	0.98	1.08	Z
0.45	0.31	0.03	0.61	0.34	0.15	0.03	0.28	0.19	Sig
abnormal	abnormal	normal	abnormal	abnormal	abnormal	normal	abnormal	abnormal	condition of variables

As seen in tables 2 and 3, Kolmogorov-Smirnov test's findings show that:

- 1- Participation opportunities from components of sportsmanship commitment variable, inspirational and active exception from components of leadership style variable have normal distribution.
 - 2- Social limitation, commitment and joy from components of sportsmanship commitment variable, and attraction, moral effect, sectional attitude, personal consideration, conditional reward, inactive exception and unrestrained from components of leadership style variable have an abnormal distribution.
- For normal data parametric statistics and for abnormal data non-parametric statistics were used.

Table 4. Results of Friedman test, the difference between athletes' commitment

Average of grades	Significance level	Freedom degree	Kai square	Levels of athletes' commitment
2.54	0.000	3	75.597	commitment
2.51				joy
1.58				Social limitation
3.37				Participation opportunity

As observed in table (4), regarding significance level of [0/00], there are significant differences between athletes' commitment. In order to clarify the difference between components Wilcoxon T test was used and the following results were obtained.

Table 5. Wilcoxon T test results - difference between components of athletes' commitment

Participation opportunity	Social limitation	joy	commitment	statistic	Levels of athletes' commitment
-4.360	-4.950	-0.261	.....	Z	commitment
0.000	0.000	0.794	.....	Significance level	
-3.742	-4.308	.....	.....	Z	joy
0.000	0.000	.....	.....	Significance level	
-6.749	.....	.....	.....	Z	Social limitation
0.000	.....	.....	.....	Significance level	
.....	.....	.....	.....	Z	Participation opportunity
.....	.....	.....	.....	Significance level	

As seen in table (5) and with regard to correlation coefficients obtained for components of sportsmanship commitment, there is a significant relationship between components of:

- (Commitment with participation opportunities)
- (Joy with participation opportunities)

- (Social limits with participation opportunities)
- But there is no significant relationship between components of:
- (Commitment with joy and social limits)
 - (Joy with social limits)

Therefore, the relationship between participation opportunities components with other components of athletes' sportsmanship commitment has been approved.

Table 6. Friedman test results, difference between coaches' style of leadership.

Average of grades	Significance level	Freedom degree	Kai square	Styles of leadership
5.40				attraction
5.79				Moral effect
6.34				inspirational
5.06				Sectional attitude
5.66				Personal consideration
4.54	0.000	8	126.895	Conditional reward
5.87				Active exception
4.11				Inactive exception
2.24				unrestrained

As shown in table (6), considering the significance level of (0.000%), there is a significance difference between coaches' styles of leadership, therefore to show the difference between components Wilcoxon T was used and the following results were obtained:

Table 7. Wilcoxon test results, difference between different styles of coaches' leadership

unrestrained	Inactive exception	Active exception	Conditional reward	Personal consideration	Sectional attitude	inspirational	Moral effect	attraction	statistic	Significance level	Styles of leadership
-6.542	-4.267	-1.169	-2.428	-0.253	-1.058	-1.879	8.35	.....	Z		Attraction
0.000	0.000	0.242	0.015	0.800	0.290	0.060	0.404	.....	Significance level		Moral effect
-6.271	-4.051	-0.192	-3.475	-0.648	-2.175	-1.341	.....	.....	Z		inspirational
0.000	0.000	0.848	0.001	0.517	0.030	0.180	.....	.....	Significance level		Sectional attitude
-6.340	-4.438	-1.149	-4.273	-2.250	-3.218	.....	.....	.....	Z		Personal consideration
0.000	0.000	0.250	0.000	0.024	0.001	.....	.....	.....	Significance level		Conditional reward
-6.072	-3.064	-2.762	-1.358	-1.675	.....	.....	.....	.....	Z		Active exception
0.000	0.002	0.004	0.174	0.094	.....	.....	.....	.....	Significance level		Inactive exception
-6.108	-4.128	-1.220	-2.783	.....	.....	.....	.....	.....	Z		

0.000	0.000	0.223	0.005	.....	.....	.....	.....	.....	Significance level	unrestrained
-5.595	-2.391	-3.694	.....	.....	.....	.....	.....	.....	Z	attraction
0.000	0.017	0.000	.....	.....	.....	.....	.....	.....	Significance level	Moral effect
-6.295	-4.382	.....	.....	.....	.....	.....	.....	.....	Z	inspirational
0.000	0.000	.....	.....	.....	.....	.....	.....	.....	Significance level	Sectional attitude
-5.758	.....	.....	.....	.....	.....	.....	.....	.....	Z	Personal consideration
0.000	.....	.....	.....	.....	.....	.....	.....	.....	Significance level	Conditional reward
.....	.....	.....	.....	.....	.....	.....	.....	.....	Z	Active exception
.....	.....	.....	.....	.....	.....	.....	.....	.....	Significance level	inactive exception

- There are significant differences between attraction style and styles of conditional rewards, inactive exception and unrestrained, but there are no significant differences between attraction style and styles of Inspirational, sectional attitude, moral effect, personal consideration and active exception.
- There are significant differences between moral effect style and styles of sectional attitude, conditional rewards, inactive exception and unrestrained, but there are no significant differences between moral effect style and styles of attraction, Inspirational, personal consideration and active exception.
- There are significant differences between Inspirational style and styles of sectional attitude, personal consideration, conditional rewards, inactive exception and unrestrained, but there are no significant differences between inspirational style and active exception style.
- There are significant differences between sectional attitude style and styles of active exception, inactive exception and unrestrained, but there are no significant differences between sectional attitude style and personal consideration and conditional rewards style.
- There are significant differences between personal consideration style and styles of conditional rewards, inactive exception and unrestrained, but there are no significant differences between personal consideration style and active exception style.
- There are significant differences between conditional rewards style and styles of active exception, inactive exception and unrestrained.
- There are significant differences between active exception style and styles of inactive exception and unrestrained.
- There are significant differences between inactive exception style and unrestrained style.

Table 8. Pearson, Spearman test results; correlations between commitment and different leadership styles

Sportsmanship commitment	statistic	Style of leadership
0.0393	Pearson correlation coefficient	attraction
0.000	Significance level	
0.530	Pearson correlation coefficient	Moral effect
0.000	Significance level	

0.388	Spearman correlation coefficient	inspirational
0.001	Significance level	
0.307	Pearson correlation coefficient	Sectional attitude
0.007	Significance level	
0.257	Pearson correlation coefficient	Personal consideration
0.017	Significance level	
0.168	Pearson correlation coefficient	Conditional reward
0.151	Significance level	
0.304	Spearman correlation coefficient	Active exception
0.008	Significance level	
0.029	Pearson correlation coefficient	Inactive exception
0.803	Significance level	
-0.237	Pearson correlation coefficient	unrestrained
0.041	Significance level	
75		quantity

As shown in table (6), There are significant correlations between sportsmanship commitment with styles of attraction, moral effect, inspirational, sectional attitude, personal consideration, active exception and unrestrained, which rejects the assumption.

Discussion

Friedman test showed that there are significant differences between components of sportsmanship commitment, so in order to verify these differences T Willcoxon showed that there is a significant difference between commitment with participation opportunities and social limitations, there is no significant difference between commitment and joy. The differences between component of joy and participation opportunities and social limitations, and differences between participation opportunities and social limitations are significant. Component of joy, which is one of motivation components, plays effective role in creating commitment for athlete. Omand, also, came to conclusion that athletes' satisfaction from coach's strategies and decisions appears because of joy component of motivation. Studying of commitment as sportsmanship commitment in sports teams and athletes is in accordance with findings of researchers such as Fathi (1390), Andrew (2004) and Garcia (2010)

Considering Friedman test, there are significant differences between coaches' leadership styles; therefore to determine the differences between leadership styles, T Willcockson test was used. The results showed that there are no significant differences between styles of attraction and moral effect and other coaches' leadership styles so that increasing of using attraction and moral effect components by the coaches could cause an increase in using other components of coaches' leadership styles. This in turn could bring about more respect from athletes towards their coach, making them proud of him and making them to believe in his values, beliefs and ideas. Therefore it is necessary for the coaches to consider more effective components such as attraction and moral effect styles while choosing the style of leadership.

Sportsmanship commitment is a psychological concept which shows the interest and inclination towards sports and paves the way for continuing participation in sports. This concept shows the psychological condition of athletes for participation in sports and has motivating value for them. On the matter of relationship between sportsmanship commitment of athletes and coaches' leadership style, based on Spearman- Pierson's correlation coefficient, this research shows that there is a significant relationship between sportsmanship commitment of Karatek athletes and coaches' styles of leadership. Therefore it could be concluded that adoption of leadership style by a coach could increase or decrease the level of commitment among the Karate-k athletes. So coaches should pay more attention while choosing style of their leadership.

Findings of this research on relationship between styles of leadership and sportsmanship commitment on Karate-k athletes show that sportsmanship commitment has significant relationships with attraction, moral effect, inspirational, sectional attitude, personal consideration, active exception styles of leadership, while it has no significant relationships with conditional rewards and inactive exception styles. It also has a negative significant relationship with unrestrained style.

This shows that for increasing the athletes' commitment, a coach should adopt such styles as attraction, moral effect, inspirational, sectional attitude, personal consideration, active exception, while leaving aside styles of conditional reward and inactive exception. He should also know that using conditional rewards and inactive exception styles decrease sportsmanship commitment of athletes specially those who are active in Karate.

These findings confirm theoretical bases of the research. On this basis, some important duties of leaders include: creating commitment and motivation, developing an effective relationship with the athletes, creating coordination and increasing satisfaction of athletes. Recognition of factors that have effect on mental and physical

condition of athletes, could be determining for success of coaches in their teaching effort, especially among athletes at the national levels. Besides, athletes are the most important human source in sports and the real producers and consumers of it. Therefore it is necessary for coaches and sport managers to create a pleasant experience and an atmosphere of satisfaction for athletes to continue their activities. Successful coaches help athletes to gain new skills and to be well versed in their field, and also have satisfactory feelings in competing with others. Therefore it is suggested that coaches use appropriate methods for creating motives. In order to do so, it is recommended to senior managers of ministry of sport and youth and sports federations, in particular Karate federation, to organize courses on the matter of motivation explanation and ways for creating motive among team members so that coaches get familiar with theoretical basis of motivation and effective leadership by which they can lead their teams in a more adequate way.

Among components of commitment it should be noted that restrictions and necessities, imposed by coaches, team-mates, family members and other persons related to the athletes, have lead the athletes to feel committed for participating in sports events. Even though the pressures exerted upon athletes by the coach make them stick to their commitments, but imposing unnecessary pressure by coaches should be avoided. Researches show that athletes who feel self committed based on others' expectations and necessities have continued participating in sporting activities. If these expectations be non realistic and beyond the abilities of athlete it may make him leave the team and even the sport altogether. On the other hand to have a lower expectation than athletes' abilities could cause commitment evasion and negligence in him.

Considering these explanations, generally all individuals relating to athletes, and especially coaches, should have reasonable and attainable expectations from him, so it could affect his commitment favorably. If athletes feel no joy in sport activities, we cannot expect much commitment from them towards their teams and clubs. This should be noted that having an opportunity for participating in sporting events could result in athletes' sportsmanship commitment. Result showed that participation opportunities create more commitment in Iran super league Karate athletes. These results confirm Sousa's findings (2007) but not that of researchers such as Andrew (2004) and Scanlan (1993). If opportunities for participating in daily activities are provided in sports, athletes would feel committed in joining such activities.

Conflict of interests

The authors declare that there is no conflict of interests.

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