

FEATURES OF FUNCTIONAL SUPPORT OF COMPETITIVE ACTIVITY IN SPORTS DANCE GIVEN THE DIFFERENCES PREPARED BY PARTNERS

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Annotation. Purpose - to determine the specifics of the functionality of the dancers with the differences of partners. The study involved 24 dancers. They were 12 couples - men aged 22.8 ± 5 years and women aged 21.3 ± 4.2 years. We measured the performance VO_2 , pulmonary ventilation and lactate concentrations. The evaluation was conducted on the basis of the maximum levels of VO_2 , pulmonary ventilation, HR, and blood lactate concentrations. In the simulation of competitive activity in the majority of dancers reported high rates of reaction of the cardiorespiratory system, the aerobic and anaerobic energy supply. The rate of accumulation of acidemia shifts remained stable and high in all athletes. This leads to reduced efficiency and accumulation of fatigue. Differences dynamics of functional maintenance of the increase in the integrated assessment of preparedness in pairs. In most pairs of marked differences in their dynamics and consequently differences in the structure of reactive properties. It is shown that this affects the implementation of the existing operational capacity and efficiency of competitive activity in general.

Keywords: sports, dance, functional, preparedness.

Introduction

Present stage of modern dancing's development is characterized by high level of technical and masterly execution. In conditions of rising competitiveness achievement of high results by sportsmen-dancers requires constant consideration of continuously growing preparedness factors and, on this base, improvement of training methods [3, 6, 8, 10-13]. Among the most important problems, requiring urgent solution, there is a problem of improvement of sportsmen's motion abilities, their special functional preparedness [1, 2].

At the same time, it should be noted that in this kind of sports there are specific requirements to functional fitness, which are determined by different requirements to male and female partners as well as to interaction of dancing couple. It contributes to requirements to special functional dancers' preparedness, which shall facilitate formation of holistic bio-dynamic structure of sport actions, videlicet: execution of dancing figures, required for this increasing of organism's energetic potential and resulting from it potential of couple's special endurance [4, 5]. Thus, functional preparedness in system of dancers' training solves the task of intensification of special muscular functioning's mode, plays developing and maintaining role as well as facilitates organization of training process [14, 15].

At the same time, theory and practice of sport dance states a problem of difference between functional level of male and female partners, which limits special workability and reduces possibilities of integral fitness's realization in couples. Besides, speed and character of progressing of male and female partners' tiredness can significantly influence on effectiveness of couple's competition functioning [1, 5].

These questions have been studied obviously insufficiently. Informative criteria, which could permit to evaluate differences between partners' functional levels, have been being still unsolved.

There is a ground to think that consideration of differences between partners' functional fitness can give new opportunities for formation of special endurance criteria and, on this base, development of practical recommendations on individualization of training process.

Purpose, tasks of the work, material and methods

The purpose of the work was determination of dancers and dancing couples' functional fitness with their analysis in respect to indicators of effectiveness of dances' execution, considering possible differences between male and female partners. It can be a precondition for increasing of specialized character of physical and functional training.

The tested persons: 24 dancers took part in the research. They composed 12 couples: men – of 22.8 ± 5.0 years old age and women of 21.3 ± 4.2 years age. The mass and body length of men were accordingly 70.7 ± 5.8 kg, 179.8 ± 5.1 cm; and women - 51.5 ± 4.3 kg, 164.9 ± 3.8 cm. The group of sportsmen was homogeneous by sport qualification; all sportsmen were of national and international level. They were members of national sport dance combined team of Ukraine, winners of prestige international tournaments of category A. The period of participation in official tournaments of all tested sportsmen was 5.2-9.5 years. *лет.* The scope of monthly training work was 12.5 ± 1.1 hours per week.

Organization of the research. The research was carried out in competition period of training with voluntary written consent of sportsmen and endorsement of local committee of bio-ethic of scientific researches. All participants of experiment did not take any medicine, dopes or stimulants.

Tests' physical loads. Measurements were fulfilled in conditions of competition functioning's simulation at final and semi-final as per standard European program. All tests were preceded by standard warming up during 10 minutes. Between simulation of final and semi-final, sportsmen had 20 minutes' rest. In the period of standard (European) program's simulation we registered indicators of men's and women's functional fitness and got ground for

analysis of characteristics of couples' functional fitness. On this basis specific characteristics of male and female partners' functional fitness were determined.

Measurements and applied devices. Analysis of functional fitness' characteristics was carried out on the base of evaluation of aerobic and anaerobic energy supply indicators. VO_2 indicators, indicators of pulmonary ventilation and lactate concentration were measured. Evaluation was carried out on the base of maximal levels of VO_2 , pulmonary ventilation, HR (heart rate) and lactate concentration.

Indicators of cardio-respiratory system were registered during all period of testing. For this purpose we used complex for physiological estimation of sportsmen's functional fitness - Meta Max 3B (Cortex, Germany).

Lactate concentration in blood was determined with automatic bio-chemical analyzer – photometer LP 420 ("Dr LANGE", Germany) using standard set of reagents. The method is based on enzymatic determination of lactic acid concentration in blood. For its determination we took blood samples from finger (10 mcl) with the help of special micro-pipette. Blood was introduced in ready reagent; the content was mixed and put in device for determination of control sample's extinction at wave length of 520 nm. Then the plug of test-tube, in which there were reagents for enzymatic reaction, the content was mixed again and put in photometer's pit; after this in 2 minutes photometer's display showed value of lactate in blood in units: $m.mole.p.l^{-1}$ of blood.

Blood sampling was fulfilled 7 times. Period of blood sampling: 1st – in rest; 2nd – after third dance of semi-final; 3rd – after fifth dance of semi-final; 4th – at third minute of recreation after semi-final; 5th – after third dance of final; 6th – after fifth dance of final and 7th – at third minute of recreation after final.

Analysis of special preparedness. We ranged sportsmen on the base of integral evaluation of competition functioning's effectiveness during last year before our testing. Couples were ranged on the base of evaluation of their sportsmanship, in the process of competition's standard program's simulation in compliance with competition rules for sport dances. Evaluation was based on expert estimation of dance components in the process of fulfillment of five kinds of competition program. Evaluation was carried out as per principle: positive mark (+), negative mark (–). It was fulfilled by 15 experts. Three experts evaluated every component of dance. With it, it was appraised: 1. Rate and main rhythm ("music tint" – evaluation of music tint within execution of every time). 2. "Lines of body" (correct, elegant lines of couple, corresponding to character of stylized competitive dance). 3. Movements ("dynamic" – solid execution of figures, movements, corresponding to character of dance). 4. "Rhythmic interpretation" (clear expressiveness within every time, emotional responsiveness to music, artistry). 5. Work of foot – ("technique" – precise execution of figures).

Statistical analysis. Processing of experimental material was carried out with the help of statistical and graphical software MS Excel-7, Statistica-7.

We applied methods of descriptive analysis, which included table representation of separate variables and calculation of mean arithmetic – \bar{X} , of standard deviation – S. For checking up of selective data for compliance with normal law of distribution we used Wilky-Shapiro's criterion. For determination of statistical significance of differences between samples, distribution of which complied with normal law, we used Stjudent's criterion. For determination of statistical significance of differences between samples, distribution of which did not comply with normal law, we used non-parametrical criteria for small samples (Wilkinson's test). We admitted level of significance (i.e. probability of error) of $p=0,05$. Informative significance of tests and registered indicators were estimated in standard conditions of measurements.

Results of the research

Estimation of highly specific indicators of functional fitness in final and semi-final by indicators of aerobic and anaerobic energy supply showed significant strain of organisms of both male and female partners. In the process of simulation of dancers' competition functioning in final and semi-final we registered significant strain of organism. In some cases pulse reached 190-200 b.p.m. It is well-known that in this period full manifestation of aerobic and anaerobic functions takes place.

In table 1 we present indicators of aerobic and anaerobic energy supply, registered in semi-final and final.

Table 1.

Differences between characteristics of physical fitness of 12 couples (n=24)

Indicators		Semi-final			Final		
		\bar{X}	S	CV	\bar{X}	S	CV
HR, $beat \cdot min^{-1}$	male	190.4	7.9	4.1	193.6	7.0	3.6
	female	192.6	8.6	4.5	191.0	9.6	5.0
VO_2 , $ml \cdot kg^{-1} \cdot min^{-1}$	male	58.9	4.9	8.3	56.6	8.5	15.0
	female	50.0	7.3	14.6	46.4	8.0	17.2
V_E , $l \cdot min^{-1}$	male	128.2	18.6	14.5	126.5	16.1	12.7
	female	83.5*	12.7	15.2	81.8*	12.9	15.8
La, $mmol \cdot l^{-1}$	male	9.6	3.2	33.3	12.0	3.9	32.5
	female	9.7	1.3	13.4	11.7	1.2	10.3

* – differences are confident at $p<0,05$

From the table it can be seen that confident differences of male and female partners' fitness characteristics were registered by reaction of pulmonary ventilation and range of individual indicators of lactate concentration in blood. At the same time, it should be noted that there is a clear trend for cardio-respiratory system's responsiveness to remain high in semi-final and final by most of indicators both of male and female partners. Also it is interesting the fact that range of individual differences of partners is much higher by indicators of anaerobic energy supply's reaction.

Results of correlation analysis showed absence of confident connection of indicators of KPC power indicators, aerobic and anaerobic energy supply with indicators of competition functioning's effectiveness (sum of points for five dances in final). Indicators of $\dot{V}O_2$ max and \dot{V}_E max had statistical connection at level accordingly $r=0.09$ and 0.08 of men and $r=0.08$ and 0.09 of women. Indicators La max and HR max had trend to connection with effectiveness of competition functioning. Their indicators were at level accordingly $r=0.40$ and 0.38 of men and $r=0.41$ and 0.44 of women.

These data witness about difference in organism's response to increasing of acidosis shifts, accumulation of tiredness, and, as a result, workability of all sportsmen, male and female partners in the course of competition period.

Results of analysis permit to make conclusion that evaluation of functional fitness of male and female partners by maximal indicators of aerobic and anaerobic energy supply in semi-final and final require more specific analyzing of indicators. It obvious that indicators of functional capabilities shall be regarded considering the structure of dancers' competition functioning. The purpose of such analysis is evaluation of stability of aerobic energy supply with increasing acidosis shifts and determination of ways for their compensation in the course of work. For this purpose in the process of execution of five competition dances in semi-final and final we analyzed indicators of O_2 consumption, pulmonary ventilation and lactate concentration in blood in dynamics.

In fig. 1 we present changes in O_2 consumption in the process of execution of five competition dances in semi-final and final.

In the figure we can see that in the process of simulation of competition functioning, indicators of O_2 consumption of most of sportsmen reached the level of model of men's and women's functional fitness [7]. Statistically confident differences of O_2 consumption's indicators of men were registered between indicators of third and fifth dances of semi-final; as far as women concern they were registered between second and forth dances in final. All sportsmen had trend to reducing the level of indicators with execution of forth-fifth dances in the process of simulation of semi-final and final competition functioning. Also attracts attention rather significant range of individual differences in women O_2 consumption's indicators in semi-final; concerning men, this fact was noticed during execution of first-third dances in final.

In fig.2 we present schematic picture of levels and change of pulmonary ventilation during all period of competition functioning's simulation. It was determined that indicators of response power of most of sportsmen were rather low. Comparative analysis of respiratory reaction's indicators, in compliance with structure of competition functioning, did not show statistically confident differences in response power between male and female partners. Alongside with it, the analysis revealed significant range of individual differences between indicators, which preserved during all period of measurements for both categories of dancers. All these point at differences and, simultaneously, at specific character of dancers' respiratory response's realization in the process of competition functioning.

We also took in consideration the fact that activation level of pulmonary ventilation is and informative marker of optimization of organism's responsive abilities, which maintain high level of KPC response, including increasing of potential of metabolic acidosis's respiratory compensation under great physical loads. Alongside with it, the data of special literature point at possibility and necessity of estimation of special endurance's functional provision in certain kind of sports, considering specific character of KCP responsive properties' structure [9]. They manifest themselves with different correlation of power, stability and kinetics of reaction. This specific character clearly manifests itself in sport dances, where role of high level pulmonary ventilation differs from common criteria of its evaluation in most of kinds of sports. It is connected with the fact that aesthetic perception of work is a part of evaluation of dancers' sportsmanship. That is why, when evaluating responsiveness of pulmonary ventilation, not only possibility to achieve high levels of pulmonary response is meant, but rather maintaining of its stability, ability to quickly respond to increasing of acidosis shifts in organism.

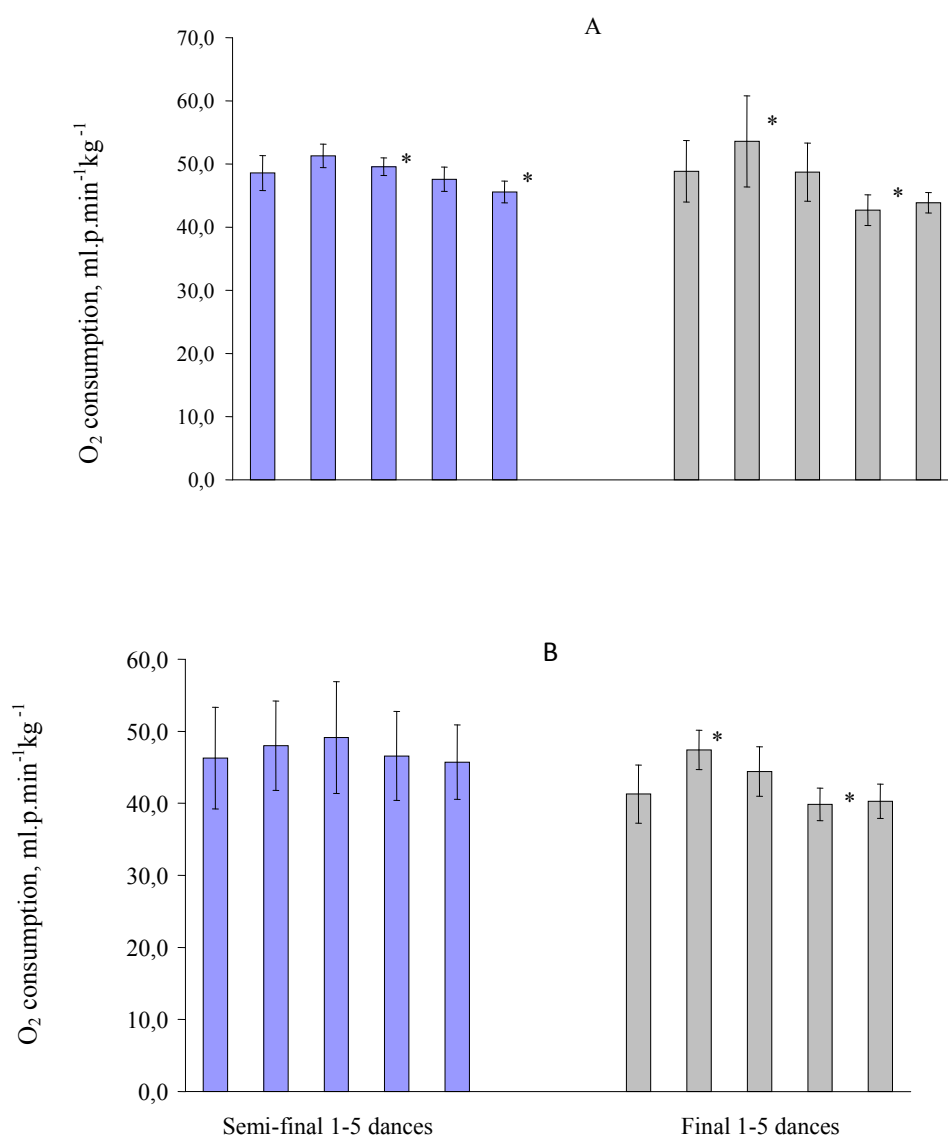


Fig.1. O₂ consumption in the process of simulation of competition functioning in semi final and final. (A) men and (B) – women

* – differences are statistically confident at p<0,05

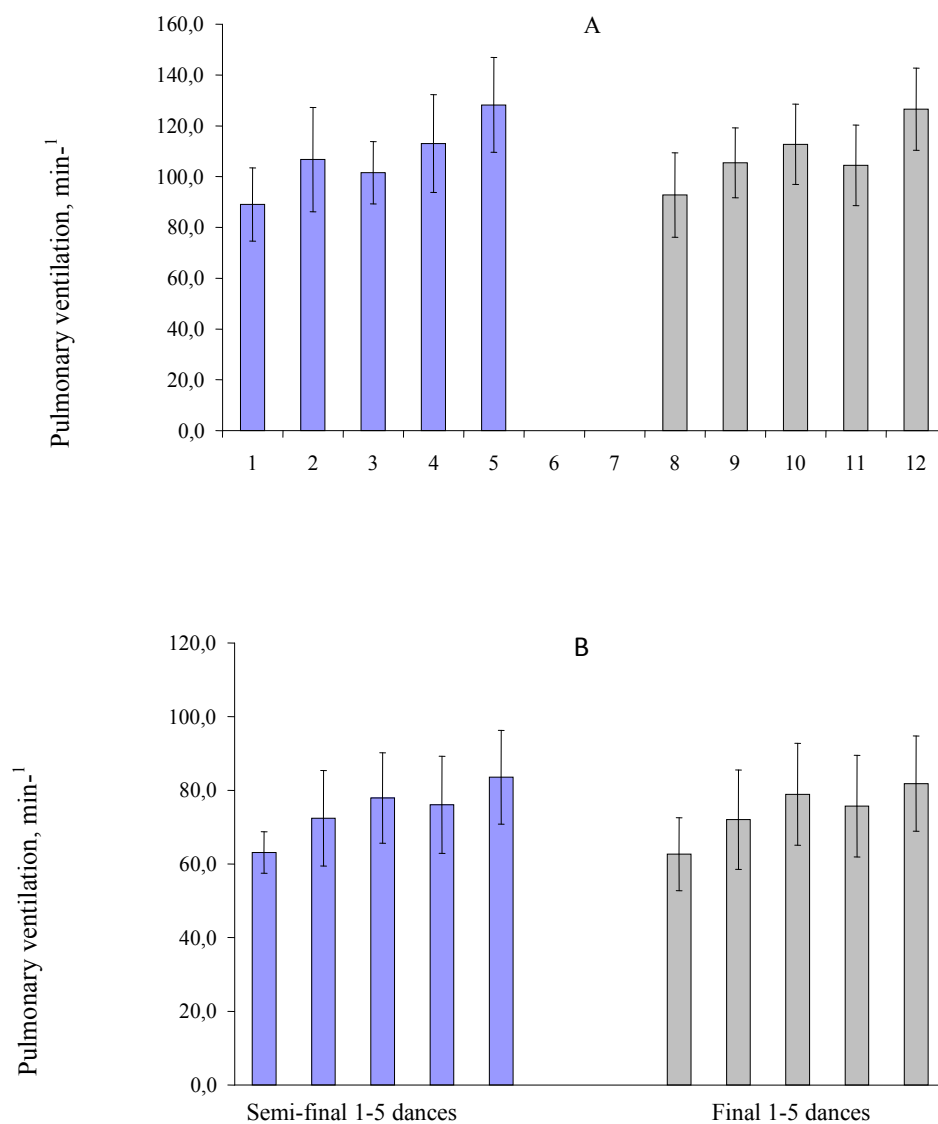


Fig.2. Changes of pulmonary ventilation in the process of competition functioning's simulation in semi-final and final; (A) men and (B) – women: - differences are not statistically confident.

Comparative analysis of respiratory response's indicators in compliance with structure of competition functioning showed no statistically confident differences of reaction's power; alongside with it, it showed significant range of individual differences of indicators, which preserved during all period of measurements, both for male and female partners.

The level of glycolitic energy supply of work and differences in indicators of blood lactate's concentration are shown schematically in fig.3. Analysis of glycolitic energy supply dynamics showed that levels of blood lactate concentration of all sportsmen were high during all period of work.

It is necessary to note high dynamic of blood lactate's accumulation in men's organisms, in which there was registered clear trend to reaching high metabolism's level already in the process of third dance of semi-final. After fulfillment of third dance of final, blood lactate concentration (by x_{cp}) increased confidently (up to more than $11 \text{ mmol} \cdot \text{l}^{-1}$) at the end of competition program. Concerning women, blood lactate concentration confidently increased after fifth dance of semi-final. We registered increasing of reaction's level (by x_{cp}) just after execution of the last dance of competition program.

Analysis of glycolitic energy supply of partners' work witnesses about high individual differences of indicators during all period of semi-final's second half, final and recreational period. Significant individual differences of lactate concentration of female partners were registered after third dance and on third minute of recreational period after simulation of final.

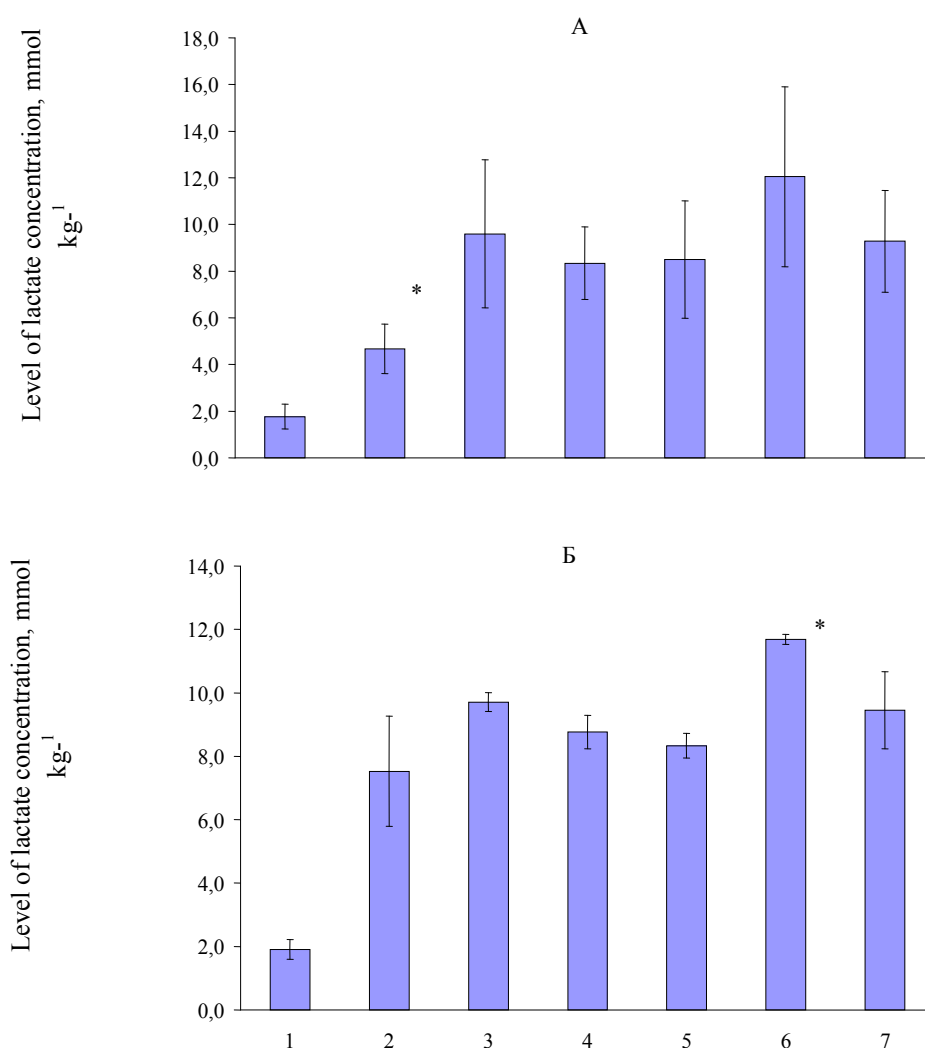


Fig 3. Change of lactate concentration in process of competition functioning's simulation in semi-final and final; (A) men and (B) – women

* - differences are statistically confident at $p < 0,05$;

1,2....7 – periods of blood sampling: 1 – in rest; 2 – after third dance of semi-final; 3 – after fifth dance of semi-final; 4 – on third minute of recreation after semi-final; 5 – after third dance of final; 6 – after fifth dance of final; 7 – on third minute of recreation after final.

The presented differences witness about high individuality of dynamic of anaerobic glycolytic energy supply's reaction and, as a result, about high individuality of metabolic acidosis increasing in sportsmen's organisms.

Distinctive feature of dancers' organisms with high levels of anaerobic metabolism (La more than $11 \text{ mmol}\cdot\text{l}^{-1}$), were reduced indicators of recreational reactions' speed in 20 minutes rest between two tours of dancing program. In this period five male dancers and seven female partners did not restore HR level up to $120 \text{ beat}\cdot\text{min}^{-1}$ during 5 minutes.

Analysis of dynamics of individual highly specialized indicators of functional fitness, considering structure of dancers' competition functioning showed that in the process of work most of sportsmen did not manifest high level of reactions' stability. Actually optimal dynamic of reactions was registered only in couple G. and G., in couple K. and D. and in female dancer M. Functional provision of these dancers' work was characterized by balanced and stable levels of anaerobic and aerobic energy supply. In the course of testing program the range of indicators of these dancer was registered at level: $\text{VO}_2 \text{ max} - 53.2\text{-}57.1 \text{ ml}\cdot\text{min}^{-1}\cdot\text{kg}^{-1}$, $\text{V}_E \text{ max} - 135.3\text{-}147.4 \text{ ml}\cdot\text{min}^{-1}$; $\text{la} - 6.1\text{-}8.3 \text{ m.mole.l}^{-1}$ –for men; $\text{VO}_2 \text{ max} - 46.1\text{-}52.3 \text{ ml}\cdot\text{min}^{-1}\cdot\text{kg}^{-1}$, $\text{V}_E \text{ max} - 105.7\text{-}117.3 \text{ ml}\cdot\text{min}^{-1}$; $\text{la} - 6.0\text{-}8.6 \text{ m.mole.l}^{-1}$ – for women. Increasing of power of glycolytic reactions was accompanied by adequate response of KPC, by increasing of pulmonary ventilation that witnessed about high responsiveness of respiratory compensation of increasing acidosis shifts. All these permitted to formulate preconditions for increasing of sportsmen's endurance and raising, on this base, effectiveness of competition functioning.

Discussion of the research's results

Strain of organism, which appears in the process of work, sets high requirements to dancers' functional fitness. It is witnessed by high indicators of functional fitness, showed by both men and women. At the same time analysis of specific characteristics of functional fitness showed differences in functional fitness of couples in the process of simulation of standard (European) program's semi-final and final for sport dances. They are connected with different levels of anaerobic and aerobic energy supply as well as different organism's responses to accumulation of acidosis shifts and tiredness. It is a certain problem, owing to the fact that the level of saving aerobic energy supply has wide range off individual differences in group of sportsmen, while level of anaerobic, lactate energy supply of all sportsmen was high and stable.

These data confirm results of interconnection of the highest functional fitness's indicators, registered in semi-final and final of men's and women's competition functioning with indicators of competition functioning's effectiveness. Interconnections of competition functioning's integral indicators (sum of positive marks for execution of elements of competition functioning's structure) and indicators of aerobic and anaerobic energy supply were statistically unconfident. All indicators of functional fitness had no confident connections with indicators of competition functioning's effectiveness.

Analysis of the obtained data permits to state that ability to single achievement of high level of energy supply of certain sportsmen does not result in stability of their work's functional provision and reduces possibility of high workability during all competition period. Solution of this problem becomes difficult owing to differences of highly specific characteristics of functional fitness in couple, first of all differences, connected with speed of tiredness's accumulation and possibility of its compensation by male and female partners in the process of competition functioning.

Orientation on power indicators of functional fitness, such as O_2 consumption, pulmonary ventilation, lactate concentration, analyzed without consideration of competition structure of dances, are significantly restricted. In spite of high values of men and women, actually their mark characterizes only sportsmen's potential. These indicators characterize those sides of organism's responsiveness, which reflect rather organism's preconditions to endurance in the process of heavy motion functioning. There are grounds to say that these principles relate to evaluation of integral fitness in couples, where male and female partners can have high potential level and with it confident differences in dynamics of aerobic and anaerobic energy supply in couple.

It significantly hinders using of existing system of functional fitness's evaluation, when forming orientation of training process in couples.

Results of the researches, presented in this work, point at possibility and necessity in upgrading of control system as function of control in sport dances. It can be based on evaluation of highly specific characteristics of functional fitness in couples in strict compliance with structure of competition functioning and requirements of integral fitness in a couple. It has become obvious that it is necessary to evaluate functional fitness, considering dynamic of indicators of work's functional provision and unification of highly specific characteristics of functional fitness in couple according to functional fitness of men and women.

The data of special literature point at possibilities of upgrading of functional fitness's evaluation in dances on the base of specifying of most important components of sportsmen's functional fitness [9]. Analysis of functional fitness in kinds of sports, which combine sport and art, showed that functional fitness's most important components are mobility and stability of responses' kinetic [7]. Their realization is effective with reaching of required, specific for the given kind of sports, power level and saving character of responses. As a rule, in different kinds of sport the structure of functional fitness differs by level of highly specific characteristics of functional fitness and specific weight of its components.

The presented data characterize need in optimization of power, saving character and stability of KPC responses' kinetic and in unification, on this base, of highly specific characteristics of functional fitness in couple. Realization of this approach, on the base of control of KPC response will permit not only to increase the level of aerobic energy supply of work, facilitate rational usage of anaerobic, glycolytic energy supply, but also to optimize the structure

of organism's responsive abilities, which would permit to increase organism's ability to quickly, adequately and completely respond to competition loads in sport dances.

On this basis there were formed preconditions for more detail analysis and working out of more precise criteria of functional fitness. Realization of this direction of researches could be possible in case of formation of normative (model) highly specific characteristics of functional fitness, registered in the process of competition functioning; in case of optimization of indicators' dynamics, considering variability of temp and rhythm of five competition dances' execution; with consideration of individual differences of partners' preparedness in couple. In these conditions rather important role is played by evaluation of functional fitness structure, with using of wider indicators spectrum, which reflect characteristics of kinetics, stability, saving level of functional provision of dancers' work.

Conclusions:

In the process of simulation of competition functioning's semi-final and final most of dancers showed high indicators of highly specific functional fitness's characteristics. They had the following maximal values: male partners - HR - 193 ± 7.0 beat·min⁻¹; VO₂ - 58.9 ± 4.9 ml·kg⁻¹·min⁻¹; V_E l·min⁻¹ - 128.2 ± 18.6 l·min⁻¹; La - 12.0 ± 3.9 mmol·l⁻¹. Female partners — HR - 192 ± 6.0 beat·min⁻¹; VO₂ - 50.0 ± 7.3 ml·kg⁻¹·min⁻¹; V_E l·min⁻¹ - 83.5 ± 12.7 l·min⁻¹; La - 11.7 ± 1.2 mmol·l⁻¹. These data pointed at high level of organism function's strain and, as a result, at high requirements to level of dancers' functional fitness. Alongside with it, the research has showed that determination of level of dancers' functional fitness only on the base of evaluation of responses' maximal level is insufficient.

It has been state that maximal highly specific characteristics of functional fitness have no confident interconnection with effectiveness indicators of dancers' competition functioning in standard competition program.

Alongside with it, level of highly specific characteristics of functional fitness, registered in the process of competition functioning's simulation, witnesses about differences between KPC responses and aerobic energy supply of work. We noticed a trend, with which responses' indicators reduce in the process of competitions. It happens against the background of steady growth of acidosis shifts in organism. Decreasing of KCP responsiveness, under influence of acidosis shifts accumulation in organism, witness about clear preconditions to increasing of tiredness. It results in reducing of special workability and differences of competition functioning effectiveness. The problem became still more difficult owing to repeated execution of competition program. Also the problem is that there are all grounds to speak about differences of functional fitness in couples and these differences increase with different speed of tiredness's accumulation.

In group of sportsmen optimal dynamics of functional provision of dancers' competition functioning was registered only in one couple. It is important to note that this couple is a repeated winner of international tournaments of "A" category. The presented in the work indicators of highly specific characteristics of functional fitness, which were registered in the process of simulation of competition's semi-final and final, had the following ranges of values: men - VO₂ max - 53.2 - 57.1 ml·min⁻¹·kg⁻¹, V_E max - 135.3 - 147.4 ml·min⁻¹; La - 6.1 - 8.3 m.mole.l⁻¹; women - VO₂ max - 46.1 - 52.3 ml·min⁻¹·kg⁻¹, V_E max - 105.7 - 117.3 ml·min⁻¹; La - 6.0 - 8.6 m.mole.l⁻¹. It is obvious that these indicators can serve as a kind of bench mark of dancers' physical fitness. The generalized characteristics require special analysis with consideration of wider indicators' spectrum, which would more specifically characterize dynamic of functional provision of work.

Thus, it can be stated that in sport dances realization of control as function of training process's managing can be upgraded on the base of consideration of competition functioning's structure and its interconnection with highly specific characteristics of functional fitness. The presence of functional provision's dynamic gives grounds not only for evaluation of preparedness but also for formation of individual orientation of functional training in a couple. At the same time results of our research prompt directions of evaluation process's improvement of functional fitness's highly specific characteristics in dances. They are connected with working out of more precise criteria of functional fitness, with consideration of KCP responses' dynamic characteristics as well as aerobic and anaerobic energy supply.

In the presented material we have given grounds for appropriate researches, in the base of which there are studying of different aspects of functional fitness, their systemizing and determination of specific generalized attributes, ensuring manifestation of special endurance, its evaluation and, on this base, possibility of training process's upgrading.

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