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Development of common principles for the evaluation of quality characteristics of motor activity in the fitness and sports aerobics aesthetic orientation

Abstract.. *Purpose:* *to develop and validate methods for quantifying qualitative indicators special physical preparedness of sportsmen in fitness-aerobics and sports aesthetic orientation.* ***Materials and Methods:*** *an analytical synthesis of these scientific and methodical literature, the use of the theory of similarity and dimensionality, biomechanical analysis of motor activity, processing of video.* ***Results:*** *based on the use of similarity theory presents the methods of quantitative evaluation of qualitative characteristics of motor activity in special physical training, which allow an assessment of motor talent of the athlete and to provide objective guidance to training in particular sport.* ***Conclusions:*** *the presented methods quantify the qualitative indicators of the special motor preparation allow us to estimate a measure of motor gifted individual and his susceptibility to training in particular sport.*
Keywords: *speed indicator, the relative intensity of physical load, efficiency of work, versatility of preparation, competitive reliability.*

Introduction. The successful organization of training of athletes can be made based on scientifically based system of control at all stages of their years of athletic excellence. It is particularly important the implementation of such control technical and special physical preparedness. Deficiency of methods to control various aspects of preparedness in fitness-aerobic and sports aesthetic orientation greatly complicates their development. This state of the matter under consideration was the basis for the development of a unified approach to the evaluation criteria of quality indicators of motor activity, regardless of the type of sports activity.

The connection of the research with scientific programs, plans, themes. Ongoing research is made in accordance with the plans of research work in the sphere of physical culture and sports-topic 2.6. "Theoretical and methodological bases of improvement of training process and competitive activity in the structure of long-term preparation of athletes" (number of state registration 0111U001168) Consolidated plan of scientific-research works in sphere of physical culture and sports 20011-2015, and topic 3.8 "Theoretical-methodological bases of construction of system of mass monitoring and evaluation of the level of development and physical preparedness of different groups of the population" (number of state registration 0111U000192).

Objective: Develop and validate methods quantitative estimation of quality indicators of special physical preparedness of athletes in fitness-aerobics and sports dance, cheerleading, acrobatic rock-n-roll aesthetic and artistic gymnastics.

Research objectives: 1. To develop quantitative methods to evaluate qualitative characteristics of motor activity and to determine the presence of equity in their implementation.

2. To develop a method for estimating the universality of the athlete and the measure of its severity in the development of the arsenal exercises in the special physical preparation. 3. To develop a method of individual control over the intensity of the performed load and permissible duration of its execution.

Material and research methods. Analytical review of scientific-methodical literature, methods of the theory of similarity and dimension, biomechanical analysis of video data of the considered motor activity.

The results of the research. For performing *motor activities of any nature, evaluation is carried out by duration and velocity of passing*. These two components are interdependent rigorous analytical dependence, which was described by I. Sechenov and has been repeatedly confirmed by many authors (Trofimets, Y., Platonov V.) and received rigorous theoretical justification in the works of G. Artemieva, V. Druz, Y. Pugach [1, 2, 6, 7, 10].

The analytical dependence of these relations represented *by the exponential curve*. The gist of it is that the increasing argument in the same number of times always correspond to the same increment function. When the argument is changed by the law of geometric progression, the function changes according to the law of arithmetical progression. In fact, this feature is fundamental in the organization of biological, social, and physical phenomena.

Established an analytical relationship between endurance and speed may significantly change the research methods process of fatigue, with the introduction of accounting for individual characteristics, the qualitative characteristics of its flow and determine the optimal loads for obtaining the maximum possible performance of the given intensity. Moreover, the installed pattern allows to recover the full structure of reaction the response to the action load which was got on a separate empirical data are not used in ongoing studies [8].

To build the observed dependence, it is necessary to have an estimation of maximum speed (MS) and special endurance (SE).

Maximum speed or maximum speed index (MS) in the characteristic dimensionless quantities is defined as follows, the absolute value of the *best run time of the job* (single element, complex elements, or separate phases of complex element) measured in seconds; either use the model characteristics of execution, which are the standard for comparison this job; either indicator of time of execution this task leader; it is necessary to divide on the best time of the examined individual, which is represented in the following formula:

$$M\% = \frac{\text{the absolute best time of the standart (s)}}{\text{the best time of the examined person (s)}} * 100\%$$

Similarly, define the *specific endurance (SE).* There are *two alternatives for its determination*, which are equivalent to the value of the assessment, but used for different purposes. The peculiarity of this ambiguity one of the same characteristic is the polysemy understanding of meaningful to one and zero, which may reflect and be used as the origin and limit of achievement of the compared values. It is evident from the following estimates (special endurance).

The first method consists of determining the average speed when executing the same task many times (the total duration of the series re-run the exercise is divided into the number of executions) and from this the average time subtracted the time of most rapid single exercise in this series.

The greater the "difference of speed" the worst-developed "special endurance".The limit value for the development of "special endurance" will be achieved when the difference is equal to zero, that is, when the result of comparing coincides with the value used standard of comparison, which acts as a "unit" of comparison.

The second method consists in the direct determination relations *the time for the best performing* (TBP) separately repeatable quests by the middle time of performing (TMR) for index single job. That is:

$$SE\% = \frac{TBP}{TMR} * 100\%$$

The sum of the two characteristics of the established "*maximum speed*" and "*special endurance*" allow to judge about the level of "*special preparedness*" (SP) athlete that can be represented as follows:

$$SP\% = MS + SE\%$$

$$SP\% = \frac{the\ absolute\ best\ time\ of\ the\ standard\ (s)}{the\ best\ time\ of\ the\ examined\ individual\ (s)} * 100\% + \frac{time\ best\ run}{the\ average\ time\ of\ execution} * 0{,}5$$

The factor of 0.5 is entered in order to value of special training was expressed in proportional magnitudesof its presentation with other indicators and does not exceed the value of 100 % or unit.

There is a close relation between the described evaluation criteria of the special endurance and training and an indicator of cost-effectiveness during the performance.

The most characteristic indicator of the expression strain intensity is heart rate (HR) during its execution. For this purpose it is necessary to estimate the changes that occurred in the cardiovascular system. In particular, the most available indicator, which is convenient to use is HR.

Relative intensity of physical activity by heart rate (Ihr) can be determined by the formula:

$$Ihr = \frac{HRload - HRresting}{HRmax - HRresting} * 100\%$$

where HR resting determined in the morning after sleep, in the supine position, the maximum heart rate is determined by a step test on a bicycle ergometer (treadmill) with work to failure, HR load immediately after the competition or control performance. These characteristics can be obtained due to the method of Rothenberg without determination HR is in the morning after sleep and burden on the treadmill [4, 9].

In this case, the *efficiency of spending energy (E)* to the performance is also expressed by the ratio of the competition result, (CR) to load intensity (Ihr):

$$E = \frac{CR}{Ihr}$$

As higher indicator (E), as higher the efficiency of the examined athlete. The indicator of the economy determines tension of the work at the competition. It has a high correlation with the amount of lactate in the blood during competitive activity (p = 0,835).

Comparing the efficiency (E) obtained by executing the same program in different periods of training can be evaluated, how the process of adaptation of athletes is going in the mastering of program performance. The indicator of efficiency allows estimating at what voltage was received success in competitions.

As higher efficiency in the implementation of specific work, as steadier and more confident the athlete in competition. The indicator of economy allows you to more purposeful control of the training process.

An important indicator in the preparation of an athlete is such a characteristic as a *reliability of competitive activity (Rca).* Its indicator is determined from the ratio of two quantities of the special preparedness, one of which is the assessment of the special preparedness, which has manifested in the competitions (SPc), and the second rating of the special preparedness on the training sessions (SPt) that can be written as:

$$CR = \frac{SPc}{SPt}$$

The reasonableness of the method of assessing the reliability of competitive activity of the athlete is based on the basic provisions of the reliability theory commonly which widely used in engineering psychology [5].

The definition of the reliability measure of competitive activity allows you to evaluate the results of performances in the competition with the results of the indicators at the control training sessions, which indicates that the reduction result obtained in conditions of competitive activity regarding the result of the last benchmarks in training. The magnitude of the reduction is regarded as a measure of the reliability of the athlete. Evaluation of reliability of competitive activity is the only measure of the influence of *special conditions* on the efficiency of performances of the sportsman. Comparing the results of performances at competitions of a various level it is possible to assess the influence of *the factor value and responsibility* for reliability of performance.

As closer the value of factor of safety to unity, as reliable competitive activities of the athlete. Based on the accumulation of data indicator reliability can be set average indicator. At calculation of this criterion of evaluation, it is important to considering the importance of the competition, determining the average weighted value of the specified ratio, allowing installation of a ranked relationship between the magnitude of the significance of the special conditions and reliability.

An important criterion for assessing the qualitative characteristics of the special physical preparedness of an athlete is an indicator of his *universality(U)*. In this case, it is not about the absolute value of the index universal manifestation of special physical preparedness, but about equally possible to different directions manifestation abilities athlete

In each sport the versatility of the special physical preparation can have a wide variety in their content of physical activity, but a comparison of components in terms of the level manifestation of their special training will be close to unity. This follows from the method of its determination:

$$U = \frac{SPa}{SPb}$$

where SPa - special preparation in the manifestation of execution of the component (a) in the special preparedness;

SPb - special preparedness in the manifestation of execution of the component (b) in the special physical preparedness of the athlete.

The absolute value of manifestation equally possible of multidirectional abilities can be quite different and be in a some of range their equally important to manifestation from the minimum to the maximum possible manifestations.

Versatility of the special physical preparedness is an indicator of qualitative characteristics of the ratio of the share value integral components in achieving the end result, but not a reflection of the outcome. The absolute value of the final result is determined by innate abilities (genius) that determine measure of their manifestation, which determines the level of physical talent.

Described the characteristics indicators of evaluation of special physical preparedness enables to make the individual passport of the quality structure of its construction, but the absolute values reflect the level of its manifestation.

When in transformation relationship of the absolute values as the standard of comparison is taken permanently fitted standard, comparable individual indicators may reflect not only the qualitative structure of individual special preparation, but it differs from the used standard. In this case it is necessary to use a special feature of *the semantic* space with the introduction in their common measures to comparisons of the manifestation of the used signs

The foregoing provisions characterize the object of study and compliance environment, which defines the requirements of what, is necessary for possible the mutual organization with her. This dictates the need to description level of difficulty interaction that determines access stay in it depending on individual special physical preparedness of the athlete.

Therefore, the environment should be characterized by the duration of irritating factors, their quantity and variety of following in order or time, the power, speed and orientation of their changes relative to some standard of their condition and their deviations. The access of the development of environment is completely determined by the ratio of motor skills and measures their development, what is the main goal of the research.

Conclusions. Representation of qualitative characteristics of physical preparedness of athletes can be carried out only when translating them into a system of relative values, which requires the use of a parametric semantic space introduced in measures of quality indicators in fractions of sigma (σ) deviations that is determined using a normal distribution in the density estimation of the studied parameters.

The introduction of a unified standard of comparison equity ratio qualitative indicators of motor activity, regardless of their number, which is used in the structure of the standard, to evaluate this indicator of physical preparedness as universality These sets not only equal in severity the diversity of the appearance of the indicator of the versatility, but the strength of her manifestation, that characterizes the motor talent of the athlete.

The use of the technique Rotenberg and developed Y. Pugach based methods for determining the true universal of the boundaries of the minimum and maximum heart rate could on the based current heart rate to monitor the intensity of physical exercise and possible duration of its execution.

The prospects for further research. Methods qualitative assessment the nature of motor activity, considered in respect of the athlete can fully be applicable to the environment in which it occurs and the objects or projectiles that are used by the athlete. Overall, this is a system of relations "human, object of management, the environment action" what the future direction of the research is.

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