



Theoretical foundations of classification of adaptive sport disciplines by physical load intensity

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Abstract

Objective of the study was to classify sports disciplines of adaptive sports according to the level of intensity of competitive loads.

Methods and structure of the study. To achieve this goal, an analysis was made of modern scientific publications and dissertations devoted to the study of improving the performance of Olympians and Paralympians, their reactions to competitive loads. An attempt was made to define universal criteria and approaches to classification. The search depth was 10 years.

Results and conclusions. Taking into account the variability of the content of competitive activity, approaches and methods for determining intensity zones, types of disorders in athletes, in the sport of persons with lesions of the musculoskeletal system (LMS), the classification of disciplines of adaptive sports was carried out taking into account the pulse zones during the competition, lactate indicators after the competition, and comparison of the time of performance of competitive activity with the power of muscular work.

The authors note that due to the lack of empirical data on the physiological and biochemical reactions of the body of Paralympic athletes, some positions of the classification were determined by extrapolation, and, therefore, can be revised as new data become available.

Keywords: *adaptive sport, intensity of physical activity.*

Introduction. The problem of developing a universal criterion for assessing and measuring the intensity of competitive loads of athletes with disabilities remains relevant and requires further study.

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Methods and structure of the study. To achieve this goal, modern scientific publications and dissertations devoted to the study of improving the performance of Olympians and Paralympians, their reactions to competitive loads were analyzed. An attempt was made to define universal criteria and approaches to classification. The search depth was 10 years.

In 2021-2022 faculty of the Institute of Adaptive Physical Culture Lesgaft National State University, St.

Petersburg, carried out research work "Development of evidence-based proposals for improving the processes of physical training, education, upbringing and socialization of persons with disabilities, including the disabled, by means and methods of adaptive motor recreation and adaptive sports" (based on the order Ministry of Sports of Russia No. 955 of December 22, 2020). The research plan assumed the classification of disciplines of adaptive sports, including the intensity of physical activity. In the course of the work, the most universal approaches to determining the intensity of loads were concretized and characterized.

Results of the study and their discussion. A *common approach* is based on determining the predominant mechanism for energy supply of muscle work and the volume of oxygen consumption by tis-



sues. In accordance with it, three mechanisms of energy supply are distinguished: aerobic, anaerobic and anaerobic-aerobic. The intensity of the load is determined by the duration of physical work and the mechanism of its energy supply [1].

Common approaches include determining the intensity of physical activity by indicators of lactate in the blood, as well as indicators of heart rate (HR) during exercise. These indicators, in relation to the duration of the work performed, make it possible to plan loads in a certain intensity zone, the calculation of which is made from the athlete's anaerobic support threshold (ANOT), which makes it possible to individualize these zones for those involved in different levels of preparedness.

However, this approach should be applied in cyclic sports disciplines. For acyclic, game sports disciplines, martial arts, its relevance is lower, since various mechanisms of energy supply are involved in the energy supply of the competitive activity of an athlete, and the volume, duration and power of work depend on many variable factors.

For various types of martial arts, a mixed mode of operation is characteristic: during a fight, depending on the situation, an aerobic or anaerobic oxidation mechanism may prevail. The high intensity of the competitive fight is provided mainly by the anaerobic mechanism of oxidation. Also in these disciplines there is a high variability in the time of performing competitive actions: on average, a fight lasts about 3-4 minutes, which is provided by glycolytic oxidation and corresponds to high power work. At the same time, actions with the maximum power of muscular work (a series of strikes, throws or their combinations) can be performed during the specified period. In this regard, heart rate indicators are also used to plan the intensity of the load in martial arts.

In gaming sports disciplines, there are also developed ranges of physical activity intensity, but they are not universal, since the volume and power of work performed by a particular player during a competition depend on his role, tactical settings and game situation.

A *specific approach* to determining the intensity of loads is used in power disciplines, where its main criterion is the power of work. The power of muscular work is determined by the product of the mass of the lifted load by the number of repetitions and the distance over which the load moves. This approach to determining the intensity is used in planning the train-

ing loads of powerlifters, however, its individualization does not allow it to be used as a universal method for classifying.

In the course of the analysis of more than 160 scientific and methodological publications, we have not identified studies that systematize and generalize the indicators of the heart rate of Paralympic athletes for physical activity of different power and intensity. However, the analysis made it possible to identify relevant and *individualized approaches* to determining physical stress intensity zones - determining individual pulse training zones, the Joe Friel method - determining intensity zones as a percentage of the ANOT, Peter Jansen's method - determining intensity zones as a percentage of an athlete's maximum heart rate, Marti Karvonen's method - determination of intensity zones from the heart rate reserve, the method of Allen and Kogan, according to which training zones are calculated from the functional power threshold [3].

The described approaches and methods make it possible to plan training loads, but do not provide indicators that can be used as a universal classification criterion for intensity, since they are calculated individually, and the physiological characteristics of Paralympic athletes have a high variability.

Biochemical parameters of blood can serve as objective indicators for determining intensity zones in the disciplines of adaptive sports, however, modern research is mainly aimed at studying the correspondence of biochemical changes resulting from physical exertion to the level of an athlete's physical fitness and assessing his adaptive capabilities to physical activity.

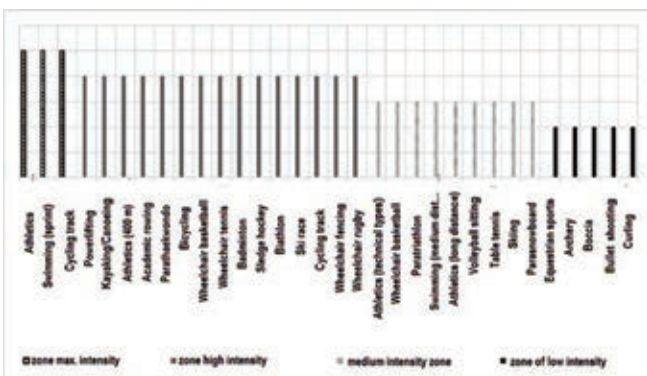
N.B. Novikov and N.B. Kotelevskaya, in her study on the assessment of the biochemical indicators of fitness of Paralympic skiers, compared intensity zones by the type of energy supply mechanism with lactate indicators and individual heart rate indicators of an athlete as a percentage of the maximum heart rate [2].

Using this approach to analyze the data obtained in the study by N.D. Goldberg and N.B. Kotelevskaya [1], we determined that sports disciplines: middle-distance running, swimming 400 m, cross-country skiing 1200, 5000, 1000 m can be attributed to work performed in the submaximal power zone of the corresponding anaerobic-glycolytic intensity zone. Disciplines such as 50m swimming, sprinting, belong to the maximum power zone and the anaerobic-alactic intensity zone, respectively.

However, in the sport of persons with lesions of the musculoskeletal system (LMS), the problem of tak-

ing into account the sports-functional class arises. Athletes classified in different classes according to the type of disorders, overcoming the same distance, spend different time on this and develop different power of muscle work, which significantly affects the mechanisms of energy supply and the amount of lactate in the blood. This approach is also unreliable in determining the intensity of competitive loads for situational disciplines, since the teams include athletes with different levels of functionality and performing tactical tasks of different volume and intensity.

The classification of disciplines of adaptive sports, taking into account the pulse zones during the competition, lactate indicators after the competition, and comparing the time of performing competitive activity with the power of muscle work made it possible to classify the Paralympic disciplines of sports for people with LMS, taking into account these indicators (see figure).



Classification of the Paralympic disciplines of sports for persons with LSM by zones of intensity of physical activity

Conclusions. In view of the variability of the content of competitive activity, approaches and methods for determining intensity zones, types of impairments

in athletes, in the sport of persons with PHD, it is advisable to classify the disciplines of adaptive sports, taking into account: pulse zones during the competition, lactate indicators after the competition, and comparing the time for performing competitive activity with muscle power.

However, due to the lack of empirical data on the physiological and biochemical reactions of the body of Paralympic athletes, some positions of the classification were determined by extrapolation, and therefore may be revised as new data become available.

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