Value of Testing Loads in Determining the Functional State of the Athletes Body

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Abstract—The Use of testing loads to determine the functional state and identify the functional capabilities of athletes body is necessary in order to improve the quality of the training process and achieve high sports results. For this purpose it is necessary to choose appropriate testing loadings which will have scientific and practical value, both at survey of athletes, and for modification and additions in training occupations. When determining the functional state of the athlete's body, it is advisable to focus on testing loads of a dynamic nature. In this case, the individual characteristics of athletes associated with adaptive relationships between the components of the cardiorespiratory system are revealed. They are manifested in a variety of response options, depending on age characteristics, sports and physical activity capacity.

Keywords—testing physical activity; work capacity; Bicycle Ergometer; functional state.

I. INTRODUCTION

P. K. Anokhin (1980) proposed to consider human activity from the standpoint of physiology and psychology within a single functional architecture, focusing on the functional system as a "closed physiological formation with continuous feedback on the success of such adaptive action" (1). In his opinion, the functional state is a complex systemic reaction, dynamically changing in the process of activity and resulting from the interaction of functional systems of the human body. Therefore, the functional state must be considered as a result of the organism dynamic interaction with the external environment, reflecting the state of the "organized whole". Currently, the functional state is a functional background or factor that largely determines human behavior, its capabilities (including labor and related to exercise) and reflecting the features of regulatory processes in the norm and pathology (6). In this case, the background activity in which the activity is carried out is considered.

II. LITERATURE REVIEW

Application of various testing loadings modeling different sides of the environment is one of the principles laid down at the beginning of the last century by I. p. Pavlov (1999) (5). With their help, information can be obtained on the objective characteristics of the organism functional state (4). Such a test can be a change of the body position in space. This is a natural, not associated with the use of any additional effort functional test and is a model of everyday human loads, as well as the result of vegetative regulation. In this regard, to obtain a reliable assessment of the cardiovascular system adaptive capabilities, as part of the cardiorespiratory system, various tests with changes in body position are used. In addition, in medical and biological studies, motor actions with high diagnostic value have become widespread (8), (11). In this case, veloergometry is generally accepted and preferred, due to which it is possible to obtain physiological information during the work itself (3). The aim of the study was to identify testing loads of different physiological orientation and power to determine the of the athletes organism functional state.

III. RESEARCH METHODOLOGY

With an active change of body position, a group of male athletes aged 22-26 years, in the number of 20 people, was examined. They had an average body length of 175.45 cm and weight-73.90 kg. All subjects had orthostatic stability and they had the first minute of lying, sitting and standing by tetrapolar thoracic rheography by W. G. Kubicek et al. (1966), recorded differential rheogram and electrocardiogram to determine the shock and minute blood volume, as well as heart rate (10).
When working on the Bicycle Ergometer gradually increasing power to 200 watts, male athletes aged 18 to 53 years, 108 people engaged in various sports and having sports qualifications from master of sports to 2 categories took part. In addition, a group of male athletes of (12 people) aged 19-44 years, with high total body size was examined.

In biomedical research, the following testing loads were used. Natural, not associated with the use of any additional effort, an active change in the position of the body in space (active orthostasis). It is the result of autonomic regulation and work on the bike Ergometer gradually increasing power with an accurate dosage of physical activity, through which it is possible to obtain physiological information during the motor activity. All these testing loads are widely used in the examination of athletes in the study of adaptation physiological mechanisms and in order to make changes in the training process for athletes to achieve high sports results in their chosen sport (2), (3)

IV. RESULTS

The simplest and most accessible testing load is an active change in body position or an active orthostatic test used to detect shifts in the cardiovascular system and to monitor the recovery processes in the athlete’s body. To clarify the shifts in the initial period of active changes in body position, we used an orthostatic test, as a result of this function: chronotropic and inotropic mechanisms to provide the body with oxygen during motor activity. All these testing loads are used in the examination of athletes in the study of adaptation physiological mechanisms and in order to make changes in the training process for athletes to achieve high sports results in their chosen sport (2), (3)

TABLE I. INDICATORS OF HEART ACTIVITY IN THE GROUP OF ATHLETES IN THE INITIAL PERIOD OF ACTIVE CHANGE OF BODY POSITION

| Indicators | Position of the subject | Lying down | Sitting | Standing |
|------------|------------------------|------------|--------|----------|
|            | 0-10 c | 50-60 c | 0-10 c | 50-60 c |
| SVB, ml    | 109.84* | 93.93* | 91.77 | 91.43O | 77.37T |
| Heart rate, beats/min | 3.34 | 3.65 | 3.88 | 3.17 | 3.04 |
| MV, l/min  | 67.84* | 86.97* | 74.74X | 87.80X | 85.85 |
| MOD, l     | 2.04 | 2.45 | 2.63 | 2.18 | 2.82 |
| MVB, l/min | 7.39* | 8.30** | 6.81X | 8.13XO | 6.16O |
| MOD, l     | 0.47 | 0.39 | 0.33 | 0.46 | 0.32 |

Note: * - statistical reliability of differences between the same indicators, at different body positions and time intervals.

TABLE II. TYPES OF REACTION OF CARDIORESPIRATORY SYSTEM IN GROUPS OF ATHLETES AT VELOERGOMETRIC LOADING WITH POWER IN 200 W.

| Reaction type | Performance |
|---------------|-------------|
| Heart rate, beats/min | WALK, ml | MOD, l |
| Inotropic | 141.83 ±1.55 | 147.53 ±2.18 | 58.51 ±1.16 |
| Chronotropic | 169.34 ±0.83 | 103.96 ±2.59 | 63.04 ±0.76 |
| Respiratory | 149.42 ±2.49 | 112.11 ±4.96 | 78.71 ±2.70 |
| Chronotropic-respiratory | 173.62 ±2.99 | 111.88 ±5.29 | 84.35 ±2.44 |
| Inotropic SVB-MVB | 146.74 ±1.87 | 144.75 ±3.64 | 86.83 ±3.07 |
| MOD, l | 86.24% | 88.70% |

The study showed that the active change in body position, which we refer to minimal physical exertion, a set of cardiorespiratory system indicators takes part in the compensatory-adaptive reactions of athletes and among them it is impossible to allocate a leading factor in the adaptation of the organism. Therefore, the value of the proposed physical activity is leveled by the results of the research, indicating the low importance of this load.

Use of the last two loadings for identification of features in activity of athletes organism acquires important
scientific and practical value, as the additional factor of athletes functional condition control and modification of a mode of training occupations.

TABLE III. TYPES OF REACTION OF CARDIORESPIRATORY SYSTEM IN GROUPS OF ATHLETES AT VELOERGOMETRIC LOADING WITH A POWER OF 3 W / KG

| Type of reaction          | Performance |             |             |             |
|---------------------------|-------------|-------------|-------------|-------------|
|                           | Heart rate, beats/min | WALK, ml | MOD, 1     |
| Inotropic                 | ±4.15       | 135.29     | ±3.93      | ±2.06       |
| Respiratory               | ±5.61       | 119.55     | ±3.27      | ±3.17       |
| Chronotropic-respiratory  | ±2.10       | 107.67     | ±3.88      | ±9.03       |
| Heart rate                | KV = 2.75%  | 84.60      | KV =       | 8.95 %      |
| Chronotropic-inotropic    | ±1.39       | 149.70     | ±5.02      | ±2.48       |
| Heart rate                | KV = 1.69%  | 95.76      | KV =       | 5.81 %      |
| SVB                       | KV = 7.51%  | 84.60      | KV =       | 5.81 %      |
| MVB                       | KV =        | 5.81 %     |            |             |

V. CONCLUSIONS

When determining the functional state of the athlete's body, it is advisable to focus on testing loads of a dynamic nature. In this case, their individual characteristics associated with adaptive relationships between the components of the cardiorespiratory system are revealed, manifested in a variety of response options that depend on age characteristics, sports and the power of physical activity used. Therefore, the identification of testing loads value for their subsequent use will contribute to the correct construction of the training process.

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