

## Determination Secure Loads in A Power Fitness

Chernomorsk state university by P. Mogila, Nikolayev

The article is devoted to the problem of determining the value of physical activity (% of max), for a different level of physical capability contingent, which will have a positive impact on the efficiency of the training process without showing the pathophysiological changes in the body.

20 untrained young men in ages of 19 – 20 years were examined. The structure of the control test and laboratory studies of blood samples is similar in content to the one used for the solution of the first phase of the experiment.

LDH concentration in the serum was determined by the kinetic method on the equipment "HIGHTECHNOLOGYINC" (USA). The level LDH registered of young in the condition of rest before and after the training session.

In the results of research it was set that our proposed exercise regimes, in which the weight ratio of the working complication is 70-80% of the one-time maximum force efforts, are optimal for the experienced athletes and for untrained persons. Determined that optimal exercises do not influence on the level of lactate dehydrogenase (LDH) in the blood serum of untrained young men, and at the same time it promotes the statistically significant decrease in the enzyme in athletes. It is exposed that temperate physical loads practically don't influence the level of LDH's content in blood serum of untrained young people, and at the same time it promotes valid decrease of given enzyme, which allows assumption about the presence of compensatory mechanisms and change of their activity depending on the level of training of the contingent under study.

**Keywords:** physical activities, adaptation, safety requirements, activity of lactate dehydrogenase.

**Introduction.** Modern athleticism is one of the most optimal for youth kinds of sport activities, attracting such positive qualities as strength development, the formation and correction of shape through the formation of strong muscular "corset" of back, with the overcoming of physical inactivity. Especially popular athletic activities acquired in recent decades, becoming a kind of fashionable and acceptable in society activity, significantly surpassing the previously popular controversial (martial arts) and game kinds of sports activities (volleyball, basketball, soccer) [4, 5, 6, 12].

Naturally that during the athletic activities with the improving orientation, we have to work with a wide variety, but mostly poorly prepared physically contingent, that is a real threat to the inadequacy of physical activity

to functionality of the organism, with subsequent development of the state of overtraining and disruption to the systems and organs. In connection with these highly relevant problems there are problems of the adequacy of physical activity and the development of specific training schemes that are very different from those which used in professional power kinds of sport. In this, the particular problem highlights the issues objectively, differentiated assessment of the impact of the level of the physical exercise on the body, sophisticated of the specific athletic exercises, as well as the operational control of the body in the course of their performance [2, 3, 11]. Regarding the latter, there are some generally accepted methods of indirect control, but they do not differ clarity and reliability in the operational assessment of the body. More successful in this respect are the direct indicators of the condition of the key systems supporting of the body functioning in a state of physical activity. Among the most informative and reliable diagnostic indicators of functional systems are indicators of content and activity of key enzymes. They clearly demonstrate a clinically even "hidden" primary tendencies and biochemical changes. One of these enzymes is a lactate dehydrogenase (LDH), functionally catalyzing reversible reduction of pyruvic acid to lactic acid in the process of glycolysis. This process is under physical stress naturally is most intense in the myocardium, skeletal muscle, kidney and liver damage, initiating a marked increase in enzyme levels. In the case of over-training the body or in the exhaustion of its compensatory abilities under stress develop the secondary processes of the pathological order, accompanied by a marked increase in lactate dehydrogenase (LDH), which signalizes about the unacceptability of such regimes [1, 9, 10, 13-16].

The limiting factor in the widespread use of this test in the sport, as a method of operational control of the body state is the need for drawing blood from the veins and difficult process of the quantitative determination of the enzyme. But, in the absence of alternatives regarding of reliable tests for operational control during athletic training with poorly prepared contingent the application of LDH-test on small (20-30 people) control groups is justified.

No less important and problematic during the usage of LDH test in training activities is the lack of sufficient information about the patterns change in the content of LDH in the blood, especially the untrained troops in response to the physical activity of different quantity. Therefore, the aim of this article is determination, based

on the operational control of the content of LDH in the blood, optimal quantities of physical activity in athletics for athletes and untrained young men. To achieving this aim we need to solve the number of **tasks**:

working out the methodological principles of quantification of physical activity in athleticism;

determine the effect used by athletes and untrained individuals in the experimental conditions, the values of physical activity (% of max) at the level of LDH in the blood to and after muscle activity.

**Methods.** The basic material having been used for analytical generalizations of this work were the results of their experimental, testing and control testing, hold in 2011-2012 years. There were also used large amounts of necessary issues, which enabled to hold comparative analytical generalizations having gotten during the research facts. Moreover, as research materials were used the results of various tests carried out in 2008-2010 years on a group of athletes with a different level of physical capability who went in for athleticism.

For solving these tasks, it was developed and tested a special scheme of organization of researches which helps to get direct results with a sufficient level of confidence at all it levels (**Fig. 1**).

General scheme of the organization of researches provided work with athletes (19-20 years old) who regularly engaged in athleticism for three years and also with untrained young men of the same age who are in good physical shape. All the participants who took part in the study were instructed about the aims of experiment, be warned about the voluntary participation and confirmed their agreement in writing form. After that they went through a complete physical examination and laboratory testing complex (9 indicators), according the results of which were admitted only those who had no medical contraindications to participation in the experiment.

In the first phase of research organizations, it was created a research group in the number of twenty people which consisted of trained young men (athletes with three years of regular employment athleticism) for determination the value of optimal physical activity in athleticism.

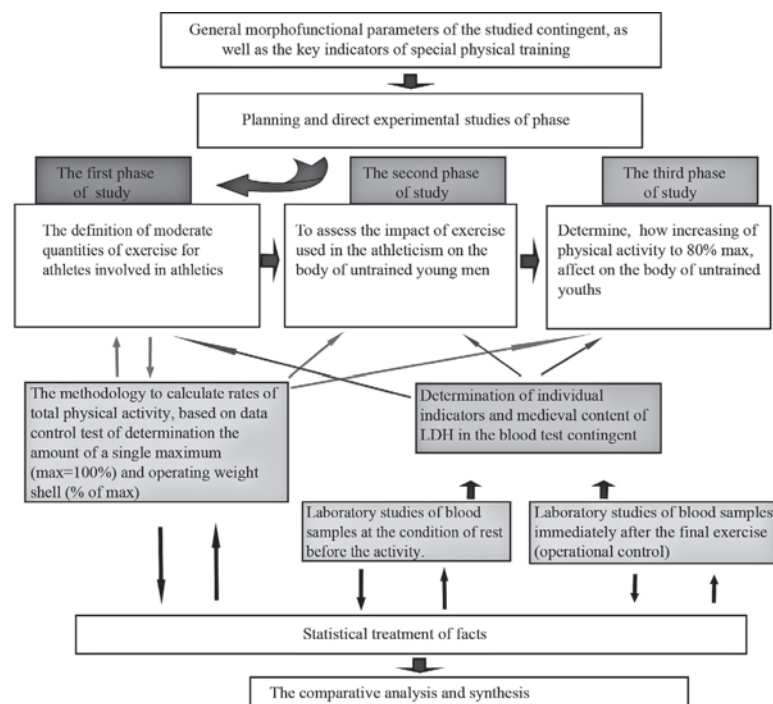
A strong argument in favor of the choice of this contingent, for solving this problem, was the fact that the body of trained young men is more stable (adapted) to physical activity, comparing with untrained individuals, which allow holding the primary researches without compromising pathological changes.

At this stage of the study were tested various methods of quantitative assessment of the level of physical activity, which is a significant problem in the application, especially to the specific athleticism. Methodologically problematic issue in this case was a selection of single exercise, qualifying of quantitative

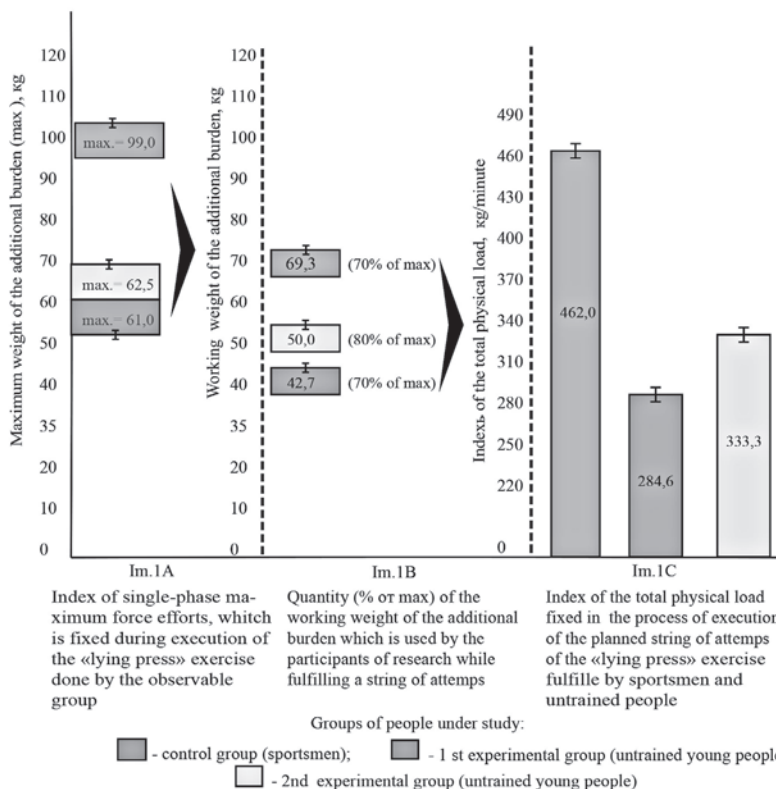
mark on the value of power loads. After a series of preliminary studies, in order of such exercise it was chosen "bench press on a flat bench," performed with a full amplitude and a fixed rate (10 repetitions per minute).

One of the main conditions of this study is the adequacy of physical activity to individual features of the body of the experiment participants. Thus, the working (% max) weight of the shell used by the group of athletes in test determined within 70% of the maximum level of their security features (weight complication, which can overcome the athlete during exercise only once), which allows to held a comparative analysis of the impact of these levels of activities on the body of the investigated contingent without pathological consequences. This arrangement of the experimental conditions allows making a detailed accounting of input and outputting indicators. The latter provided the summation of weight a lifted shell and the total duration of the series approaches of only one power exercise, but not all the time of a single session. As a result of this approach was obtained a quantitative index of total physical activity (kg / min), which allows a comparative evaluation of levels of physical activity outside in which took part the representatives of treatment group for the implementation of series of approaches in one exercise.

During the holding of primary research, in order to obtain reliable results in the calculation of the total rate of the pilot exercise in athleticism there were unified all the approaches to the definition of a single maximum (m = 100%) and work (% max) weight of the shell, depending on the conditions of the implementation of the control exercise. Thus, during the training session, leaving the experimental conditions, the duration of continuous muscle tension in a separate approach, under the



**Fig. 1. The methodological framework of research.**



**Fig. 2. Scheme of the impact of training work's components on the variable of index of the total physical load which are used by the sportsmen and untrained people in the process of athleticism activities.**

control exercises was in average from the  $41,3 \pm 0,22$  seconds (about 8 reps in a separate approach). Thus, considering the total number of approaches performed in one exercise (4), the total time of power loaded in an average  $2,7 \pm 0,09$  minutes.

Organization of laboratory monitoring of serum LDH provided for the maintenance of blood samples: 1) in the condition of rest before the training session, 2) immediately after the series of four approaches in the final exercise. Samples of blood from a vein of research participants selected the nurse under medical supervision in compliance with all required standards of sterility and safety requirements. Blood samples were numbered, made the necessary description and accompanying documents. LDH concentration in the serum was determined by the kinetic method on the equipment "HIGHT-ECHNOLOGYINC" (USA) [7,8] under the conditions of a certified medical laboratory «Valeo», in Nikolaev.

In the second phase of research organizations, in order to determine the effect of physical activity, the value of which (% max) is admissible (referring to the results of the first stage) to the level of physical capability of athletes, the experimental group was formed consisting of 20 untrained young men in ages of 19 – 20 years. The structure of the control test and laboratory studies of blood samples is similar in content to the one used for the solution of the first phase of the experiment.

The third stage of the organization of the experiment carried out the case of studies in order to identify the

mechanism of correction of the allowable limits of magnitude of physical activity for untrained young men, by raising the rate of the working weight of the shell to 80% of max. For solving these tasks it was formed the second experimental group which consisted with the untrained young men of similar age. Adequacy, used during the execution of a series of approaches to control the exercise of physical activity, the functionality of the body of untrained members of the group is determined by rate of change of the content of LDH in their blood.

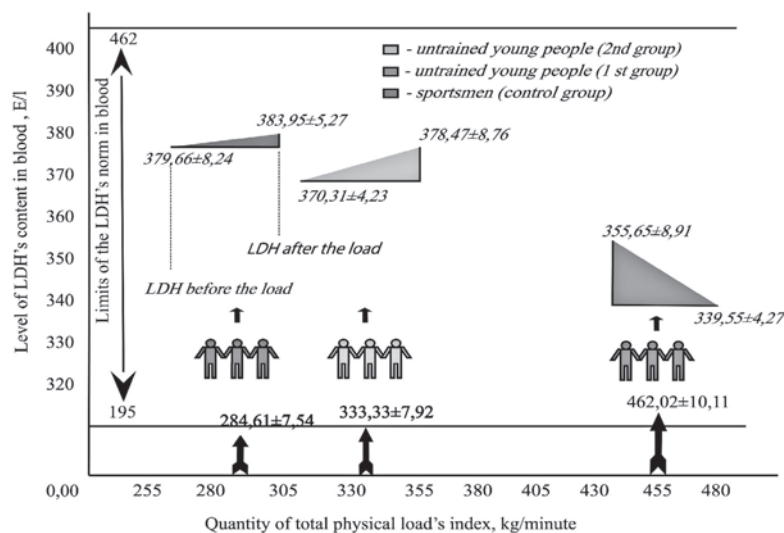
The materials of researches were statistically processed using the software package "Statistics" in the system "Microsoft Excel-2010", focusing on the content of the physiologically permissible level of LDH in the blood serum of healthy people within 195-462 E/l.

**Results.** During the experimental studies lined at determining the value of exercise adequate functionality of athletes and untrained individuals were identified diverse facts not only by fixing the parameters of power control testing capabilities, but also in the processing of the results of laboratory

tests concerning the difference in the blood levels of the enzyme LDH (Fig. 2, Fig. 3).

There is a scheme on the Fig. 2 representing methods of identification the index of the total physical load in athleticism, based on the bench-mark statistics, that is a fixation of the single-phase maximum and working weight of the apparatus (additional burden). The results of the researches shown on the (Fig. 2). A demonstrate the average group indexes of the maximum of the force capabilities of the sportsmen and groups of the untrained people in the process of carrying out the "lying press" test. According to the primary inspection data of the untrained people, the representatives of the first and second experimental groups, almost the same level of development of the maximum force capability has been fixed. The index under consideration belonging to the representatives of the control group (sportsmen having 3-year experience in athletics) has been appropriately different from the results which youngsters having no experience in training athleticism have shown ( $+59,7\%$   $p < 0,05$ ).

Indexes, represented in a graphical form on the Im. 2B and 2C, reflect quantity of the additional burden's working weight (from 70 to 80% of the maximum) which is used by the representatives of all 3 groups, during execution of the "lying press" test among the string of training attempts, and its influence on the level of the total physical load's index.



**Fig. 3. LDH's content in blood of sportsmen and untrained people in quiescent, before and after the physical load, n=60.**

It has been established that quantity of the total physical load depends on the level of development of the maximum force capability of the participants, their level of training as well as on the rate of the physical load and conditions of conducting the researches.

Biochemical studies of the blood serum belonging to the sportsmen having different level of trainings are the most informative sources giving possibility not only to control the organism's state and its reaction to the physical exercises but are also one of the major criteria influencing the process of optimization of the training and competitive process on various stages of training of several years' standing. Thereby, assessment of the index of content of lactate dehydrogenase (LDH) in blood of the contingent under study before the beginning of research, gives possibility to speak about the level of sportsmen's training and state of body of untrained people.

Results of the laboratory control of the blood serum, shown on the Fig. 3, show the average group indexes of sportsmen's and youngsters' in the quiescent LDH's content before the beginning of experiment and after the suggested physical load. Analysis of the findings indicates the satisfactory physical state of representatives of all 3 groups under consideration and points to the correspondence of indexes of LDH's level in the blood with the limits of diagnostic regulations (195-462 E/l).

Results of the studies show definite appropriateness between the primary level of content of the enzyme under study in blood (before the load) and the level of training. Thus, live data of the LDH-test fixed among the group of sportsmen before the load, indicate much lower level of enzyme under the study (von the average 5,4%) versus the benchmark which are demonstrated by representatives of both experimental groups (the initial level of LDH's content in blood among untrained people is identical).

Analyzing the on-line control's data of LDH's content in blood of sportsmen having the temperate physical load (the working weight of additional burden is 70% of maximum), it has been established that the derive results show the decrease of enzyme under study by -4,7% ( $p < 0,05$ ). Thus, fixed data indicate the adequacy of the used index of physical load to the functional capability of the sportsmen's organism which gives possibility to assume the appropriateness of the additional burden's working weight usage for the untrained youngsters, at the rate of 70% of maximum

Results of the compulsory checking of LDH's content in blood of untrained people (representatives of the 1<sup>st</sup> experimental group) fixed after execution of the planned string of attempts to the

"lying press" exercise with the temperate physical quantity (70% of maximum) demonstrate a slight increase of rate under study (+1,1% ( $p > 0,05$ )) (Fig. 3).

The usage of physical load, the quantity of which was about 80% of maximum, by the representatives of the 2<sup>nd</sup> experimental group (untrained youngsters as well) promoted the increase of the rate of LDH's content in blood only to +2,2% ( $p > 0,05$ ).

**Discussion.** Thus, analysis of revalidation's results (after the load) demonstrates the absence of common regularities of the change of LDH's content in blood of participants of all 3 research groups after having planned load. Comparative analysis of initial (before the load) and final data (after the load) concerning LDH's content in blood has shown that character of change of enzyme under study directly depends on the quantity of rate of total physical load and on the level of training of the contingent under test. In total, despite the marked quantitative changes of enzyme under study before and after the load, LDH's content in blood of representatives of all 3 groups, remains among the limits of physiologically acceptable rate, that indicates adequacy of specified physical loads to the functional capabilities of the organism of sportsmen as well as untrained young people.

#### **Conclusions.**

1. It is established that physical loads with the rate of the working weight of additional burden of 70-80% of the single-phase maximum force load are temperate both for the experienced sportsmen and untrained people, which allows usage them as optimal rate of quantity of force load in athleticism.

2. It is expose that temperate physical loads practically don't influence the level of LDH's content in blood serum of untrained young people, and at the same time it promotes valid decrease of given enzyme, which allows assumption about the presence of compensatory mechanisms and change of their activity depending on the level of training of the contingent under study.

**Perspectives of further studies** are connected with the search of means of optimization of the training process in athleticism and its regimes of physical load as well as with the discovery of appropriateness of the pattern of change of rate of LDH's content in blood of sportsmen having different level of training, during the prolonged period of mastering (several mesocycles).

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### ВИЗНАЧЕННЯ АДЕКВАТНОСТІ НАВАНТАЖЕНЬ В УМОВАХ СИЛОВОГО ФІТНЕСУ

**Чернозуб А. А., Міненко О. В., Тітова А. В., Дімова А. М., Дімов К. В.**

**Резюме.** Стаття присвячена проблемі визначення безпечних параметрів фізичної активності (% від макс), для контингенту різного рівня фізичних можливостей і підготовки, що дозволяють позитивно впливати на ефективність тренувального процесу, не провокуючи прояв патологічних змін в організмі людини. У результаті дослідження було встановлено, що найбільш оптимальними навантаженнями як для досвідчених спортсменів так і для нетренованих осіб, в умовах пропонуваніх учасникам режимів роботи, є робоча вага обтяжень близько 70-80% від максимальних зусиль. Визначено, що оптимальні вправи не впливають на рівень лактатдегідрогенази (LDH) у сироватці крові непідготовлених молодих людей, і в той же час сприяють статистично значимому зниженню активності даного ферменту у спортсменів.

**Ключові слова:** фізичні навантаження, адаптація, безпечні режими, активність лактатдегідрогенази.

УДК 613.7+796.015.62

### ОПРЕДЕЛЕНИЕ АДЕКВАТНОСТИ НАГРУЗОК В УСЛОВИЯХ СИЛОВОГО ФИТНЕСА

**Чернозуб А. А., Міненко А. В., Титова А. В., Димова А. Н., Димов К. В.**

**Резюме.** Стаття посвящена проблеме определения безопасных параметров физической активности (% от макс), для контингента разного уровня физических возможностей и подготовки, позволяющих положительно влиять на эффективность тренировочного процесса, не провоцируя проявление патологических изменений в организме человека. В результате исследования было установлено, что наиболее оптимальными нагрузками как для опытных спортсменов так и для нетренированных лиц, в условиях предлагаемых участникам режимов работы, является рабочий вес отягощений около 70-80% от максимальных усилий. Определено, что оптимальные упражнения не влияют на уровень лактатдегидрогеназы (LDH) в сыворотке крови неподготовленных молодых людей, и в то же время способствует статистически значимому снижению активности данного фермента у спортсменов.

**Ключевые слова:** физические нагрузки, адаптация, безопасные режимы, активность лактатдегидрогеназы.

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