PHYSICAL EDUCATION AND SPORT

CHARACTERISTICS OF CHANGES IN THE CORTISOL AND TESTOSTERONE CONCENTRATION IN BLOOD SERUM TO DIFFERENT-ORIENTATION POWER EXERCISES AND THEIR IMPACT ON PECULIARITIES OF HUMAN BODY ADAPTIVE REACTIONS

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Abstract. *One of the main objectives of this research was to examine the question of humans' adaptive reactions dependence on the characteristics of data changes in steroid hormones concentration n blood serum applying different volume and intensity power loads training.*

It was established that used in the beginning of our studies high intensity loads training with small workload in terms of a phased change of training regimes proved to be more efficient in long-term power fitness training. The research showed that regardless the hormonal response to acute power load in terms of different mode combinations, the participants' body power abilities demonstrated positive dynamics of growth by 80.2% ($p<0.05$) throughout the study period in both groups. However, the most pronounced adaptive changes were established in terms of high intensity loads mode (training mode=0.71conventional units).

Keywords: *adaptation, hormonal response, power loads mode, cortisol, testosterone, training process, power abilities, intensity.*

Introduction. Physical activity is performed due to mechanisms, which let our body do various exercises and adapt to them. These mechanisms are directly related to the hormonal regulation of physiological systems together with acute and chronic adaptive changes [1, 4]. Different hormonal response while training is the result of testosterone and cortisol concentration change in blood serum that may be caused by the intensity of physical activity, amount of work and mode of exercise [1, 5]. Motor activity can call short-term increase or decrease of these hormones concentration in blood serum, depending on the combination of exercise parameters, conditions and duration of training sessions [7, 8].

At the same time, we can assume that short-term reduction in testosterone and cortisol concentration, is mainly manifested while increasing the duration and amount of training that contributes to possible fatigue against on the background of energy deficit [3, 6]. However, the impact of hormone changes on the human body in the training process, as well as physiological mechanisms of adaptive rearrangements, especially in frequency of certain modes of power load, have been insufficiently studied.

It is known that the optimal period of power exercises cannot exceed two or three months to achieve the most pronounced adaptive changes in the body of untrained persons in terms of muscle activity with the same parameters of physical activity, regardless of the intensity and scope of work [2, 3]. However, for further effective continuation of adaptive processes it is necessary to change the parameters of some components of the power mode or even full training activity mode. Notwithstanding, questions of adaptive-compensatory reactions peculiarities in conditions of phase mode switching power load (mesocycle) particularly among untrained people, have been hardly investigated.

The aim of this paper is to determine the changing characteristics of cortisol and testosterone concentration in blood serum of untrained young men in terms of frequency of certain modes of power load and its impact on human body adaptive reactions.

Research methods. Forty healthy not involved in power sports boys aged 20-21 were examined during this research. Two research groups (control and experimental) were formed. Each group used two completely different modes of power load alternately within six months of training in power fitness.

Parameters denoting maximum power capacity of participants while performing given power exercises were recorded in the process of control testing, and value of the power load was calculated afterwards. The studied parameters control was carried out prior to the use of a particular mode power load (output indicators 1st and 5th stages) and after every 30 days of regular power fitness exercises during 6 months.

The research participants underwent laboratory studies of testosterone and cortisol concentration changes in blood serum 8 times within 6 months of training force fitness with intervals of one month. Two blood collections (before the training and immediately after it) were conducted every month. Vein blood samples were taken by a nurse under a doctor's medical supervision to meet all the required standards of sterility and safety. The testosterone and cortisol concentration in blood serum was determined by immune fermented analysis method in a certified medical laboratory.

Research results discussion. Based on the studies of peculiarities of the cortisol and testosterone concentration changes in blood serum of untrained young men in terms of frequency of different power load modes in power fitness, it is possible to make the following generalizations:

The dynamics of the testosterone and cortisol concentrations in blood serum of untrained young men in the regime of acute power load of various character, testify the divergent hormonal responses manifestation that was recorded during the study period. The growing level of studied hormones in the untrained young men blood occurred in response to high intensity training with a small amount of work. At the same time, average intensity power load with large amount of work reduced the testosterone and cortisol concentrations in the blood serum compared to the pre-training state.

It was established that the studied hormones concentration in response to high intensity power fitness training (training mode=0.71conventional units) increases by 10.2% ($p<0.05$) at the beginning of the experiment to 19.4% ($p<0.05$) at the end of training mesocycle. Using average intensity power loads training with large amount of work(training mode=0.64conventional units) causes the opposite hormonal response that is manifested in reduced testosterone concentrations by 12.6% ($p<0.05$) and cortisol concentrations by 16.4% ($p<0.05$) in blood serum after motor activity compared to the pre-training state, but not beyond the norm. Herein, basal testosterone level decreases by 11.2% ($p<0.05$) during mesocycle when used in long-term high intensity mode that indicates certain manifestation of adaptive changes due to considerable growing dynamics in power abilities of the studied young men.

The research also revealed, that hormonal response to acute power load becomes more pronounced within each next month of power fitness training especially in terms of using high intensity training mode. On the contrary, the long-term adaptation results of power fitness training are characterized by slow increase in maximal muscle strength compared to the data set after the first month of training, due to the increased level of body resistance to physical stress. However, changing the load mode also contributes to the growth of maximum muscle strength parameters.

The conducted study showed the priority and effectiveness of power fitness training performed in terms of a phased training regimes change with high intensity loads and small work load (as it was applied in the beginning of our research) in the long period trainings. At the same time, using this power fitness-training mode prevents any physical fatigue manifestation and, consequently, does not cause a state of overtraining despite a significant productivity growth.

The lack of data concerning the nature and extent of changes in the cortisol and testosterone concentrations in blood serum of young men in response to acute physical activity, during long-term power fitness training with a phased training regimes change, does not let us control the training process precisely, especially blood hormones concentration that may contribute to disruption of homeostasis. Accordingly, the prospect of establishing regularities and disclosing relationships between the levels of studied hormones, training loads volume and intensity, as well as the dynamics of performance indicators, will provide us with an opportunity for the scientific justification of such processes as planning, control, and management of long-term training process in power fitness and other sports.

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