ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Combined Use Of Medical And Biological Means Of Recovery By Powerlifters.

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ABSTRACT

A characteristic feature of modern sport is significantly extensive and intensive training loads, which impose extremely high demands on the athlete's body. Training sessions are often conducted against chronic fatigue. Frequent physical overload leads to overstrain of the locomotor apparatus and to various prepathological and pathological conditions. This occurs in cases where the organization of the training process does not meet the scientific requirements and the load does not match the age and individual abilities of an athlete. Analysis of the relevant scientific and methodological literature has revealed that there are contradictions between the health level of the younger generation and the achievement of high results in sport. Objective of the study was to determine the effectiveness of the combination of medical and biological means of recovery suggested for powerlifters. We offer the experimentally selected means of recovery for athletes subject to their age, gender and qualification. We used these complexes of recovering means during the entire training cycle and approbated them throughout the experiment. Under approbation, we studied the influence of means of recovery on the dynamics of physical performance in athletes doing powerlifting in main competition exercises. The results of the study revealed that the proposed combination of vitamins, liquid amino acids, BCAA, table water, recreation, immunomodulators, hygienic day regimen, creatine monohydrate, and Ecdysten enhance physical performance of powerlifters.

Keywords: means of recovery, physical performance, powerlifting.

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ISSN: 0975-8585

INTRODUCTION

Sports pharmacology today is a thriving industry. Many search for such a drug, which can ensure the best results without any adverse effects. We agree with O.V. Denisenko in that adequate and careful application of a number of available means helps athletes to achieve new athletic performance [10, p.150]. The problem of using different means of recovery by athletes was studied in domestic school of sciences by V.U. Avanesov, V.M. Volkov, N.D. Graevskii, V.I. Dubrovskii, V.M. Diachkovyi and others.

A.S. Solodkov defined recovery as "a set of physiological, biochemical and structural changes occurring in the body after work, which ensure its transition from the working level to the initial (pre-working) state" [20]. Mean is a method, a way of achieving anything [11]. We may respectively consider a mean of recovery as a method of achieving a pre-working state. However, V.A. Pankov, S.E. Trishin and S.V. Nasevich note that the recovery as a process must lead not only to the original state or similar thereto and to consolidate the obtained results and the functional capabilities of the body in combination with individual training load, but also enhance the physical performance of an athlete [19, p.9].

V. Vinogradov and Sh. Lei noted the following features of recovering means:

- Strengthened metabolic processes;
- Reduced negative impact of factors on the psychological state of an athlete;
- Accelerated growth of muscle mass;
- Development of endurance;
- Optimized delivery of necessary substances to the muscles and excretion of negative products [8, p.20].

N.G. Arshinova distinguished two basic strategies in using sports means in the sports practice. The first strategy involves the use of means of recovery during a contest season, so that they could have a directed effect on the recovering process in the pre-contest, contest and post-contest periods. The second strategy involves the use of means of recovery in the course of training process. The author notes that the means of recovery themselves often act as an additional physical load and strengthen the effect on the body [4, p.4].

N.G. Ozolin notes that the means of recovery in sports practice are mainly divided as follows [18, p.150]: pedagogical means of recovery - they imply the application of adequate training means and methods. N.I. Cherdantsev listed a number of requirements for the pedagogical means of recovery such as reasonable planning of the training process that takes into account the individual characteristics of an athlete; an optimal combination of various training means of an athlete; rational planning of cycles of the training process; the possibility of athlete to switch from one activity to another; obligatory recovering microcycle in training; rational planning of hygienic day regimen; training session must meet all the rules of competent training planning, taking into account the psychological factor; individual approach to the development of the warm-up and final part of training; active recreation during the recovery period and application of relaxation methods during the entire period of training [22, p.225]; psychological means of recovery - means aimed at “accelerated neutralization of nervous and mental fatigue." [6, p.228]. Such means include relaxation exercises, ideomotor training, the creation of a favorable psychological environment in the team, etc. Methods such as aromatherapy and music therapy gain certain popularity in the correction of mental state of athletes; medical and biological means of recovery - methods used to replenish the resources expended by the body, balance vitamins and minerals in the body, improve the various functions of the body, which include both recovery and protection [17]. This group of means is divided into hygienic and supporting factors [16, s.262].

The researchers emphasize the importance of all these means of recovery, however, pedagogical methods have remained high-priority, while the others act as supporting. We agree with the I.G. Litvinov and K.A. Ogloblin that managing the performance of athletes requires competent integration of all means of recovery [14, p.90].

Seeing that our work is focused on the study of medical and biological means of recovery, it is necessary to better consider this group of ergogenic means. Iu.F. Kuramshin has presented a complete classification of medical and biological means of recovery:

- Rational daily regimen and personal hygiene of an athlete, hygienic support of training places, and hygienic condition of sports equipment;
- Balanced diet using drugs and products of enhanced biological value (protein drugs, sports drinks, oxygen cocktails, etc.);
- Oxygen inhalation, inhalation of artificial ionized air (air ionization);
- Water procedures (different kinds of shower, baths, sauna);
- Physiotherapy (ultraviolet radiation, light (heat) effects, ultrasound, shortwave diathermy);
- Staying in a pressure chamber and a heat chamber with a measured change in pressure, oxygen content and temperature;
- Electrical stimulation (electrical sleep, electrical stimulation of neuromuscular apparatus, electrical action on biologically active points of the body - electropuncture);
- Different types of massages and self-massage (manual, hardware - vibratory massage, pneumatic massage, hydromassage, etc.). [21, p.350-351].

Pharmacological drugs gain a greatest popularity among the athletes. Their popularity is due to a more rapid onset of action as compared to physiotherapy and other methods of recovery. G.A. Makarova has proposed the following classification of pharmacological means of recovery:

- Pharmacological drugs that ensure the increased needs of a body in major food ingredients under intense muscle activity;
- Pharmacological drugs that promote the creation of optimal conditions for the acceleration of natural processes of post-exercise recovery;
- Pharmacological drugs that artificially accelerate the processes of post-exercise recovery;
- Pharmacological drugs that reduce both the formation of toxic metabolites and their damaging effect;
- Pharmacological drugs that potentiate the training effect;
- Pharmacological drugs that prevent the reduction of immunity under intense muscle activity. [16, p.273].

A variety of medical and biological means of recovery allows today optimizing their effect through different combinations depending on the individual differences of athletes. Despite a large list of pharmacological drugs, this article will deal only with those drugs and methods not included in the prohibited list.

Objective of our study was to determine the effect of the proposed combination of medical and biological means of recovery on physical performance of powerlifters. Powerlifting, like any other sport, requires athletes to use means of recovery, which functions (generally) are not only to increase the performance in a certain sports activity, but also to keep up health of athletes. Powerlifting becomes especially popular among students due to that it allows to develop strength, correct shape, as well as recover and maintain a healthy body state.

When developing a combination of recovering means the following factors were taken into account:

- Individual body potentials;
- Availability of time (since most of the experimental subjects were students, more time was devoted to the learning process);
- Financial capabilities of the experimental subjects (one of the challenges is to find the optimal combination subject to well-being of the population).

To perform this study, we chose 8 powerlifters from the students and employees of Elabuga Institute of KFU, represented by three masters of sports of international grade of Russia, three masters of sports of Russia, and two candidates for masters of sports.

ISSN: 0975-8585

RESEARCH METHODS

To take readings of physical performance of the athletes, we analyzed the results shown by these athletes at competitions both individually and for three exercises in aggregate. Powerlifting is a kind of sport aimed at the development of strength abilities of athletes and defining the strength level based on the results of exercises such as squats with a barbell on your shoulders, bench press, and deadlift with a barbell.

The basis of the study was an experiment that had been conducted throughout a year. Health care professionals were checking a health status of the subjects, since the experiment was performed under the supervision of doctors.

In the course of the experiment, we used a combination of the following medical and biological means of recovery: table water (throughout the entire period, except for recovery one), vitamins (courses were prescribed and applied individually by a doctor), liquid amino acids, creatine monohydrate, Ecdysten and BCAA for five weeks prior to large-scale competitions, leisure activity during the recovery period, the hygienic day regimen, and immunomodulators for medical reasons [5, p.374].

- Table water. During training process, the athletes have an increased expenditure of minerals which must be regularly compensated. Therefore, the athletes are prescribed table water during the pre-contest, base, contest and post-contest periods in order to replenish salt-water reserves of a body. The athletes drank up to 1.5 l of mineral water throughout a day. The powerlifters had to drink 200-300 ml of cold water immediately before the training. The amount of water consumed during the training was 200 - 300 ml in order to compensate for loss of water and minerals in the body. The amount of water was reduced during the recovery period due to reduction of load.

- Vitamins The athletes were undergoing vitaminization during the preparatory, base, pre-contest, and contest periods [7].

The main task of vitaminization during the preparatory period was to prepare a powerlifter's body to withstand gradually increasing training loads and psycho-emotional stress. The doctors and trainers together with the athletes chose the following multivitamin complexes, which compositions are largely similar: Complivit, Alfavit, Vitrum.

A multivitamin complex "Complivit" has the following composition

Vitamin A - 1.135 mg (3.300 IU); Vitamin E - 10.00 mg; Vitamin B1 - 1.00 mg; Vitamin B2 - 1.27 mg; Vitamin B6 - 5.00 mg; Vitamin C - 50.00 mg; nicotinamide - 7.50 mg; folic acid - 100.00 g; rutin - 25.00 mg; calcium pantothenate - 5.00 mg; Vitamin B12 - 12.50 g; thioctic acid - 2.00 mg; P - 60.00 mg; Fe - 5,00 mg; Mn - 2.50 mg; Cu - 750.00 g; Zn - 2.00 mg; Mg - 16.40 mg; Ca - 50.50 mg; Co [13].

A multivitamin complex "Alfavit Classic" has the following composition [3]

vitamin A - 0.5 mg; Vitamin E - 10.00 mg; Vitamin B1 - 1.5 mg; Vitamin B2 - 1.8 mg; Vitamin B6 - 2.00 mg; Vitamin C - 35.00 mg; nicotinamide - 20 mg; folic acid - 100.00 g; calcium pantothenate - 5.00 mg; Vitamin B12 - 3 g; Fe - 14.00 mg; Mn - 2 mg; Cu - 1.00 mg; Zn - 15.00 mg; Mg - 50 mg; Ca - 100 mg; Vitamin D3 - 5 g; Biotin (H) - 50 g; K1 - 120 g; Cr - 50 mg; Se - 70 g; Mo - 45 µg; I - 150 µg.

A multivitamin complex "Vitrum" has the following composition [9]

Vitamin A and Beta-carotene - 5000 IU, Vitamin D3 - 400 IU; Vitamin E - 30 IU; Vitamin C - 60 mg; Vitamin B1 - 1.5 mg; Vitamin B2 - 1.7 mg; Vitamin B6 - 2 mg; nicotinamide - 20 mg; Vitamin B12 - 6 g; folic acid - 400 micrograms; pantothenic acid - 10 mg; Vitamin K1 - 25 mg; Ca - 162 mg; Mg - 100 mg; K - 40 mg; Fe - 18 mg; Cu - 2 mg; Zn - 15 mg; Cr - 25 mg; Mn - 2.5 mg; Sn - 10 g; Ni - 5 g; Si - 10 g; V - 10 g; Cl - 36.3 mg; P - 125 mg; Mo - 25 µg; Se - 25 g; I - 150 µg.

When choosing multivitamin complexes, both the variety of vitamins in the complex and balance of microelements were considered. Despite a high similarity of vitamin complexes, the doctors recommended their alternation, as some trace elements are available in a variety of multivitamins.

A base period is characterized by the transition to the volume-strength training, which in turn can cause overtraining of an athlete and reduced endurance. At this period, the athletes made a gap in taking drugs in order to avoid the accumulation of decay products of vitamins in their body. The doctors additionally prescribed vitamin B complex that prevent the decrease of muscle mass of an athlete when increasing the load intensity.

Pre-contest period is characterized by the transition to the strength training to prepare for a competition. During this period, the athletes continue to take multivitamin complexes due to the great increase in loads on the body and the decrease in immunity.

During the contest period, the athletes were additionally taking vitamin C, which strengthen both the immune system and endurance of the body.

Liquid amino acids

Amino acids facilitate the building-up of muscle mass, increase strength performance and accelerate the recovery process [12, p.55]. The Twinlab Amino Fuel Liquid Original liquid acids were chosen. The Twinlab Amino Fuel Liquid Original liquid acids have the following composition: leucine, isoleucine, valine, lysine, threonine, methionine, phenylalanine, tryptophan, arginine, cysteine, alanine, glycine, aspartic acid, histidine, proline, serine, tyrosine, and glutamic acid [2]. In addition to amino acids, there are also vitamins B6 and B12 contained in this complex, wherefore vitamins of this group should not be taken separately. Due to glucosamine and chondroxidum contained therein, a considered drug had salutary effect on cartilages.

The feasibility of using the liquid form of amino acids is due to their better absorption. The dosage used was recommended by the manufacturer: 3 tablespoons per day. The athletes took amino acids 30-60 minutes prior to the training and 30 minutes after. The athletes started taking the amino acids at the end of the base period, and continued prior to the competition.

Creatine monohydrate

One of the most popular drugs among powerlifters is creatine monohydrate. This drug both helps to increase physical performance and improves recovery. However, creatine monohydrate has a significant drawback such as weight gain both due to the growth of muscles and water retention in the body. Therefore, this drug is not recommended for long-term use. This feature poses hazard to the performing powerlifters considering that the victory often depends on their own body weight, so the lower the weight, the higher chances to win.

During the experiment, the powerlifters were taking creatine monohydrate at the end of the base period and in the first half of the contest period. According to the manufacturer's recommendations, the athletes were taking 5-6 g of this drug 5 times per day during the first week to accumulate the substance in the body. Further, they were taking a dosage prescribed for each athlete individually 2 times per day.

BCAA

This amino acid complex consists of three amino acids (L-valine, L-isoleucine, L-leucine) contributing to increase in muscle mass, which is necessary to improve the results of exercises. The experimental subjects were taking BCAA Optimum Nutrition [1].

The candidates for masters of sports were taking BCAA complex once per day, and the masters of sports were taking it 3 times per day in meal intervals: 1 time in the morning, 2 - an hour before training, and 3 - 30 minutes after training. The physicians determined the dose of amino acids based on individual characteristics of the organism.

Since the athletes had already been taking the Twinlab amino acids complex, BCAA were taken as additional support to withstand maximum load during the pre-contest period. For the avoidance of overdose of these amino acids, the athletes were taking BCAA during one month.

Ecdysten

Today, much attention is paid to the use of pharmacological steroid drugs. Despite similar steroid structure, Ecdysten does not refer to the prohibited pharmacological drugs, since it has no effects typical of exogenous testosterone and anabolic steroids [23].

The powerlifters were prescribed Ecdysten 5 weeks prior to their most important start in the pre-contest period. They were taking 6 tablets per day for 1 month until the beginning of competition.

Leisure activity

Leisure activity often means some amateur sports for changing the activity. This type of rest was used during the recovery period. The experimental subjects were asked to individually choose any type of physical activity. They chose the types of sports such as dance, aerobics, football, swimming, cycling and hiking.

Using this mean of recovery has contributed to both the physical recreation of athletes after usual exercises and psychological relief, because the routine monotonous exercises usually lead to psychological fatigue (especially by the masters of sports).

Immunomodulators for medical reasons.

The athletes were using these drugs at the end of pre-contest period and at the beginning of the base one.

Hygienic day regimen

The specificity of hygienic day regimen is a competent and well-structured planning of the daily routine, taking into account factors such as work, leisure, diet and sleep.

The athletes had to observe all the rules of the regimen throughout the experiment. Each daily routine was planned by the athlete and his coach and was individual for all the subjects of the experiment. Closer to the competition, when a competition schedule is presented, the training process was arranged in such a way that the athletes could train at a time when the competition would take place, so that the body could get used to such load at a certain hours.

When scheduling a day regimen, the factors considered were study time, working activity, living conditions, individual physiological characteristics (for example, in case when the highest peak of an athlete's activity falls on the evening, the training is conducted at the same time), the amount of trainings (the masters of sports trained 5-6 times a week, the candidates for master of sports - 3 times a week), and other classes in groups or sections.

RESULTS AND DISCUSSION

During the year, the subjects were prescribed medical and biological means of recovery taking into account the training load, study and working time, individual characteristics of powerlifters and competition schedule. The maximum amount of drugs was prescribed prior to the most important competitions. This is due to the increased loads in the pre-contest period, therefore, the body requires more time and energy for recovery.

The athletes had different competition schedules, which is due to their training level. The main competition for the candidates for masters of sports was the Championship in powerlifting of the Republic of

Tatarstan, taking place in autumn. For the masters of sports - the Championship of Volga Federal District. Since each phase of competition is preliminary, the masters of sports of international class competed at all levels of competition to further compete at the Russian Championship. Therefore, they had different recovering drug regimen. For example, the athletes started taking sport nutrition 5 weeks prior to the Championship in powerlifting of Volga Federal District, which is always held in early December. The athletes were taking creatine monohydrate and liquid amino acids; their physical activity decreased after performances, which allowed them to stop taking sport nutrition. Next competition was the Russian Championship in powerlifting, which traditionally takes place in late February and early March. There is, respectively, an interval of 2-3 months between the competitions. Despite a short period of time, a gap in taking the drugs is determined by the body's need to rest and to prevent self-tapering. The athletes start again to take sport nutrition with a gradual increase in physical activity 5 weeks prior to the Russian Championship. To achieve a top form on the days of contests, the athletes were taking creatinine monohydrate, liquid amino acids, capsulated BCAA and capsulated Ecdysten.

Studying physical performance of athletes started with the analysis of the results of each exercise such as barbell squats, bench press and deadlift obtained at the competitions. It should be noted that the athletes had previously been taking means of recovery on non-systemic bases: periodic intake of vitamins, amino acids, and rare intake of creatine monohydrate. Considering a high level of all the athletes, we may conclude that they had a significant decrease in their strength gain. Analysis of score-sheet data a year before the experiment has revealed that both the Russian masters of sports and masters of sports of international class virtually had no changes in their result, that is, they had a period of plateau.

At the initial phase, the first participant showed a result of 70 kg in barbell squats, and further improved it by 7.5 kg after using our means of recovery, that is, the improvement of the result was 110.71%. The second participant had an initial result of 110 kg, which was further improved by 7.5 kg (6.36%). The third participant had an initial result of 132.5 kg, which was further improved up to 142.5 kg, that is, the improvement was 10 kg (7.58%). The fourth participant had the same initial result as the third had, but with improvement of 7.5 kg (5.66%). Participants 5 and 6 showed an improvement of 10 kg (initial results - 95 kg and 55 kg, respectively), and their percentage improvement was 10.53% and 18.18%, respectively. Participant 8 showed an initial result of 110 kg in barbell squats, and his improvement after a year was only 5 kg (4.55%). Participant 6 has shown the greatest improvement, which was 20 kg: from 120 kg to 140 kg. However, the result in percentage terms has grown by 16.67%. Data is shown in Figure 1.

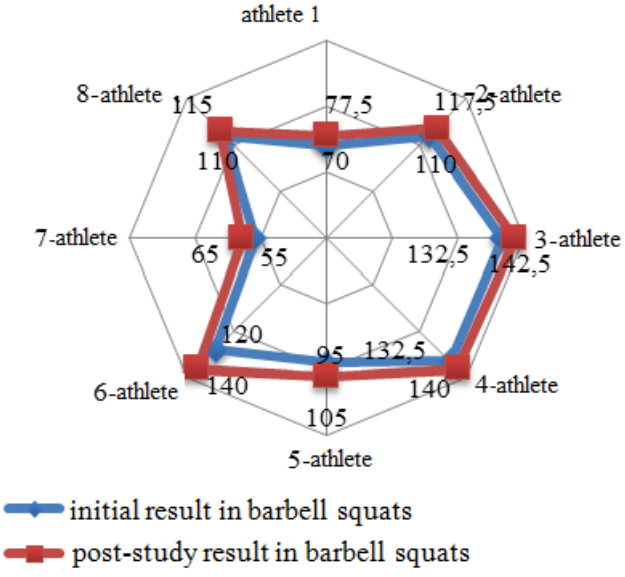

Figure 1: Diagram of changes in the results of athletes performing barbell squats before and after the study

The average growth of performances of all the athletes in shoulder barbell squats was 10.03%. It should be noted that such improvement is quite significant for those athletes, who have reached their peak - highly-trained athletes. Accordingly, the additional methods implemented and various means of recovery used had a beneficial impact on the strength result of the exercise.

ISSN: 0975-8585

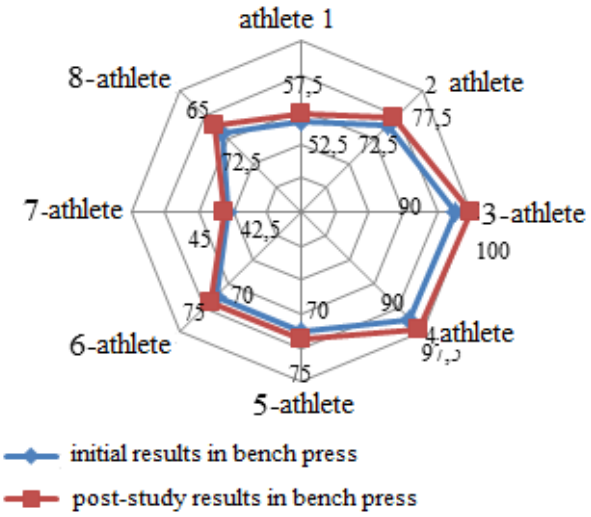

Figure 2: Diagram of changes in the results of athletes performing bench press before and after the study

Figure 2 shows the results of bench press before and after the study. The average growth of performances in this exercise was 8.45%. Participant 7 showed the lowest improvement in weight - 2.5 kg (5.88%), participant 3 showed the highest one - 10 kg (11.11%). Participants 1, 2, 5 and 6 improved their maximum results in this exercise by 5 kg, that is, by 9.52%, 6.9%, 7.14%, and 7.14% respectively. The remaining participants 4 and 8 improved their results by 7.5 kg (8.33% and 11.54%).

As well as in the previous figure, we can see growth consistent with our hypothesis that the systematic application of the proposed combination of pharmacological means had effect on physical recovery of powerlifters, which in turn ensured improvement in the exercise performance.

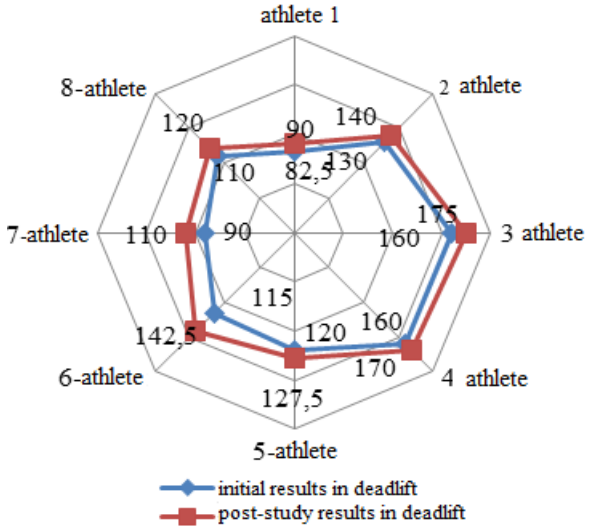

Figure 3: Diagram of changes in the results of athletes performing deadlift before and after the study

The curve “changes in the athletes’ results in deadlift before and after the study performed” on Figure 3 shows the following changes: participant 6 has shown maximum improvement in this exercise - 27.5 kg (23.91%), participant 7 has also shown a significant improvement - 20 kg (22.22%), and participant 3 has improved his result by 15 kg (9.38%). The participants 2, 4 and 8 have improved their results by 10 kg (7.69%, 6.25%, and 9.09%).

Based on the results, presented in Figure 3, the participants 1 and 5 have shown the lowest improvement in weight - 7.5 kg (9.09% and 6.25%). The average growth of performances in this exercise was 11.74%.

Summarizing the performance of the exercises we may note that the compliance with the proposed combination of ergogenic medical and biological means of recovery by athletes resulted in the improvement in the exercises performed: squats with a barbell on the shoulders - 5 to 20 kg, bench press - 2.5 to 10 kg, and deadlift - 7.5 to 27.5 kg.

Considering the total result in these three exercises, shown in competition, we can see that the first athlete improved his results from 205 kg to 225, increasing it by 9.76%. The second athlete got 335 kg for three exercises in aggregate at the end of the study, improving his result by 22.5 kg (7.2%). The third athlete has improved his total result by 35 kg (9.15% increase). The fourth powerlifter has improved his total result from 382.5 kg to 407.5 kg, that is, by 6.54%. Athletes 5 and 8 have shown similar results for three exercises in aggregate: they increased their initial weight of 285 kg by 22.5 kg (7.89%). Powerlifters 6 and 7 had better results improved by 17.21% and 17.33%, respectively.

SUMMARY

Our findings obtained confirm the hypothesis that the increase in the initial values is the result of taking the given group of means of recovery that effectively accelerate the processes of recovery after exercises, increasing physical endurance and performance.

The results of our study are aimed at further improvement of training system of athletes in powerlifting within a major cycle of training process subject to combined use of means of recovery. Different conditions created prior to, during and after physical activity, affect the recovery of the body and have beneficial effect on physical performance. The maximum means of recovery were prescribed to be used during the preparatory, base, and pre-contest periods. This is due to the fact that powerlifters become more vulnerable psychophysiologically when reaching their top form, and careless use of means of recovery may reduce their competition results.

CONCLUSION

Analyzing the scientific and methodological literature on the topic of our research, we have developed a set of means of recovery to enhance physical performance in powerlifters. We approbated this set within the framework of the pedagogical experiment. To study the effect of means of recovery on the dynamics of physical performance in athletes, we have defined the initial level of physical performance in powerlifters, and further analyzed the dynamics at the end of the experiment. We concluded that the use of pharmacological means in the proposed combination affects significantly the physical recovery of powerlifters. We will, however, continue searching for a combination that promotes further improvement in physical performance of powerlifters and has beneficial effect on the health of athletes.

ACKNOWLEDGEMENTS

The work is performed according to the Russian Government Program of Competitive Growth of Kazan Federal University.

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