

Use of non-traditional recovery means to improve performance of 11-12-year-old athletes specializing in rowing and canoeing

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Abstract:

The aim of the work was to substantiate the effectiveness of the use of autogenic training, medicinal plants and Shilajeet for the restoration of working capacity and improving the functional status of young rowers 11-12 years old. Material and methods. 43 young rowers aged 11–12 years old (girls) took part in this study, whose average height was 152.3 ± 5.2 cm; average weight - 39.01 ± 6.5 kg. The subjects were divided into 4 groups, equal ($p > 0.05$) in terms of physical and functional fitness; 3 experimental groups, 1 control group. In the first experimental group, massage was applied with a rubbing of herbal ointment and Shilajeet; in the second experimental group, the use of herbal balm and Shilajeet was used; in the third experimental group, autogenic training was used. Novakki test was used on bicycle ergometer before and after the main experiment, which lasted 8 weeks. The perceived heaviness of work was evaluated on a Borg scale at the end of each step and immediately before the end of the work. Simultaneously recorded heart rate. Results. It has been shown that the intake of balm in medicinal herbs and Shilajeet has a stimulating and tonic effect on organism. The use of these components in ointments for massage has a relaxing and regenerating effect. Auto-training has a less pronounced stimulating and restorative effect. Conclusions. In the training process of young rowers, it is advisable to use all the means investigated in this work, since they substantially complement and reinforce each other.

Key words: rowing, recovery, means, non-traditional, performance, psycho-training.

Introduction

Large “sports stars” grow out of small ones. What is needed to do this? Probably work, overcoming oneself, effective methods of training. But, in addition – also the responsiveness of the coach, an individual approach to each and a great work ability, which allows to carry high intensity loads of modern sports (Aamot, Forbord, Karlsen, & Stoylen, 2014; Kozina, Nikolayeva, Popov, Oleinik, Glyadya, & Vasilyev, 2018; Kozina, Shepelenko, Osipov, Kostiukevych, Repko, Sobko, et al., 2017; Kozina, Iermakov, Bartik, Yermakova, Michal, 2018). This requires effective recovery methods, especially since the main adaptation processes occur during rest. And the young contingent is concerned first and foremost, because overtraining and prolonged inadequate recovery are especially dangerous for them: over-played athletes are often traumatized, they throw sports due to health disorders, and future stars go away (Kozina, Sobko, Kozin, Garmash, 2018; Lamb, Eston, Corns, 1999; Selig, Borg, Runciman, La Gerche, Davison, Coquart, & Eston, 2017; Ulmer, 1979).

In the last 10-15 years in the practice of sports, general and private methods of using rehabilitation means have been tested (Kovářová, Pánek, Kovář, Hlinčík, 2015; Kozina, Iermakov, Kuzmin, Kudryavtsev, & Galimov, 2016; Kozina, Kozuhar, Sobko, Vaksler, & Tihonova, 2015; Kozina, Iermakov, Bartik, Yermakova, Michal, 2018). The complex use of pedagogical, pharmacological and physiopsychological means accelerates the processes of recovery, increases general working capacity, allowing to perform a large total amount of training load, provides prevention of overwork and improves the processes of adaptation of the organism to adverse effects of the environment (Kozina, Kalinichenko, Cretu, Osipov, Kudryavtsev, Polishchuk, Ilnickaya, & Minenok, A., 2018; Kozina, Sobko, Kozin, Garmash, 2018).

The use of recovery facilities is strictly individual, with the obligatory consideration of goals, objectives and stages: the training process, as well as climatic and geographical conditions for the athletes. Lately, new ideas and approaches to the use of rehabilitation tools are widely discussed in the literature. The perspective

possibility of influencing the means of restoration on the links of the functional system, which is not conducive to causes the appearance of fatigue (Borg, 1982; Borg, 2016; Kozina, Shepelenko, Osiptsov, Kostiukevych, Repko, Sobko, ...Mulik, 2017).

Experimental data confirming the expediency of using the previous stimulation to mobilize the reserve capacity of the organism before the beginning of the training session and in the rest of the rest between the individual exercises. This allows you to increase the intensity of work, its quality, which is especially important when performing sprint exercises, as well as the total amount of training work (Williams, 2017).

It has been established that the performance of athletes in the process of performing a series of training loads depends on the combination of fatigue and recovery processes. Active influence on recovery processes is no less important task than selecting the best means and methods of training. In this regard, the modern concept of sports training examines the training load and subsequent special restoration measures as two integral parts of a single process (Kozina, Sobko, Kozin, Garmash, 2018; Kozina, Kozuhar, Sobko, Vaksler, & Tihonova, 2015).

The scientifically grounded use of various restorative remedies is closely linked to the specifics of the training process, allows it to significantly improve its quality, avoid overloads to prevent overdosing and over-training.

However, excessive seizure of means or restoration of their inefficient use against the background of methodologically incorrect planning of the training process can not only discredit the very idea of using recovery procedures, but also damage the health of athletes. In each particular case, the options for planning restorative effects depend on the structure of the training load of this microcycle (Kozina, Sobko, Kozin, Garmash, 2018). Apparently, in this regard, all variants of schemes of rehabilitation measures can not be envisaged. However, sports practice shows: if the coach is familiar with the main principles of planning special restoration measures, he, together with the doctor, can develop programs of rehabilitation complexes, taking into account the specific tasks and content of a particular microcycle.

According to researchers (Champaign, 1998; Chen, Fan, Moe, 2002; Compagnat, Salle, Mandigout, Lacroix, Vuillerme, & Daviet, 2018), the value of training loads of one or another direction can be objectively evaluated on the basis of informative indicators that determine the development and degree of compensatory fatigue. One of the most effective means of rehabilitation of athletes is psychophysical and autogenous training, and one of the most potent products on the human body is natural balms, in particular, medicinal plants and Shilajeet (Kozina, Sobko, Kozin, Garmash, 2018). Unlike chemicals, they do not have side effects. However, their use in sports is still poorly understood.

Therefore, in the given research the following hypothesis was advanced: the complex application of non-traditional psychological, pedagogical, medical and biological means of restoration will positively influence the functional condition of young rowers 11-12 years old.

The purpose of the work – to substantiate the effectiveness of the use of autogenic training, medicinal plants and Shilajeet for the restoration of working capacity and improving the functional status of young rowers 11-12 years old.

Material and methods

Participant

In total, 43 young rowers 11-12 years old (girls) participated in this study, the average height of which was $152,3 \pm 5,2$ cm, the average weight - $39,01 \pm 6,5$ kg.

Experiment progress

The subjects were divided into 4 groups, approximately equal ($p > 0,05$) on the indicators of physical and functional preparedness (Table 1). The three groups were experimental, in which different means of recovery were used. In the first experimental group was used massage with rubbing ointment on herbs and Shilajeet (Kozina, Sobko, Kozin, Garmash, 2018; Kozina, Iermakov, Kuzmin, Kudryavtsev, & Galimov, 2016) (Table 1), in the second experimental group was used of balsam from medicinal herbs and Shilajeet was used; in the third experimental group was used autogenous training (psychotraining) (Kozina, Iermakov, Bartík, Yermakova, Michal, 2018) (Table 1). Psychotraining was conducted after training, autotraining - on their own, individually, at will. Autogenous training (psychotraining), if desired, was accompanied by musical design. The control group trained without the use of means of recovery (Table 1). Thus, for solving the problems of increasing the efficiency of regeneration and improving the efficiency of rowers, a technique was developed for the application of natural balms based on Shilajeet and medicinal plants, as well as the practice of psychotraining (autogenous training).

To test the effectiveness of the use of non-traditional means of recovery, the Novakki test was applied on a bicycle. The subjects performed the work twice - before and after the main experiment, which lasted 8 weeks. The speed of the pedal was $60 \text{ rotate} \cdot \text{min}^{-1}$. Feeling difficult to work was assessed on the Borg scale at the end of each degree and immediately before the end of work (Borg, 2016; Dobelt, Borg, Maurer, & Voigt,

2015). At the same time, was recorded heart rate (Johnson, Close, Gillon, Molassiotis, Lee, Farquhar, & Brig, 2016; Kovářová, Pánek, Kovář, Hlinčík, 2015).

Modified method of psychotraining (autogenous training)

Psychotraining is a psychological session with a psychologist, and an autogenous training is an independent psychological exercise. In our case, psychological exercises began with psycho-training, gradually moving into autogenous training (Kozina, Sobko, Kozin, Garmash, 2018; Kozina, Iermakov, Kuzmin, Kudryavtsev, & Galimov, 2016; Kozina, Iermakov, Bartík, Yermakova, Michal, 2018).

From the experience of carrying out autogenous training according to the classical scheme it is known that the learning process of this practice is very complex and time consuming. In addition, far from all athletes master this practice. The greatest effect in the application of autogenous training is achieved in the last stages of practice, with the emergence of images and bright dreams. However, this stage does not come at once, although it is most effective in influencing the processes of relaxation. Therefore, we in a real study developed a method of autogenous training, slightly different from the traditional one. The traditional method of autogenous training involves the gradual concentration on different parts of the body in order to induce feelings of warmth, weight, ease, etc., there. According to some authors, this type of autogenous training leads to excessive activation of consciousness and the subsequent stress, and not the relaxation of the muscles, and the desired effect of relaxation is not achieved. For this reason, the method of autogenous training, which is a powerful means of relaxation, recovery and psychological training, is not widely used.

When developing a modified method of autogenous training, we were based on the fact that many athletes are characterized by developed abstract thinking, since their training often passes in the zone of nature, in particular, on the water. Therefore, it is not difficult for them to think of creating any image and gradually "to merge" with him, although according to literature - this is the highest degree of possession by the method of autogenous training. In addition, the imaginary observation of natural images is the most ancient and natural for human practice relaxation. The description of the technique of "appeasement of thoughts" in ancient treatises on physical culture, mainly - from martial arts, built on the description of natural images that smoothly change each other and follow from each other. The simplest example of an autogenous training for children - a lullaby - is often built on the principle of describing the process of falling asleep of nature - birds, animals and even elements.

Based on the above-mentioned provisions, we have developed an autogenous training method that is fairly simple, accessible and provides a quick, deep and lasting relaxation effect. The essence of the technique is the repetition by the instructor or athletes of a text that describes the alternation of natural images. The language of the text of the autogenous training should be the most accessible to everyone.

When continuing the psycho training session, the instructor, the trainer himself, or the trainee, may arbitrarily include the alternation of natural images that naturally arise in thoughts already during the first sessions of practice. Autogenic training can be conducted with music that is most suitable for those practicing.

When applying this technique of psychotraining or autogenous training, its text may vary quite broadly, but in order to achieve the desired effect, it is necessary to adhere to the basic principles:

1. The best effect of relaxation is achieved when creating the image of a large landscape of nature, that is, "huge ocean", "deep river", "lawn with a lot of flowers," "starry sky," etc.
2. Images of nature should be beautiful, easy to perceive, familiar with everyday life.
3. The text of psychotraining is selected in such a way that, in its practice, there is a gradual process of immersion into a natural image and merging with it.

Method of application of Shilajeet, medicinal plants, cooking and application of Shilajeet and medicinal plant ointment (Kozina, Sobko, Kozin, Garmash, 2018; Kozina, Iermakov, Kuzmin, Kudryavtsev, & Galimov, 2016)

The study used purified Shilajeet. Shilajeet was blended with concentrated condensed resin-based aqueous extract of medicinal plants (Hypericum perforatum, Artemisia absinthium, Origanum vulgare, Urtica dioica, Tanacetum vulgare, Mentha piperita, Tussilago and Quercus robur) was used at 0.5 g 3 times a day. Ointment from Shilajeet and medicinal plants was made according to the author's technique (Patent No. 77155). Ointment from Shilajeet and medicinal plants was applied with a thin layer during massage. The massage was conducted by a trainer or a massager after each workout, which took place 3-4 times a week.

Method of subjective evaluation of physical load

Different methods exist for quantifying the subjective estimation of the perceived stress intensity. The method of estimating the intensity of physical activity on subjective sensations was elaborated in detail by the Danish researcher G. Borg (Johnson, Close, Gillon, Molassiotis, Lee, Farquhar, & Brig, 2016; Kovářová, Pánek, Kovář, Hlinčík, 2015). In the actual study, one of the scale created by them was used, which is a series of verbal (qualitative) characteristics of the subjective perception of the stress of the load (6-8, very, very light; 9-10-very light; 11-12-light; 13- 14-middle, 15-16-heavy, 17-18-very heavy, 19-20-very, very heavy), which corresponds to their quantitative characteristics from 6 to 20, with qualitative verbal characteristics corresponding to odd

numbers (Marcora, Staiano, 2010; Selig, Borg, Runciman, La Gerche, Davison, Coquart, & Eston, 2017; Thirer, Knowlton, Sawka, Chang, 1978).

In this scale, verbal definitions correspond to the numerical values (from 6 to 20). In determining the values of subjective assessment of perceived tension in this scale and other physiological parameters, the value of the correlation coefficient was added 0.8-0.9. Digital scale values from 6 to 20 may indicate a heart rate of 60 to 200 beats·min⁻¹. This facilitates its use, because the defined values of the scale will approximate the heart rate. For example, the score of 13 will correspond to a heart rate of 130 beats·min⁻¹. The application of this categorical scale provides good inter-individual comparisons. Currently, this scale is translated into many languages and is the most popular. The test performed work at a given power and subjectively evaluated the heaviness of work.

Determination of the performance of athletes

The determination of the cardiovascular system performance was carried out with the help of the continuous monitoring of the heart rate monitor "Polar". Thus, during the experiment, the experimenter had an idea of the state of the cardiovascular system of the subject.

The subjects were examined with a step-by-step incremental load on a bicycle scanner according to the Novaki method (Kozina, Sobko, Kozin, Garmash, 2018). This method consists in testing the given initial load power equal to the weight of the athlete. Every 2 min. the power increases by the weight of the athlete up to the refusal. The performance assessment was carried out according to the number of load levels, total work, which was calculated as the sum of the products of the weight of the athlete to the degree number and the time of work at this stage. The heart rate and subjectively perceived tension were retested at the end of each degree of work. After the work, the heart rate was recorded at 2, 4 and 6 min. restoration. Recovery efficiency was calculated similar to the methodology for calculating the Gvardar step-test index (ISTS) modified to Novakki's test (1):

$$IGST = \frac{t * 100}{(f_1 + f_2 + f_3) * 2} \quad (1)$$

where:

IGST - The Harvard Step-Test Index modified to the Novaki Test

t - time in minutes, f₁, f₂, f₃ - heart rate (HR) for 30 seconds with 2nd, 3rd and 4th minutes of recovery respectively (Kozina, Sobko, Kozin, Garmash, 2018).

The subjects performed the work twice - before and after the main experiment, which lasted 8 weeks. The speed of the pedal was 60 rotate·min⁻¹. The subjective evaluation of physical load was assessed on the Borg scale at the end of each degree and immediately before the end of the work. At the same time, was recorded heart rate.

Statistical analysis

The results obtained in this study were processed using appropriate well-known mathematical and statistical methods. Averaged data values for each degree of work received from the last degree. The prevalence of intergroup and intragroup differences according to the Student's t-criterion was determined. Differences were considered to be significant at p<0.05.

Table 1. Characteristics of the groups tested in the pedagogical experiment

Group	Means of recovery	Characteristics of Means of recovery
1 experimental	medical-biological	Massage after training with ointment on herbs and Shilajeet
2 experimental	medical-biological	Reception every morning in the water extract of medicinal plants from Shilajeet (mumijo)
3 experimental	psychological	Psychotraining, autogenous training
control	No special Means of recovery were used	

Results

The results of the conducted research clearly showed the effectiveness of using non-traditional psychological method of restoration of work capacity, both medicinal plants and Shilajeet for restoration of workability of young rowers and increase their level of trenirovannosti. However, the effect of using these methods was different for all three experimental groups.

Analysis of the relationship between work time and heart rate showed that both psychotraining and the use of ointments and balsam on medicinal herbs and Shilajeet, lead to a decrease in heart rate at each stage of work and increase the maximum working time (Table 2, 5), which was observed in all three experimental groups, while in the control group these changes were expressed much less. However, it was also found that heart rate decreased more significantly in 1 experimental and 3 experimental groups, compared to the 2

experimental groups, which showed the highest rates of increase in capacity for work (Table 2, 5). In addition, in the first experimental group, the subjective evaluation of the load after the experiment on the time worked was the most significantly reduced (Table 2), despite the fact that the maximum working capacity did not grow as significantly as in the 2nd experimental group. It is known that subjective tired feelings are connected, first of all, with feelings in working muscles. And since the action of massage with ointment is aimed, first of all, on muscle, it is logically the most significant decrease in the subjective evaluation of the load relative to the time of work is in the 1st experimental group. These facts indicate a predominantly relaxing and restorative effect of psychotraining and massage with ointments on medicinal herbs and Shilajeet.

Table 2. Novakki test data, recorded at the end of each degree, in the three experimental and control groups of rowers 11-12 years before and after the experiment

Group	No. Degree	Working time, min $\bar{x} \pm S$		HR, beats·min ⁻¹ $\bar{x} \pm S$		Subjective evaluation of physical load, points $\bar{x} \pm S$		
		before experiment	the after experiment	the after experiment	the after experiment	the after experiment	the after experiment	the after experiment
1 experimental	1	2.0±0.0	2.0±0.1	132.2±8.7	132.2±11.2	10.1±0.5	7.0±0.1	
	2	3.4±0.6	2.3±0.5	144.3±9.5	114.5±9.6	12.2±0.4	8.2±0.4	
	3	4.2±0.4	4.6±0.6	162.0±11.4	162.5±12.4	13.2±0.6	11.1±0.5	
	4	6.9±0.3	6.7±0.4	190.1±15.1	174.1±10.4	13.7±0.6	12.3±0.6	
	5	8.5±0.2	8.7±0.2	216.2±16.2	204.3±11.6	16.3±0.9	16.2±1.2	
	6	9.3±0.8	10.5±0.6	230.1±25.1	216.2±9.8	18.3±1.1	18.6±1.2	
2 experimental	1	2.0±0.9	2.0±0.0	120.1±9.2	126.4±8.2	11.0±0.8	9.0±0.5	
	2	3.4±0.5	4.1±0.1	150.3±8.1	153.3±8.7	11.5±0.9	11.5±0.5	
	3	5.2±0.5	6.2±0.0	171.4±12.4	174.4±15.6	13.2±0.8	14.2±0.6	
	4	7.0±0.3	8.3±0.5	189.0±15.1	186.2±11.2	14.2±1.0	16.3±0.8	
	5	9.1±1.1	10.1±0.4	207.0±14.2	198.1±13.2	16.1±1.1	17.1±0.7	
	6	9.75±0.7	11.75±0.6	216.4±17.2	227.3±12.2	18.3±1.2	19.2±1.2	
3 experimental	1	2.0±0.2	2.0±0.0	145.2±11.1	124.1±7.3	11.1±0.6	9.0±0.7	
	2	3.7±0.9	3.1±0.1	161.1±12.4	128.6±9.4	12.6±1.1	9.8±0.6	
	3	5.4±0.8	5.1±0.1	165.6±15.3	150.8±10.3	14.1±1.2	12.4±0.9	
	4	7.4±0.8	6.5±0.2	198.3±10.2	164.5±11.1	15.9±1.2	14.6±1.0	
	5	8.9±1.0	8.9±0.5	210.2±14.5	192.5±14.2	17.1±1.3	15.9±1.1	
	6	-	10.4±0.4	-	214.2±15.1	-	17.6±1.0	
control	1	2.0±0.0	2.0±0.0	132.2±10.2	120.1±8.3	10.2±0.8	9.0±0.2	
	2	3.2±0.5	3.1±0.1	114.1±16.3	150.2±7.2	11.1±0.5	11.2±0.4	
	3	4.1±0.8	5.3±0.2	162.1±12.2	171.4±12.3	12.6±1.0	12.4±0.8	
	4	6.0±0.7	7.0±0.1	174.1±11.4	189.1±13.2	14.1±0.9	14.6±0.9	
	5	8.2±0.8	9.2±0.5	204.2±12.3	207.3±14.1	15.9±0.8	15.9±1.2	
	6	9.3±0.6	9.75±0.6	216.1±15.5	216.2±14.2	17.1±1.2	17.6±1.3	

In favor of this circumstance, the detection of the highest rates of the IGST, which reflects the efficiency of rehabilitation processes in the first experimental group, which after the experiment increased by 100.0% compared with 34.7%, 24.5% and 9.0% in the second, third experimental and control groups respectively (Table 5). The increase in the ISTT is reliable ($p < 0.01$) in all three experimental groups, while in the control, this increase is unreliable (Table 5).

At the same time, it can be noted that the use of balsam acts mainly stimulating, because it is in the second experimental group the most pronounced increase in maximum working time, the values of total work and total relative work. Thus, the maximum working time in the 2nd experimental group increased by 20.5% compared with 12.5% in the first experimental and 17.7% in the 3rd experimental group (Table 5), which is probable at $p < 0.001$ for the 1st and 2nd experimental groups and at $p < 0.01$ for the 3rd experimental group. In the control group, an increase in the maximum working time was unreliable (Table 5). The total work in the second experimental group increased by 39.44% compared with 23.58%, 35.8% and 21.6%, respectively, in the 1st, 3rd experimental and control groups. In all four study groups, this increase was significant, but in experimental groups $p < 0.01$ and in the control group $p < 0.05$. Relative total work also increased the most significantly in the 2nd experimental group (37.3% compared with 23.3%, 35.3% and 13.4% in the 1st, 3rd experimental and control groups). The increase in the relative total work is reliable for all experimental groups at $p < 0.01$, and is unreliable for the control group (Table 5).

With another form of application of medicinal plants from Shilajeet, that is, at massage with ointments on these components, their action becomes more relaxing and restorative, as evidenced by the greatest increase

in the values of the IHST in the 1st experimental group (Table 5), as well as the most pronounced difference reduction in heart rate after work on comparison with preexperimental parameters in the 1st experimental group (Table 5). The obtained data indicate that massage with ointments on herbs and Shilajeet causes a more restorative and relaxing effect than the use of herbs from Shilajeet and the method of non-traditional psychotraining, which both in terms of restorative activity and stimulatory action is in second place (tabl. 2, 4, 5). This fact also shows that recovery processes depend to a greater extent on the state of muscles, that is from "peripheral" factors, than from the general activity and tone of the organism, that is, "central" factors, because massage with external application of medicinal plants from Shilajeet causes more restorative effect than taking herbal balm and Shilajeet inside, which in turn has a more tonic effect.

Table 3. The value of the correlation coefficients between the heart rate and the subjective perceived stress intensity when performing the Novak test by young scumbagers 11-12 years before and after the experiment

Group	r HR – Subjective evaluation of physical load before the experiment	r HR – Subjective evaluation of physical load after the experiment
1 experimental	0.90	0.92
2 experimental	0.87	0.97
3 experimental	0.91	0.83
control	0.88	0.89

Table 4. Characteristics of heart rate at 2nd, 4th and 6th minutes of recovery after the Novakki test by rowers 11-12 years of experimental and control groups

Group	Recovery time, min.	HR before the experiment, beats·min ⁻¹ $\bar{x} \pm S$	HR, after the experiment, beats·min ⁻¹ $\bar{x} \pm S$
1 experimental	2	177.5±15.5	129.3±7.5
	4	135.2±12.3	111.4±6.2
	6	126.1±11.1	105.2±5.1
2 experimental	2	150.5±8.6	132.5±8.1
	4	138.0±7.4	126.9±6.4
	6	126.4±6.8	111.2±4.2
3 experimental	2	139.1±9.4	134.6±8.8
	4	128.5±6.2	118.1±6.1
	6	119.6±5.1	113.8±4.2
control	2	150.1±9.2	139.4±9.1
	4	138.2±8.1	128.8±5.2
	6	126.3±6.6	119.4±4.2

Analysis of the relationship between heart rate and subjectively perceived tenseness of work in the test of Novakki showed that after conducting a pedagogical experiment, the relationship between heart rate and subjective assessment of the value of the load practically did not change in all four groups studied (Table 3). This is due to a decrease in both heart rate and subjective perceived stress (Table 3) in the Novakki test after a pedagogical experiment. It should also be noted that the values of the maximum heart rate recorded during the Novakki test far exceed literary data [28], according to which the maximum heart rate is 220-age beats·min⁻¹. Similar facts were noted by other authors. In the actual study, the mean values of the maximum heart rate in the 1 experimental group were 230.1 ± 25.1 beats·min⁻¹ before the experiment and 216.2 ± 9.8 beats·min⁻¹ after the experiment; in the 2 nd experimental group, 216.4 ± 17.2 beats·min⁻¹ before the experiment and 227.3 ± 12.2 beats·min⁻¹ after the experiment, in the 3rd experimental group they were 210.2 ± 14.5 beats·min⁻¹ for the experiment and 214.2 ± 15.1 beats·min⁻¹ after the experiment; in the control group they were 216.1 ± 15.5 beats·min⁻¹ for the experiment and 216.2 ± 14.2 beats·min⁻¹ after the experiment. The obtained data indicate that the maximum heart rate, recorded in experimental conditions, far exceeds the values derived from the generally accepted formula. In addition, the spread of these values is quite high, which suggests the inexpediency of orientation only on heart rate when determining the intensity of the load in the training process of young rowers. Substantial addition of this indicator is a subjective assessment of the stress of the load. High rates of correlation coefficients (0.87-0.97) (Table 3) were detected between the heart rate and the subjective assessment of the load, despite the large spread of heart rate values. However, the value of the correlation coefficients obtained in this experiment, due to the high rate of heart rate, is slightly lower than in studies of physiological and psychological

responses to the burden of adult rowers. The obtained data show the expediency of using the method of controlling the strain of stress on the subjective feelings of athletes in the training process of rowers 11-12 years old. After conducting a pedagogical experiment, the relationship between heart rate and a subjective estimate of the value of the load slightly increased in the 1, 2 experimental and control groups (Table 3). Obviously, this is due to a decrease in the rate of heart rate after a pedagogical experiment, and also - with an increase in the functional relationship between physiological and psychological parameters under the influence of natural balms.

The exception is the 3 experimental group, in which the relationship between heart rate and Subjective evaluation after the experiment was slightly lower than before (Table 3). This can be explained by a decrease in the sensitivity of the nervous system to discomfort caused by exercise, under the influence of psycho- and auto-training. Therefore, it is possible to recommend an unconventional method of psycho- and auto-training to reduce unpleasant sensations during exercise and increase the adaptive and restorative capabilities of the body. The expressive decrease in the values of the subjective estimation of the value of the load in the 3 experimental group after the pedagogical experiment also confirms the relaxing and restorative effect of the unconventional method of psychotraining and autogenous training (Table 2).

Table 5. Indicators of performance and recovery in the Novakki test for rowers 11-12 years before and after the experiment

№	Test Indicators	Novakki group	Before the experiment	After the experiment	Difference	Growth, %	t	p
			$\bar{x} \pm S$	$\bar{x} \pm S$				
1	Maximum working time, min	1 experimental	9.33±0.8	10.5±0.6	1.17	12.5	7.0	<0.001
		2 experimental	9.75±1.1	11.75±0.7	2.0	20.5	9.1	<0.001
		3 experimental	8.86±0.65	10.43±1.9	1.57	17.7	4.46	<0.01
		control	9.2±0.41	9.6±1.24	0.4	4.3	0.98	>0.05
2	Total work, A, kg·m·min ⁻¹	1 experimental	1134.2±89.2	1401.7±78.1	267.5	23.58	6.41	<0.01
		2 experimental	1267.3±87.6	1714.6±96.8	447.3	39.44	8.51	<0.01
		3 experimental	953.6±54.1	1295±75.8	341.4	35.8	4.45	<0.01
		control	1056.1±45.6	1285.2±56.3	229.1	21.6	3.4	<0.05
3	Relative total work, kg·m·min ⁻¹ ·kg ⁻¹	1 experimental	27.0±4.6	33.3±3.5	6.3	23.3	4.75	<0.01
		2 experimental	29.5±7.6	40.5±2.8	11.0	37.3	8.26	<0.01
		3 experimental	24.3±3.65	32.9±6.54	8.6	35.3	4.31	<0.01
		control	26.8±3.47	30.4±5.21	3.6	13.4	1.68	>0.05
4	IGST, c.u.	1 experimental	0.8±0.4	1.6±0.00	0.8	100.0	5.94	<0.01
		2 experimental	1.18±0.68	1.59±0.14	0.41	34.7	5.61	<0.01
		3 experimental	1.14±0.01	1.42±0.04	0.28	24.5	4.78	<0.01
		control	1.1±0.03	1.2±0.05	0.1	9.0	0.56	>0.05

Discussion

The research confirms the results of preliminary data on the effectiveness of the use of non-traditional means of recovery of disability (Kozina, Sobko, Kozin, Garmash, 2018; Kozina, Iermakov, Kuzmin, Kudryavtsev, & Galimov, 2016). But it should be noted that previous studies were conducted on adult athletes. We have received data, which testify to the effectiveness of the use of non-traditional means of restoration in children's sports. These data are new.

As an unconventional form of psycho-training (Kozina, Iermakov, Bartik, Yermakova, Michal, 2018), and massage with ointments on medicinal herbs and Shilajeet (Kozina, Sobko, Kozin, Garmash, 2018), and the use of balsam on medicinal herbs and Shilajeet, promote the performance of young athletes, but this effect is most pronounced in the 2 nd experimental group, tested who used herbal balm and Shilajeet, which indicates the stimulatory effect of the intake of herbs in combination with Shilajeet. The data obtained confirms the results of medical and biological studies on the effect of Shilajeet as the strongest biostimulant and adaptogen. In a valid study, its stimulatory effect in combination with medicinal plants of a general nature is revealed.

We believe that it is better to use Shilajeet just in conjunction with medicinal herbs for a child's contingent of sportsmen, because in this case, on the one hand, the range of action of Shilajeet is expanded by an additional effect of increasing its absorption and gain through medicinal plants, because medicinal plants themselves strengthens and enriches the body, and in combination with Shilajeet, they work as a means of transporting Shilajeet and securing it. On the other hand, the sharp and rapid action of Shilajeet persists for a longer time when it is combined with medicinal plants.

Thus, we can conclude that all investigated means of recovery, both psychological and medical and biological, complement each other and in the practice of the training process it makes sense to apply all the investigated means as a single complex. The unconventional form of psycho- and autotraining implies the abstract perception of beautiful and vivid natural images, which amplifies and supplements the effect of natural

balms on the recovery of young rowers and the associated increase in work capacity. Until a real study, the effect of Shilajeet on the recovery of young athletes has not been studied.

Shilajeet and medicinal plants passed the exam by time (Kozina, Sobko, Kozin, Garmash, 2018). That's why it's really useful stuff. The presence in the Shilajeet of zomeladinic acids, humic bases, a large number of trace elements, balanced on their physiological effects on humans, suggests that the results obtained by many researchers will be widely used in both medical and sporting practice. Medications created by nature are similar in structure of the human body, and are closely interrelated with the psyche, consciousness and nervous system. This is evidenced by centuries-old traditions and experience of folk medicine. That is why in this study Shilajeet and medicinal plants were used in conjunction with a special practice of influence and self-influence on consciousness, that is - with psychotraining and autogenic training, the method of which was slightly changed in comparison with the classical scheme in order to accelerate and deepen the processes of relaxation and reassurance, as well as to create an opportunity for quick learning for autogenous training and independent practice.

Thus, the study showed that the use of balsam on medicinal herbs and Shilajeet has an effect on the body that stimulates and tones. This is evidenced by an increase in performance in the Novakki test. The use of these components in the ointments during massage provides a relaxing and restorative effect, as evidenced by an increase in recovery rates. Psycho-and autotraining does, although reliable, but less pronounced both stimulating and restorative effect, and its recovery effect is more pronounced. Application of psychotraining leads to a decrease in the relationship between heart rate and subjective perception of the load due to decreased sensitivity of the nervous system to feelings of discomfort in muscle activity.

In this regard, in the training process of rowers, it is expedient to use all the means investigated in this work, because they essentially complement and reinforce each other.

It is expedient to carry out an autogenous training in the form of an imaginary observation of beautiful, harmonious, rather easily perceived natural images, perhaps - for pleasant music (optional) from 1 to 7 times a week, depending on the individual characteristics of practitioners.

To improve the efficiency of recovery processes, you can use a massage with ointments on herbs and Shilajeet, which is performed after each workout. The ointment is applied with a thin layer on the muscles of the legs, arms, back (if necessary) after the previous massage movements and then completely rubbed with the next massage.

To stimulate the ability to work, you can use a water extract of medicinal plants from Shilajeet in the form of resin-like extract (0.5 teaspoonful 1-2 times a day) or infusion of a mixture of herbs in equal proportions: Hypericum perforated, Artemisia absinthium, Origanum vulgare, Urtica dióica, Tanacétum vulgáre, Méntha piperíta, Tussilágo and Quercus róbur 1 tablespoon per 1 glass of water with 0,1-0,2 g Shilajeet.

Conclusions

It has been found that the use of balsam on medicinal herbs and Shilajeet has an effect on the body that stimulates and tones up, as evidenced by an increase in performance in the Novakki test. The use of these components in the ointments during massage provides a relaxing and restorative effect, as evidenced by an increase in recovery rates. Psycho-and autotraining does, although reliable, but less pronounced, both stimulating and restorative effect, and its restorative effect is revealed more strongly. Application of psychotraining leads to a decrease in the relationship between heart rate and subjective assessment of the value of the load due to a decrease in sensitivity of the nervous system to feelings of discomfort in muscle activity.

In this regard, in the training process of rowers, it is expedient to use all the means investigated in this work, because they essentially complement and reinforce each other.

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Conflict of interest

The authors state that there is no conflict of interest.

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