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Efficiency of a Variant of Physical Rehabilitation with Fitness Elements for Diabetes Mellitus Type I and Abdominal Obesity

Pravdov MA[1*], Kornev AV[2], Alifirov AI[2], Shutov AN[1] and Osokina EA[1]

1Department of Physical Culture, Ivanovo State University (Shuya Branch), Shuya, Russia

2Department of Theory and Methods of Physical Culture and Sports, Russian State Social University, Moscow, Russia

***Corresponding author:** Pravdov MA, Department of Physical Culture, Ivanovo State University (Shuya Branch), Shuya, Russia, E-mail: ilmedv1@yandex.ru

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Abstract

Patients with type I diabetes mellitus and abdominal obesity have recently been encountered more often. Only drug treatment of this category of patients rarely gives a significant positive effect. In this regard, modern medicine is increasingly turning to non-pharmacological methods of physical rehabilitation of these patients. Active physical activity plays an important role in maintaining normal body weight and blood sugar levels. The therapeutic effect of physical exercises in abdominal obesity in patients with diabetes mellitus is mainly due to the mechanism of trophic action. Active muscular activity improves metabolic processes in tissues and stimulates regeneration processes. Due to this, physical exercises exert a general toning effect on this contingent of patients and normalize the processes of nervous and endocrine regulation in them, promote the restoration of normal motor-visceral reflexes. As a result of the study, it was revealed that in the experimental group receiving physical loads according to the author's scheme, by the end of the observation, a more pronounced positive dynamics of the level of arterial pressure, pulse rate was achieved. This was accompanied by more pronounced positive changes in psychological indicators in the experimental group. As a result of physical rehabilitation, the blood glucose level in both groups of patients decreased. At the same time, he completely normalized only in the experimental group, excluding the progression of complications of hyperglycemia in her. Only in the experimental group was achieved the normalization of the body mass index, which indicated the elimination of the persons who made up abdominal obesity and the normalization of lipid metabolism against the background of optimization of carbohydrate metabolism.

Keywords: Physical rehabilitation; Diabetes mellitus type I; Abdominal obesity; Average age; Health improvement

Introduction

Increased physical activity is an important addition to the medical treatment of many diseases [1,2]. When exercising, muscle mass increases [3-6], which increases the number of receptors on myocytes to insulin [7-9]. Also, regular exercise increases metabolic processes in the body [10-12]. This activates the body's intake of glucose [13], fat metabolism [14], enhances protein metabolism [15]. With the metered exercise load, the psycho-emotional state of a person is significantly improved [16]. In view of the presence of these effects of muscular exercise, exercise is recommended as a non-drug treatment of diabetes mellitus [17-20].

Given that people with diabetes are on treatment in the hospital for no more than 2 weeks, then it is extremely difficult to provide proper physical rehabilitation during these periods, and it is impossible to reduce body weight [21,22]. Increase the entire process of rehabilitation of these patients can be through physical exercise [23,24].

In the gym, the physical load is selected individually for patients [25]. For patients with type I diabetes mellitus, exercise can be used to load all major muscle groups in a short time. This approach helps strengthen the muscle corset of patients, improve the quality of life, keep blood sugar level at the lower limit of the norm after physical exertion, contributing to weight loss [26]. This is due to the fact that fitness in diabetes mellitus makes it possible to increase the sensitivity of insulin receptors of the cell to insulin [27]. This leads to the fact that sugar after exercise in the body of the patient falls. Under these conditions, it is possible to reduce the doses of drugs used to lower the blood glucose level [28]. In some cases, training with diabetes can even reduce the dose of insulin used for injections [29].

The purpose of the study was to develop and test a variant of physical rehabilitation with fitness elements for healing in patients with type I diabetes and abdominal obesity.

Materials and Methods

The study was approved by the local ethics committee of the Russian State Social University on September 15, 2016 (protocol No. 9). The study was conducted on the basis of the Russian State Social University in Moscow.

Under observation, 75 persons of both sexes aged 30 to 35 years were taken, including 50 people diagnosed with type I diabetes and abdominal obesity of 1 and 2 degrees and 25 people clinically healthy. Of the surveyed, 2 controls and one experimental group were formed. Control group-1 includes 25 clinically healthy people engaged in fitness. Control group-2 included 25 people suffering from type I diabetes and abdominal obesity, which are practicing according to the generally accepted method. The experimental group included 25 people with type 1 diabetes and abdominal obesity, who received physical rehabilitation with fitness elements according to the author's method, which included circular training.

The control group-1 was examined once. Assessment of the status of the control group-2 and the experimental group was carried out two times: at the end and after 2 months of rehabilitation.

The training program for the control group-1 included: a power program with free weights on the entire body; the number of lessons per week-3 times. All of them engaged in fitness for a long time under individual programs.

The training program for the control group-2 included: a power program with free weights on the entire body; the number of lessons per week-3 times. The scheme of their training is presented in Table 1.

Type of training	Exercises	Scheme (sets/repetitions)	Time of rest (min)	Weight of weigth (kg)
Training A	1. Leg press lying	3 × 10-12	3	20
	2. Leg extension sitting	4 × 8-12	3	5
	3. Push-ups from the crossbar	4 × 15-20	3	-
	4. Mixing in the simulator	4 × 8-12	3	3
	5. T-grip thrust with a narrow grip	4 × 8-12	3	2
Training B	1. Squats	4 × 10-12	4	-
	2. Hand removal in the simulator	4 × 10-16	3	12
	3. Leg bending in the simulator	4 × 10	3	10
	4. Gluteal bridge	4 × 25	2	-
	5. Twisting on the floor	4 × 10	3	-
	6. Draft of the horizontal block	4 × 15-5	3	10
	7. Swallow	4 × 10	2	-

Table 1: Training program for the control group-2.

This program uses basic, multi-joint exercises, which the practitioner can handle on his own. They are easy to carry out, carried out on simulators, which are difficult to get injured. This program provides rapid progression of loads and relatively rapid positive bodily changes.

The training program for the experimental group included circular training, the task of which was the withdrawal of the body to the anaerobic threshold, the intensification of fat burning processes and the activation of metabolism. It included a power program with free weights on the whole body with the number of lessons per week-3 times (Table 2).

Day of the week	Exercises	Dosage (repetition)	Weight of weigth (kg)	Rest time (sec.)
Monday	1. Leg extension in the simulator 2. "Hammer" with standing dumbbells 3. Leg bending in the simulator 4. Leg development in the simulator	15 20 15 15	10 10 10 15	60 seconds, after each lap
	Total 4 laps			
Wednesday	1. Squatting plie 2. Raising the legs in the simulator 3. Retracting the leg with weights 4. Raising the dumbbells lying	15 15 15 15	8 15 5 10	60 seconds, after each lap
	Total 4 laps			
Friday	1. Squats 2. Hyperextension 3. Thrust of the lower block to the waist 4. Raising the legs in the vise	20 15 15 12	- - 15 -	60 seconds, after each lap

	Total 4 laps			

Table 2: Training program for the experimental group.

All surveyed conducted a blood glucose measurement using a standard blood glucose meter; measurement of blood pressure and pulse with a semi-automatic tonometer; the body mass index was calculated. Also in all cases, an alarm was assessed on the Spielberger scale, consisting of forty questions. For each question there are 4 possible answers. After the survey, the sum of the points was calculated and the current level of anxiety was determined:

- Up to 30 points-low anxiety;

- 31-44 points-moderate anxiety;

- 45 or more points-high anxiety.

The data was statistically processed using the standard Microsoft Excel for Windows software package.

Results

At the end and at the end of the observation, the control group-2 and the experimental group were examined, which revealed the dynamics of the indicators taken into account. The results obtained are presented in Table 3. This allowed us to compare the results of the second survey between the experimental and the second control group, taking into account the parameters of the control group 1. It also helped determine the effect of the applied physical rehabilitation tools on the physiological and psychological indicators of the observed.

The indicators considered in the study	**Control group -2, n=25, M ± m**		**Experimental group, n=25, M ± m**		**Control group -1 (healthy), n=25, M ± m**
	exodus	at the end of observation	exodus	at the end of observation	
Blood pressure systolic, mm Hg.	136.4 ± 0.54 p<0.05	125.8 ± 0.62	135.9 ± 0.63 p<0.05	121.4 ± 0.53	120.6 ± 0.47
Arterial pressure diastolic, mm Hg.	92,6 ± 0,35 p<0.01	83.9 ± 0.38 p<0.05	93,1 ± 0,41 p<0.05	81.0 ± 0.34	77.5 ± 0.42
Pulse, beats per minute	86.2 ± 0.33 p<0.01	76.4 ± 0.26 p<0.05	87.3 ± 0.29 p<0.01	65.3 ± 0.36	63.8 ± 0.31
Situational anxiety, scores	41.3 ± 0.54 p<0.01	35.4 ± 0.43 p<0.05	40.9 ± 0.48 p<0.01	31.2 ± 0.32	28.7 ± 0.23
Personal anxiety, scores	38.7 ± 0.23 p<0.01	32.2 ± 0.24 p<0.05	38.4 ± 0.30 p<0.01	27.5 ± 0.22	29.2 ± 0.15
Blood glucose, mmol/l	6.2 ± 0.18 p<0.01	5.6 ± 0.16 p<0.05	6.0 ± 0.20 p<0.01	4.2 ± 0.14	4.8 ± 0.08
Body weight, kg	84.8 ± 0.57 p<0.05	75.6 ± 0.52	85.2 ± 0.61 p<0.05	73.5 ± 0.48	74.8 ± 0.42
Body mass index, kg/m2	32.6 ± 0.33 p<0.01	27.6 ± 0.40 p<0.05	33.0 ± 0.37 p<0.01	25.4 ± 0.29	25.2 ± 0.31
Legend: p-reliability of differences with the control group 1.					

Table 3: Dynamics of indicators of those surveyed during rehabilitation.

As a result of the study, it was revealed that in the experimental group, by the end of the observation, a more pronounced positive dynamics of the blood pressure level was achieved (systolic pressure up to 121.4 ± 0.53 mm Hg, diastolic pressure up to 81.0 ± 0.34). By the end of the observation in the experimental and control group-2, similar positive changes in the pulse values were noted. At the same time, in the control group-2, after physical rehabilitation, the level of this indicator exceeded that in the experimental group by 16.9%.

More pronounced positive changes in psychological indicators were noted at the end of the observation in the experimental group. So, according to the situation of anxiety, the indicator in the control group-2 exceeded that in the experimental group by 13.5%. The level of

personal anxiety toward the end of the rehabilitation course also prevailed in the control group-2 by 17.1%, emphasizing the greater preference of the result in the experimental group.

As a result of physical rehabilitation, the blood glucose level in both groups of patients decreased. At the same time, it completely normalized only in the experimental group, completely eliminating the progression of complications of hyperglycemia in it.

Carrying out the metered, feasible and regular physical exertions provided in both groups of patients a decrease in initially increased body weight. At the same time, the experimental group achieved a more pronounced dynamics of this indicator. It provided a reduction in all patients of the body mass index. At the same time, the normalization of the body mass index was registered only in the experimental group, which indicated elimination of abdominal obesity and normalization of lipid metabolism.

Discussion

Dose physical exercise in the complex treatment of type I diabetes mellitus and abdominal obesity is very important [30]. Against this background, there is an intensification of metabolic processes in connection with an increase in energy expenditure. This is due to the acceleration of the processes of protein, carbohydrate, fat and water mineral metabolism [31]. Favorable shifts in fat metabolism are very pronounced under the influence of long loads of moderate and moderate intensity. This is more pronounced than with short-term, but intense exercises [32,33]. Creation of conditions conducive to long-term energy consumption and preferential oxidation of fats with their release from the depot [34,35], provide exercises of applied and sports nature (walking, dosed walking, mechanotherapy, circular training etc.) [36,37]. In this regard, they are very useful in diabetes and obesity.

Active physical activity, regular physical training and sports play an important role in maintaining normal weight and blood sugar level [38,39]. The therapeutic effect of physical exercises in abdominal obesity in patients with diabetes mellitus is mainly due to the mechanism of trophic action [40]. It is thanks to this mechanism that active muscle activity improves metabolic processes in tissues and stimulates regeneration processes [41]. Due to this, physical exercises exert a general toning effect on the given contingent of patients and normalize the processes in their nervous and endocrine regulation of trophic processes, and also contribute to the restoration of normal motor-visceral reflexes, restoring impaired functions [42,43].

A more pronounced effect in the experimental group can be explained by the fact that when performing muscular work there is a certain inertia in the change in the intensity and nature of the energy supply of the organism [44-46]. In particular, in the first five to seven minutes of work, the sources of energy supply for them are carbohydrates, which the working muscles extract and utilize from the blood flowing into them [47]. In the next ten to twelve minutes (ie, between the fifth and the twentieth minutes after the start of the work), the main energy reserves for the muscles are the carbohydrates formed during the breakdown of glycogen [48] first in the muscles themselves, and then in the others his depot. [49,50]. When work lasts longer than 20 minutes, energy sources become fats [51], which is an effective moment of physical rehabilitation [52]. Consequently, a sustained effect of reducing fat mass with the use of circular physical exercises can begin to be achieved only if they are carried out for a long time and at high traffic intensity. This explains the fact that the more "saturated" scheme of physical rehabilitation applied in the experimental group was able to give a more pronounced result in the observed patients, surpassing the traditional effect.

Conclusion

Active physical activity plays an important role in maintaining normal body weight and blood sugar levels. The therapeutic effect of physical exercises in abdominal obesity in patients with diabetes mellitus is mainly due to the mechanism of trophic action. Active muscular activity improves metabolic processes in tissues and stimulates regeneration processes. Due to this, physical exercises exert a general toning effect on this contingent of patients and normalize the processes of nervous and endocrine regulation in them, promote the restoration of normal motor-visceral reflexes. As a result of the study, it was revealed that in the experimental group receiving physical loads according to the author's scheme, by the end of the observation, a more pronounced positive dynamics of the level of arterial pressure, pulse rate was achieved. This was accompanied by more pronounced positive changes in psychological indicators in the experimental group. As a result of physical rehabilitation, the blood glucose level in both groups of patients decreased. At the same time, he completely normalized only in the experimental group, excluding the progression of complications of hyperglycemia in her. Only in the experimental group was achieved the normalization of the body mass index, which indicated the elimination of the persons who made up abdominal obesity and the normalization of lipid metabolism against the background of optimization of carbohydrate metabolism.

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