

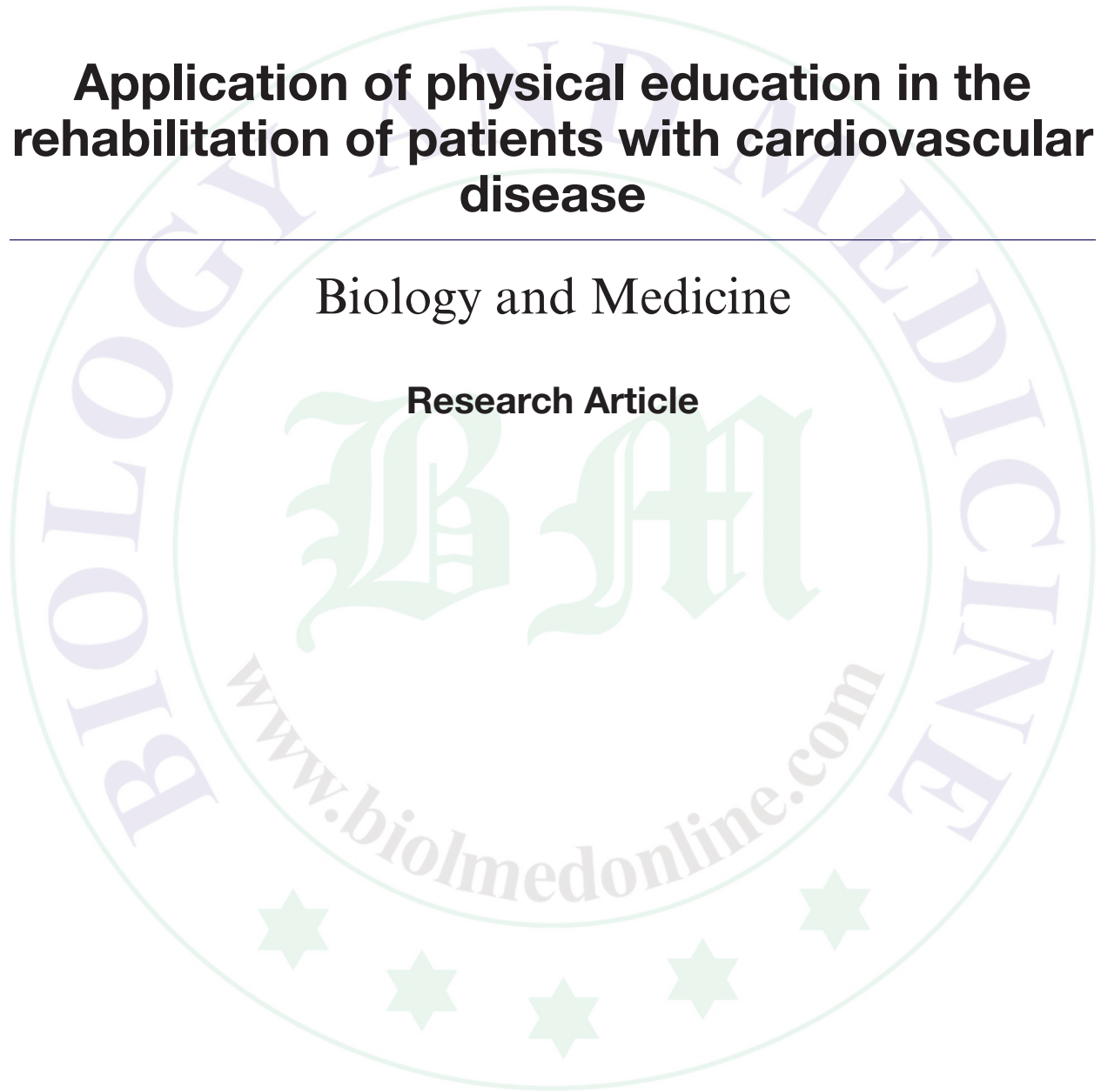
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# **Application of physical education in the rehabilitation of patients with cardiovascular disease**

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## Application of physical education in the rehabilitation of patients with cardiovascular disease

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### Abstract

We developed a comprehensive psychosomatic program for implementation of methods of physical training for the prevention and rehabilitation of patients with diseases of the cardiovascular system (hypertension and coronary heart disease). It was established that during physical training, there is considerable normalization of cardiovascular system in patients with its dysfunction. We should implement a comprehensive approach in the rehabilitation of people taking into account their unique characteristics of physical and mental states, as well as using a variety of means and methods of their correction.

**Keywords:** Comprehensive program of psychosomatic; rehabilitation; cardiovascular disease; physical culture.

### Introduction

According to statistical data from 2,028,516 deceased people in the Russian Federation, 56.8% died from cardiovascular diseases in the year 2010. The proportion of the deceased people of working age with diseases of circulatory system was 31.7% (176,739 people) of all deaths in this age group. The overall incidence for the period of 2006-2010 in the adult population was increased in the country by an average of 8.4%, in children – by 17.0% [1].

The Republic of Dagestan is one of the subjects of the Russian Federation where we can see a natural positive increase in the population. In 2012 it was equal to +13.4, while the average increase in Russia was only 0.1. First place in the structure of the death causes belongs to cardiovascular diseases – 6,978 cases, accounting for 42.3% [2].

In 2009 alone, the economic cost of acute coronary syndrome was 74.5 billion rubles, 28% of this figure – direct losses, i.e., cost of treatment, etc., and the rest – indirect costs due to premature mortality in the working-age population, temporary disability [3-5].

According to the chief physician of the Ministry of Health of the Republic of Dagestan

Abdulaev M.R., “Diseases of the circulatory system are among the major problems in our country. The incidence of diseases of the circulatory system in 2013 in the republic was within 9.3%. Cardiovascular diseases in the structure of mortality accounted for 42% of the total mortality. The mortality in the working-age population was equal to 17%. During the prophylactic medical examination, we revealed about 6,000 patients suffering from angina, 7,097 people with ischemic heart disease, and 21,000 people with hypertension. It was estimated that approximately 165,000 people have risk factors (excess body weight, poor nutrition, high blood pressure, lack of activity, tobacco and alcohol consumption). It consisted of 36.9% of the total number of population covered by prophylactic medical examination. 31.2% of the population had two or more risk factors” [6].

This is caused by the fact that people do not have time to adapt to the rhythm of life and rapidly changing conditions of civilization. That is the reason why every other citizen of our country after 30 years has high blood pressure. Personal profile of people who are prone to cardiovascular diseases is known as “Type A” (men dominate among them). This profile is characterized by high extraversion, huge ambition,

and an explosive temper, restless, hard work, and an increased sense of responsibility. At the same time such people have different options of somatized depression and anxiety-phobic disorders [7]. This is typical to the population of the Republic of Dagestan in relation to the current social situation. Patients with heart and vascular diseases are characterized by fatigue with the symptoms of hyperesthetic weakness (similar to those that can be seen in the emotional and physical stress), short sleep disturbances, and exacerbation of abnormal bodily sensations, often in the occipital head region, spine, and chest. In turn, the awareness of patients to their low tolerance to physical activity may contribute to anxiety, depression, and hypochondriacal reactions [8].

Prevention of hypertension and rehabilitation of patients with chronic forms of cardiovascular diseases (hypertension, angina pectoris, myocardial infarction) takes an important place among urgent and complex problems of cardiology. This is caused by the fact that most commonly the disease develops in able-bodied, creatively active population and leads to partial or total disability. Patients are characterized by increased irritability, negative attitude toward others, which has a considerable adverse effect on the social adaptation. Therefore, physical education as the strongest means of prevention should be a source of health, high efficiency, and effective tool for healthy stay and for removing mental stress. It also should promote physical and spiritual perfection of the individual [9].

Thus, evaluation and timely correction of physical and psychological states takes an important place when you face the issues of prevention and treatment of cardiovascular diseases [10]. In the scientific literature there is no consensus about the effectiveness, safety, and feasibility of physical training in patients with arterial hypertension (AH) and coronary heart disease (CHD).

The purpose of the study is to create a comprehensive program on applying psychosomatic methods of physical training for the prevention and rehabilitation of patients with cardiovascular system diseases.

Experiments were performed on dispensary (outpatient) stage, which included patients ( $n = 83$ ) with cardiovascular diseases (grade 1-2 hypertensive heart disease, CHD with NYHA functional class I or II) including 19 men and 64 women aged from 36 to 54 years. The course

consisted of 30 sessions of 1.5 h 2 times a week for 3 months. All participants of the study underwent a complex examination, which included an assessment of the functional state of the cardiovascular, muscular, and respiratory systems: heart rate (bpm), blood pressure (mmHg), dynamometry, peak flow measurement. Heart rate and blood pressure were monitored at each session in phases of physical activity and relaxation. We have also studied psychoemotional condition to detect depression, reactive and personal anxiety, frustration.

## Methods

1. HAM test (health, activity, mood) allows you to assess the patient's condition quickly. We have estimated health, activity and mood in quantitative terms. It contains 30 questions that characterize the human condition and the rating scale. We judge about the severity of neuropsychiatric disorders and the effectiveness of the treatment using the dynamics of points. Indicators reflecting normal state of the subject are the following: general state – 54 points, activity – 50 points, mood – 51 points. One should pay attention not only to absolute values of the indicators but also to the relationship between them on assessing the state of the subject.
2. Shortened Multifactor Questionnaire for the study of Personality (SMQP) test – a shortened form of MMPI test consisting of 71 statements. It allows to assess personality characteristics of the patient and the level of its neuroticism using 11 scales (including 8 clinical). The profile of SMQP is a graphical representation of quantitative indicators of basic scales, each of which determines the severity of particular personality tendency. We used the following algorithm to evaluate the level of psychological adaptation:
  - Indicators of all clinical scales of SMQP test are in the range of 46-55 T-points – signs of psychological maladjustment are absent;
  - Indicators of one or more clinical scales of SMQP test are in the range of 56-65 T-points and/or indicator on the 9th scale is in the range of 36-45 T-points (but none of the indicators of other clinical scales should exceed 65 T-points) – poorly marked impairment of psychological adaptation;

– Indicators of one or more clinical scales of SMQP test are in the range of 66-75 T-points and/or indicator on the 9th scale is in the range of 26-35 T-points (but none of the indicators should exceed 75 T-points) – moderately impaired psychological adaptation;

– Indicators of one or more clinical scales of SMQP test above 75 T-points and/or indicator on the 9th scale below 26 T-points – marked impairment of psychological adaptation.

3. Spielberger–Hanin test – A way of self-esteem level of anxiety at the moment (reactive anxiety as a state) and reactive anxiety (as stable characteristic of the person). Self-esteem scale consists of two parts separately assessing personality (PT, statements N 1-20) and reactive (RT, statements N 21-40) anxiety. The result was evaluated as follows: up to 30 points – the lowest anxiety; 31-45 points – moderate anxiety; 46 points or more – high anxiety.

At the end of the program, we performed a comprehensive re-examination of the physical and psychoemotional states. The dynamics of the studied parameters was evaluated in order to assess the effectiveness of the used method.

Classes were performed in the musical accompaniment which contributed to the improvement of both the emotional tone of patients and the burst of energy. It also contributed to a pleasant conversation, increase in confidence and openness to other people which

ultimately led to the decrease in anxiety and depression.

The obtained results were processed by the methods of mathematical statistics, statistical significance of differences was determined using the Student's *t*-test. An assessment of psychoemotional state before and after the wellness program has undergone a comparative analysis, interpretation using normal ranges proposed in the Beck test intended to diagnose depression, scale of reactive and personal anxiety of Spielberger–Hanin, methods for diagnosing the level of social frustration of Wasserman (in modification of Boyko). Pearson correlation analysis between reactive and personal anxiety in the gender difference was performed. The classes were organized by the few-group method and consisted of 12-15 people. This contributed to a more efficient recovery process in terms of increasing mutual understanding, peace, self-confidence, because the large volume and diversity of information indirectly through all the members of the group is perceived and recognized more easily if compared to the individual work.

**Results and Discussion**

Heart rate (HR) and blood pressure (BP): systolic (SBP) and diastolic (DBP) blood pressure before treatment and after treatment are shown in Table 1.

As it can be seen from Table 1 in patients of both treatment groups after rehabilitation

**Table 1: Parameters of the functional status of patients under the influence of the rehabilitation means during the study period.**

Parameters	Men (n = 19)		Women (n = 64)	
	Prior to rehabilitation	After rehabilitation	Prior to rehabilitation	After rehabilitation
Heart rate at rest, beats/min	75.4 ± 3.58	66.2 ± 2.9	83.2 ± 5.7	77.6 ± 6.1
Heart rate under load, beats/min	142.7 ± 10.4	134.5 ± 9.7*	135 ± 9.3	126 ± 10.1*
SBP before classes, mmHg	140.81 ± 5.5	132.74 ± 5.0	134.7 ± 12.6	128.3 ± 11.9
SBP after classes, mmHg	133.64 ± 4.4	125.37 ± 4.8	125.6 ± 15.3	119.1 ± 14.7*
DBP before classes	90.22 ± 5.3	84.11 ± 5.0*	87.2 ± 6.2	81.8 ± 6.0*
DBP after classes	83.14 ± 4.7	77.68 ± 5.2*	82.3 ± 7.5	76.2 ± 6.9*
Peak flow measurement	443.8 ± 30.5	489.5 ± 27.2*	301.2 ± 1.7	321.7 ± 1.3*
Dynamometry	74.3 ± 6.1	82.1 ± 6.4*	32.24 ± 4.0	37.14 ± 4.4*

\*Significant differences at *p* < 0.05.



there was a decrease in heart rate and blood pressure (systolic and diastolic) and simultaneous increase in peak flow measurement and dynamometry values. Thus, increased muscle strength and respiratory function during rehabilitation results in stabilization of the heart activity.

Table 2 presents the performance of psychoemotional state of patients.

As it can be seen from Table 2, the majority of patients initially have moderate levels of depression of situational or neurotic origin. Women have higher rates due to the fact that they are more emotional and honest. During testing they noticed physical fatigue, emotional exhaustion, inability to break out the vicious circle of problems.

The values of depression in men are lower than in a group of women, which is probably caused by withdrawn and bravado behavior. Perception of own personality in this group is also characterized by increased anxiety, particularly in terms of employment and professional competence. Reactive anxiety in the group was of moderate intensity and was expressed in particular in interpersonal conflicts: 47% – relationships with family, 22% – with relatives, 18% – with work collective, as well as in “unpromising future”. Frustration in the group was increased: 3.1 points in men, they were dissatisfied about spheres of a workplace, financial situation, situation in the republic. The average value for women was 2.9 points: they were dissatisfied about personal relationships and a lifestyle. During the study period the overall rate of depression in the group

has gone down, especially the emotional background in women was improved.

Table 3 shows the dynamics of the HAM test in patients before and after rehabilitation.

As it can be seen from Table 3 after rehabilitation there was a mathematically reliable increase in being, activity, and mood.

According to Spielberg–Hanin test as a result of rehabilitation according to the proposed rehabilitation program, we achieved decrease in reactive anxiety from  $45.9 \pm 2.2$  to  $32.4 \pm 1.8$  points ( $p < 0.05$ ), which indicates an improvement in psychological state.

Analysis of the average results of SMQP test indicates that prior to the rehabilitation the most pronounced deviations were detected in the scales of neurotic triad (1st, 2nd, 3rd) and the scale of psychasthenia (7th scale).

As a result, there was a decrease in rehabilitation indicators by the 1st scale (from  $63.2 \pm 1.7$  to  $52.6 \pm 1.5$  ( $p < 0.05$ )), 2nd scale (from  $61.3 \pm 1.8$  to  $50.7 \pm 1.8$  ( $p < 0.01$ )), 3rd scale (from  $65.6 \pm 1.5$  to  $53.4 \pm 1.27$  ( $p < 0.01$ )), 7th scale (from  $65.1 \pm 1.7$  to  $55.7 \pm 1.7$  ( $p < 0.05$ )), which indicates an improvement of mental and emotional status reflected in a decrease in anxiety, suspiciousness, and asthenia.

The study showed a positive effect of rehabilitation on the condition of the patients suffering from cardiovascular diseases. This is indicated by the results of statistical processing of the data. Almost all indicators have improved: both functional and psychoemotional

**Table 2: Gender parameters of psychoemotional state of patients.**

Parameters	Men (n = 19)		Women (n = 64)	
	Prior to rehabilitation	After rehabilitation	Prior to rehabilitation	After rehabilitation
Depression	$17.6 \pm 0.7$	$13.1 \pm 0.6^*$	$25.4 \pm 1.1$	$19 \pm 1.3^*$
Panic reactivity	$32.3 \pm 1.2$	$23.5 \pm 0.9^*$	$39.7 \pm 3.3$	$28.4 \pm 2.7^*$
Personal anxiety	$51.6 \pm 3.1$	$27.9 \pm 2.9^*$	$53.2 \pm 4.4$	$11.52 \pm 3.5^*$
Frustration	$3.1 \pm 0.3$	$2.6 \pm 0.7^*$	$2.9 \pm 0.4$	$14.0 \pm 5.1^*$

\*Significant differences at  $p < 0.05$ .

**Table 3: Dynamics of HAM test parameters.**

Parameters	Men (n = 19)		Women (n = 64)	
	Prior to rehabilitation	After rehabilitation	Prior to rehabilitation	After rehabilitation
Wellbeing	$47.4 \pm 3.9$	$58.6 \pm 3.8^*$	$25.8 \pm 2.2$	$19.4 \pm 2.0^*$
Activity	$44.1 \pm 2.6$	$56.3 \pm 3.3^*$	$39.3 \pm 2.4$	$28.4 \pm 2.1^*$
Mood	$43.8 \pm 3.1$	$56.7 \pm 3.0^*$	$53.7 \pm 3.9$	$51.52 \pm 4.1^*$

\*Significant differences at  $p < 0.05$ .

parameters: decreased depression, reactive and personal anxiety, frustration. There has also been an increase in general vitality, normalization of sleep and blood pressure. At the same time, we have revealed the following trend: men were easier to train physical qualities, but more difficult to train muscular and mental relaxation indicating their unwillingness or inability to verbalize their emotions, difficult realization of negative irrational cognitions and behavioral methods that may be the reason of high blood pressure and various diseases of cardiovascular system.

As it is well known, the development of hypertension contributes to chronic stress due to psychological reactions to prolonged stress, which in turn leads to muscle stiffness, body strain, and depressed emotions that impede normal functioning of the whole organism [11,12]. Chronic freezing on the physical level and suppression of emotions go hand in hand, so the greater muscles tension and stiffness, the more there is a need for special therapeutic methodologies aimed at reducing strain of certain muscle groups and thus causing the release of emotions that were constrained by this strain [13]. It is advisable to use the breathing exercises with a delay on the exhale, physical exercise with contrasts of tension and relaxation, massage, moderate exercises combined with muscle and mental relaxation aimed at restoring forces and the formation of positive thinking toward yourself, people, and life in general [14].

Our study showed that men need longer, careful, may be more individualized approach that could serve as a strengthening of the effectiveness of psychocorrective programs. It should be noted that in the state program "Health of the Nation" there is a special direction – "salvation of men".

We have revealed that the internal picture of patients suffering from disorders of cardiovascular system includes such features as an increased reactive and personal anxiety, concern for the life, and low level of communicative competence. Psychological assistance is aimed at the realization of internal conflicts, which serves as a source of personality disorders and causes of diseases. Also, it helps to stimulate rational thinking in order to find inner peace and harmony, develop self-confidence, increase energy, and improve personal properties [15-17].

Thus, an involvement in physical training for the prevention and rehabilitation leads

to normalization of cardiovascular system in patients with its dysfunction. We should implement a comprehensive approach in the rehabilitation of people taking into account their unique characteristics of physical and mental states, as well as using a variety of means and methods of their correction. We need to create and implement the original psychosomatic program involving physical training, which is a part of the comprehensive therapy including phases of diagnostic, preventive, and psychocorrective exercises with patients those are prone to cardiovascular diseases.

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