Pilates as a method of improving physical fitness and strengthening the health of students assigned to a special medical group

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Abstract

Objective of the study is aimed at determining the impact of Pilates training on the level of physical development and physical fitness of students assigned to a special medical group.

Methods and structure of the study. The study involved 48 students aged 18 to 20 years. The work included measurements and evaluation of anthropometric and functional characteristics, as well as an analysis of motivational factors.

Results and conclusions. The results of the work carried out demonstrate that the inclusion of a set of Pilates exercises in the main part of the workout led to stabilization of body fat and water mass, increased muscle mass, improved flexibility of the spine and optimized the work of the cardiovascular and respiratory systems. In addition, students reported an improvement in their general condition and increased resistance to physical exertion, which had a positive effect on motivation to engage in physical education, attendance, and completing independent assignments in the subject of Physical Education.

Keywords: *pilates, physical development, physical fitness, special medical group, motivational factors, resistance to physical exertion, motivation.*

Introduction. In the last decade, the number of school graduates with health problems has been growing rapidly [5]. According to a number of authors [6], this is due to the fact that the educational process is characterized by high intensity and informative saturation, and an irrational lifestyle and insufficient physical activity only reinforce this trend, which has led to an increase in the number of students classified as a special medical group for health reasons. The organization of the physical education educational process with this contingent is fraught with certain difficulties, since students are characterized by low body functions, insufficient physical fitness, and lack of interest and motivation in classes. [1, 2, 3, 4].

All this, as well as individual characteristics and the presence of diseases, must be taken into account when developing meaningful support for classes, the use of such methods, techniques and tools that allow not only to take into account the characteristics of the student body, but also to increase students' motivation to increase physical activity. [1, 2, 3, 4], including due to the inclusion of hours provided for independent physical exercises in work programs as a possible resource for optimizing the motor regime of students and their initiation into a physically active lifestyle.

Objective of the study is aimed at determining the impact of Pilates training on the level of physical development and physical fitness of students assigned to a special medical group.

Methods and structure of the study. The scientific work was carried out on the basis of Vyatka State University with the participation of 28 students aged 18-20 years, Moscow Polytechnic University (20 people) assigned to a special medical group for health

reasons (a total of 22 boys and 26 girls). Conventional anthropometric techniques were used to measure standing body length, body weight, chest circumference (OGC) at rest, with maximum inhalation and maximum exhalation, chest excursion, waist and hip circumference.

The assessment of body composition was carried out using the bioimpedance analysis technique of the Scientific Research Center "Medass", program AVC01–0362. Measuring and current electrodes were applied according to a standard tetrapolar scheme. The following parameters were determined: phase angle, proportion of body fat mass (BMI), proportion of active cell mass (ACM), proportion of musculoskeletal mass (SMM), proportion of mineral mass in fat-free body weight (MMT), total body water (TVA), basal metabolism and specific metabolism. The body composition values were calculated relative to a reference all-Russian sample of patients examined in Russian Health Centers in 2010-2012 by S.G. Rudnev et al. (2014) [7].

The mobility of the spinal column was determined by the test "Leaning forward from a standing position on a gymnastic bench" and was evaluated using the standards of the All-Russian Physical Culture and Sports Complex "TRP". Methods such as heart rate monitoring and spirometry were used to assess the state of the cardiorespiratory system. The heart rate (HR), vital lung capacity (VL), adequate vital capacity (JL), percentage of VL to JL, vital index (GI) were determined. The following tests were used to characterize the motivational component: to identify the level of motivation, the test "Motivation for learning and emotional attitude to learning"; to determine the subjective level of stress during physical exercise, the Borg Scale test; and classroom attendance and independent work assignments in the discipline "Physical Education" were also taken into account.

The results of the study were processed using the Biostat 7.3, Microsoft Excel for Windows and AVC01–0362 application packages. In the case when the data were presented as a percentage, Pearson's chi-square was used to identify statistically significant differences, in all cases the differences were considered significant at $p<0.05$. In the case of comparing the average values of the indicators, the Student's t-test was used (these data have a normal distribution), in

Morphofunctional indicators of students of the special medical group before the start of the pedagogical experiment, October 2024

Indicator	Young men n=12	Girls n=16
	M±m	M±m
Standing body length, cm	176,17±2,89	165,00±2,88
Body weight, cm	77,83±4,21	72,13±4,18
Waist circumference, cm	86,67±3,26	80,25±2,84
Hip circumference, cm	103,17±3,25	103,13±3,27
OGK at rest, see	91,83±3,02	85,50±2,77
OGK in a state of maximum inhalation, see	96,83±3,24	90,00±2,68
OGK in a state of maximum exhalation, see	89,67±3,02	84,00±2,89
Chest excursion, cm	7,17±0,55	6,00±0,90
Vital lung capacity, ml	3600,00±131,23	2787,50±87,39
The percentage ratio of vital lung capacity to the proper vital lung capacity, ml	74,65±1,48	65,23±2,65
Vital index, standard units	47,26±3,06	39,72±2,43
Heart rate, beats/min	73,50±5,82	79,88±5,89
Mobility of the spinal column, cm	4,33±2,56	1,50±1,05
Phase angle, degree	6,56±0,29	6,90±0,28
The proportion of GI, %	24,08±3,31	35,91±3,09
AKM share, %	62,80±2,36	57,76±1,14
SMM's share, %	53,48±0,91	47,50±0,93
Total body water, kg	42,73±1,23	33,26±1,33
MMT share, %	5,34±0,12	5,90±0,05
Basic metabolism, kcal	1773,67±49,97	1449,25±46,77
Specific exchange rate, kcal/sq.m	921,17±46,21	822,88±27,66

all cases the differences were considered significant at $p<0.05$.

Results and conclusions. The morphofunctional indicators of the students of the special medical group at the time of the beginning of the pedagogical experiment are presented in the table.

A comparative analysis of the indicators with age norms indicates that the majority of morphofunctional indicators of students corresponded to age norms. The exceptions were respiratory system parameters and spinal column mobility, which were below the age norm, as well as body weight and body fat fraction above the age norm.

The assessment of the subjective level of exercise load corresponded to the level of "difficult" (11.33±0.88 points for boys and 11.00±0.35 points for girls), and the motivation for learning was fixed at an average level, i.e. equal severity of positive and negative motivation for learning, ambivalent attitude to learning (3.54± 0.13 points for boys and 3.15± 0.10 points for girls). Class attendance was 60%, and independent work was 35.71%.

During the academic year (from October to May) physical education classes with a three–hour structure were conducted with students twice a week (once in a training session and once on their own) using a set of Pilates exercises in the main part of the lesson. The exercises were performed at a slow pace, smoothly, without sudden movements, to calm music.

In order to familiarize oneself with the methodological features of performing exercises, teaching proper breathing, strengthening the muscles of the abdomen, back, legs, buttocks, increasing joint mobility, and focusing on muscle sensations, a set of "basic" levels was used when performing exercises, which included seven well-known exercises that are most accessible to those involved in the technique of performing exercises: "hundred" (from 20-30 up to 100 breathing movements at a fast pace); "twisting-unwinding" (8-10 times at a slow pace); "circular leg movements" (8-10 times with each leg at a slow pace); "rolling on the back" (6-8 times at a slow pace); "stretching the leg muscles" (6-8 times with each leg at a slow pace); "simultaneous stretching of the leg muscles" (8-10 times at a slow pace); "stretching the spine" (6-8 times at a slow pace).

As students mastered the technique of performing exercises, they moved on to the next "initial" level, the main task of which was to gradually increase the speed of performing exercises. The entry-level program consisted of 12 exercises and, in addition to the basic ones, included the following: "seal" four to six rolls at an average pace; "a series of side swings" in three modifications with a gradual increase in the amplitude of movements 10-12 times with each leg; "small circles" 10-12 times with each leg.

A comparative analysis of the indicators at the time of completion of the pedagogical experiment revealed that the use of Pilates exercises in the practice of working with students of a special medical group contributes to a decrease in body weight (by 22.14% in boys and by 27.60% in girls; $p<0.05$), waist circumference (by 15.77% and 18.59%, respectively; $p<0.05$), hip circumference (by 10.83% and 12.62%, respectively; $p<0.05$).

This decrease is due to a decrease in the proportion of body fat (by 9.82% in boys and 10.33% in girls; $p<0.05$) and the total body water content (by 15.84% and 14.97%, respectively; $p<0.05$).

There was also an increase in the muscular component (by 10.99% in boys ($p<0.05$) and by 0.68% in girls ($p>0.05$), the phase angle (by 1.37% in boys ($p>0.05$) and 4.24% in girls ($p<0.05$), an increase in spinal column mobility (by 32.34% and 67.95%, respectively; $p<0.05$) and the life index (by 25.10% and 26.76%, respectively; $p<0.05$).

The results obtained indicate an increase in the level of physical development and physical condition of students of the special medical group.

At the same time, the assessment of the subjective level of exercise load corresponded to the "easy" level (8.83±0.28 points for boys and 9.13±0.21 points for girls), and the motivation for learning was fixed at the productive level (2.13±0.11 points for boys and 2.06±0.10 points for girls). We also note the 100% attendance of classes and the performance of independent work – 96.43%.

Conclusions. The results obtained indicate that the use of Pilates exercises with students of a special medical group contributes to:

– normalization of the fat and water components of the body composition, growth of the muscle component and, in general, an increase in the level of physical condition;

– increase the mobility of the spinal column and improve the functions of the respiratory system;

– improve well-being and exercise tolerance. In conclusion, we note that the use of Pilates exercises allowed not only to optimize the motor mode of students of the special medical group, improve their level

of physical development, but also contributed to the formation of interest and increased motivation to exercise, ensured high attendance and responsible attitude of students to independent work in the discipline "Physical culture".

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