

Effect of aerobic exercise on physical performance of special medical group female students

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Abstract

Aim. The aim of the study was to evaluate the effect of aerobic exercise on the performance of SMG students. **Materials and methods.** The study involved 22 female students aged from 19 to 21 years (Institute of Sport, Tourism and Service, South Ural State University, Russia, Chelyabinsk). Female students were divided into two groups - groups A (control) and B (experimental). The first group had training sessions according to the standard program of this academic discipline. The second (experimental) group had training sessions with aerobics exercise. Anthropometry measurements were used to calculate physical indices and assess the performance of the cardiovascular and respiratory systems. The functional status of the respiratory system was evaluated with the following tests: total lung capacity (LC) and Stange test (breath holding test). Based on the data obtained in the Stange test, the response of the cardiovascular system was calculated (CVR). The Gench test was used to calculate the coefficient of resistance to oxygen deficiency (OD). The Skibinsky index was also used to assess the combined performance of the cardiovascular and respiratory systems. The correlation between the Skibinsky index and OD was evaluated. The adaptive potential (AP) was evaluated as an indicator of adaptation to various environmental factors. **Results:** A comparative analysis of respiratory and cardiac performance, as well as the associated parameters (cardiovascular response, oxygen deficiency, the Skibinsky index) at the end of the experiment were better in group B compared with group A. **Conclusion:** The experimental method with aerobics exercise had better effect on respiratory and cardiac performance compared with the traditional program. **Keywords:** physical performance, physical education, health, physical activity, aerobics, special medical group.

Introduction.

Physical education (PE) in a special medical group (SMG) is based on generally accepted principles but has a number of features determined by the students involved (Sidorova N.A., Borisova M.V., 2015). One of the main characteristics of physical education is its health-enhancing nature. However, it is equally important to attract students to regular PE classes and create a need for them (Deikova T.N., Mishina E.G., 2019). The huge sanogenetic effect of various motor activities contributes to the recovery of organs and body systems in students (Cherepov, E. A., 2016; Badau D., Talaghir LG, Rus V., Badau A., 2018).

Motor insufficiency of SMG female students caused by health conditions results in a decrease of their physical performance and fitness and reduces working and adaptation capacity to muscular activity (Kukic F., Koropanovski N., Jankovic R., Dopsaj M., 2019; Eganov A., Cherepov E., Aminova A., Savinykh E. 2019).

As is known, regular PE classes affect functional and morphological changes in various organs and systems of SMG female students (Borodulina O.V., Stepanova O.N., Zhmurova T.A., 2015). These adaptation changes can be interpreted in different ways but their essence is the same. Thus, most changes in cardiac performance are associated with physical fitness, sympatho-inhibitory effects, and cholinergic mechanisms. First of all, this refers to the decrease in heart rate and normalization of blood pressure. The problem of adaptive changes in the cardiovascular and respiratory systems of students with reduced physical fitness undoubtedly remains relevant, as it is directly related to the optimization of their functional fitness (Surzhenko, YA., Yakubovskiy D.A., 2014). At the same time, it is no less important to identify the baseline data and the effect of exercise on SMG female students.

A variety of forms and methods of aerobic exercise allows us to talk about the universal nature of this physical activity, which is the main criterion for choosing exercise mode for SMG students. Since the SMG consists of students with different levels of physical fitness, the question arises of the choice of physical activity for students with various diseases (Grigoreva S.A., Borisova M.V., 2016).

A number of studies have found that the methodology of fitness training in the physical education of female students quite effectively affects their health and physical performance (Eganov, A., Cherepov, E., Romanova, L., & Bykov, V., 2020). However, most often this program is optional or considered as additional

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motor activity (Sidorova N.A., Borisova M.V., Tolstykh, U.I., 2015; Turgut M, Bagir S, Bozkus, T, Talaghir L-G., Sarikaya, M., 2019). Our task was to introduce some elements of fitness training into the physical education program of SMG university students.

The program with aerobics exercise was introduced and tested. Health-enhancing, training and educational effects make fitness aerobics a means to ensure harmonious development and an important element of the educational environment (Rostovceva M.B, Petrozhak O. L., Stovba I. R., Stolyarova N. V., Cherepov E. A., 2018). The effect of aerobic exercise on the physical performance and health of university female students was identified by means of aerobics exercise, which is explained by the physiological orientation of this physical activity.

Basic exercises from the classical aerobics program were used as an experimental technique. The advantage of these exercises is in their complexity in terms of coordination. Moreover, they contributed to a sufficient warm-up for joints before the main part of PE classes. Fitness elements were used in the first part of the training session in the so-called low activity zone (50% -60% of the maximum load). Motor activity included: jumps with different amplitude (jumping jack, assemble, kick), basic steps (mambo, cross, v-step, etc.); simple combinations of basic aerobics.

During the study, the intensity of physical activity increased, physical exercise became more complex due to the increase in the range of motion, speed of performance and a variety of different combinations, which changed from simple to complex.

Materials and methods.

The study involved 22 female students aged from 19 to 21 years. Female students were divided into two groups - group A (control) and group B (experimental). The first group had training sessions according to the standard program of this academic discipline. The second (experimental) group had training sessions with aerobics exercise.

The functional status and working capacity of SMG students were measured at the beginning and at the end of the academic year by means of physical indices, functional tests and physical examinations.

Anthropometry. Anthropometry measurements were used to calculate physical indices and assess the performance of the cardiovascular and respiratory systems.

The functional status of the respiratory system was evaluated with the following tests: total lung capacity (LC) and Stange test (breath holding test). Based on the data obtained in the Stange test, the response of the cardiovascular system was calculated (CVR).

The Gench test (Borisova M.V., Musokhranov A. Grigoreva S.A., Borisova M., 2018), which is the breath holding time after a normal exhalation, was used to calculate the coefficient of resistance to oxygen deficiency (OD). The Skibinsky index was also used to assess the combined performance of the cardiovascular and respiratory systems. The correlation between the Skibinsky index and OD was evaluated.

The adaptive potential (AP) was evaluated as an indicator of adaptation to various environmental factors. This is a physiological indicator of vital activity, which characterizes the ability to adequately respond to a changing environment. $AP = 0.011 (HR) + 0.014 (SBP) + 0.008 (DBP) + 0.014 (age) + 0.009 (BW) - 0.009 (BL) - 0.27$ (where, SBP - systolic blood pressure, DBP - diastolic blood pressure, BW - body weight, kg, BL - body length, cm).

Results

AP data were obtained, which were almost out of the reference values and close to the so-called stress of adaptation mechanisms (mean value – 2.1 ± 0.5 points in group B). After the study, AP data were re-measured. The data obtained corresponded to satisfactory adaptation (mean value – 1.8 ± 0.3 points in group B). An increase of 0.3 points was observed, which indicated that this experimental program had a positive effect on tolerance to physical activity, and therefore, contributed to an increase in working capacity.

Figure 1 shows changes in the external respiration of SMG female students (groups A and B) at the beginning and at the end of the academic year, as well as the associated indices that characterized the performance of the respiratory muscles. Based on the data obtained in the Stange and Gench tests, it can be concluded that the functional status of the oxygen-transport system of female students was normalized. The reaction index (RI) and the coefficient of resistance (CR) allowed us to conclude that resistance to hypoxemia increased in both groups (Oliver W.A., Wilson, Michael J., Panza M. (2021).

The Skibinsky index was used to evaluate the performance of the cardiovascular and respiratory systems. By the end of the year, better values of the index were found, however, its growth was more obvious in group A, which was probably associated with a normalizing effect of aerobic exercise on the cardiorespiratory system (Fig. I).

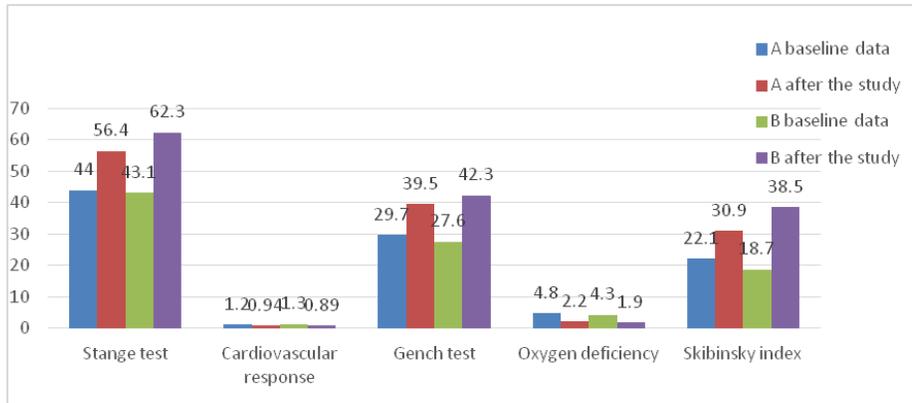


Figure 1 –Changes in respiratory data in groups A and B after the study.

Our analysis of the correlation between the Skibinski index and the body response to breath holding is shown in Figure II.

The correlation coefficients of both groups were negative and equal - 1. This means that an increase in one indicator leads to a decrease in the other (significant changes). At the beginning of the study, in group A, the response rate was 1.2, and the Skibinsky index was 22.1. In group B, the same parameters were equal 1.3 and 18.7 respectively. At the end of the academic year, the following data were recorded: in group A - 0.89 and 30.9; in group B – 0.89 and 38.5 for the response rate and Skibinsky index respectively.

The figure clearly shows that an increase in the Skibinsky index leads to a decrease in the response rate, and vice versa (Figure 2).

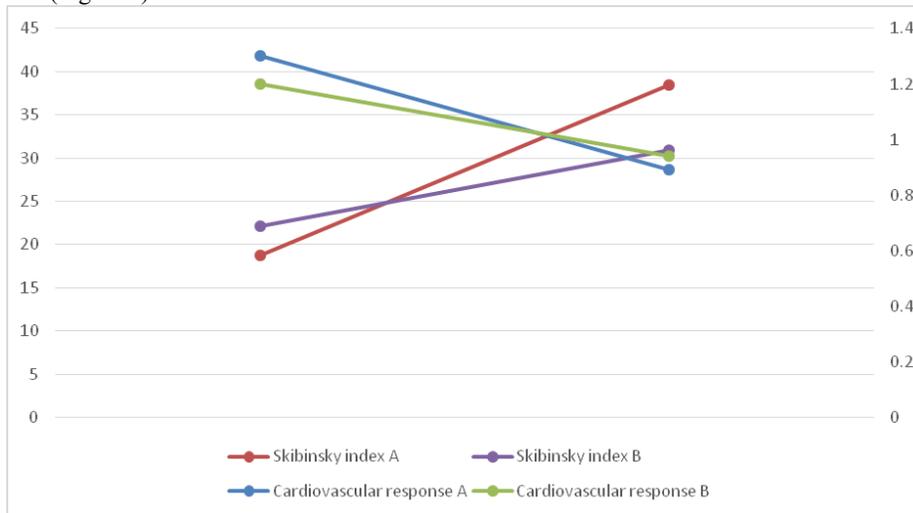


Figure 2 –The correlation between the Skibinsky index and the response rate in SMG female students before and after the study

After the use of the experimental PE program with SMG female students, positive changes in the cardiovascular system and the signs of successful adaptation to aerobic exercise were found (Fig. 1).

Discussion

External respiration and cardiac performance affect the physical fitness and working capacity of SMG female students. Therefore, an experimental technique was developed based on the use aerobics exercise, which made it possible to improve the overall performance of female students aged from 19 to 21 years and ensure the adequacy of their physical activity. As a result, a pronounced positive increase in the indices of the respiratory and cardiorespiratory systems was noted.

Conclusion

- 1) The analysis of baseline data allowed to identify reduced working capacity, cardiovascular and respiratory performance of SMG female students in both groups.
- 2) In group B, experimental training sessions with aerobics exercise were conducted. The training process itself was changed with respect to health conditions and physical fitness of female students (Roman P., Vallejo A., Aguayo B. Acure, Rumba O.G.).
- 3) A significant improvement in respiratory and cardiac performance was found in the experimental group, which confirmed the effectiveness of the experimental methodology.

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