

Impacts of aerobic self-training program on the physical development and preparation of female students

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Abstract: An aerobic self-training program that includes a variety of aerobic activities is important for the development of students' physical and mental fitness, relieving physical and mental fatigue, and preventing physical inactivity accordingly. Aerobics is one of the most self-paced exercises designed to increase heart rate and breathing, as well as body temperature, including large groups of muscles.

With a purpose to improve physical development, fitness, preparation level, endurance and metabolism of overweight female students, this study tested an active, high-intensity aerobic exercise program. The weights of students were reduced together with muscle circumference, the general physical development and preparation level were improved accordingly. The results were compared and analyzed to highlight the effectiveness of the training.

The results of the study showed a significant improvement in the participants' body weight, body circumference, and body mass index compared to pre-test, intermediate and final results. It shows the importance of the aerobic program.

Keywords: *Aerobic exercise; fitness; body weight; body mass index; body; organ system;*

INTRODUCTION

Rapid development of science and technology and an increased use of information technology nowadays result in minimizing human physical labor, and as a result, many people suffer from insufficient movement.

According to a study of the World Health Organization, "Regular physical activity can help prevent cardiovascular disease, type 2 of diabetes and cancer, reduce the symptoms of depression and anxiety, improve memory and support brain function". If the world's population were more active, it would be possible to prevent 5 million deaths a year. A guidelines to intensify the implementation of

"Exercise Action Plan" (2018-2030) has been developed, and "Global Action Plan to Promote Exercise" has been approved, setting the objective to reduce physical inactivity by 15% by the year 2030 [8].

A Russian scholar B. K. Zamarenov has defined that young people aged 17-25, having 5-8 hours of active movement per week, can fulfill their body movement needs [1].

In a book published in the late 1960s, K. Cooper wrote that "Aerobics is a health system for people of all ages, as well as for physical fitness."

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V. V. Matov has noted that "Aerobic exercise is the most common method for the treatment of various diseases" [6].

It has been well documented that regular physical activity not only decreased percentage of body fat and body weight, but it also increased health-related physical fitness of middle-aged obese woman [3].

Previous studies on obesity had emphasized that a persistent increase in the number of obese population is caused by a decrease in physical activity and excessive intake of nutrition, due to the development of industrial technology [2].

A World Health Organization study notes that obesity is a medical condition in which excess body fat, which has been accumulated to

the highest possible extent, may have a negative effect on health. World Health Organization reported that in 2014, 13% of adults over age 18 (11% for men and 15% for women) suffered from obesity, which has more than doubled as compared to 1980 [7].

For the prevention and treatment of obesity and metabolic syndrome, it is recommended to perform a variety of exercise programs, including aerobic exercise, resistance training and flexibility [5].

Stretching, relaxation, cooling down and yoga at the end of the aerobics class are all important for meeting students' physical needs and also to improve their metabolism, weight loss, and maintaining oneself in shape.

MATERIALS AND METHODS

Although aerobics is classified differently depending on the level and purpose of the exercise, we have implemented public and fitness aerobic exercise programs involving 15 female second to fourth year students of the National University of Mongolia. The program was continued for 6 months: 3 times every week.

The differences between the results of the study were determined by movement test method, anthropometric method, average by mathematical statistics, calculation of average percentage, disperse and t-test combination methods.

RESULTS AND DISCUSSION

Physical development of female students was measured by the "Movement test" method developed by J. Pagano and anthropometric method was applied for measuring physical development. The students' physical

development was assessed by taking a preliminary test, an intermediate test after three months of training, and a final test after six months of training.

Table 1. Average physical development indicators of self-training aerobic program students of pre-test and post-test comparison

		n	Mean ± SD	df	t	p
Age (years)	Pre test	15	20 ± 2.5	14		
Height /cm/	Pre test	15	157.41 ± 8.5	14		
Weight /kg/	Pre test	15	70.77 ± 11.95	14	65.66	0.000*
	Post test	15	66.34 ± 11.2	14		
Shoulder girth	Pre test	15	103.05 ± 5	14	4.5	0.0001*
	Post test	15	97.05 ± 5	14		
Chest circumference /cm/	Pre test	15	97.97 ± 6.4	14	14.95	0.000*
	Post test	15	94.42 ± 6.2	14		
Right upper arm /cm/	Pre test	15	37.02 ± 3.8	14	5.91	0.003*
	Post test	15	33.72 ± 3.8	14		
Left upper arm /cm /	Pre test	15	37.04 ± 4.05	14	6.34	0.002*
	Post test	15	33.94 ± 4.05	14		

Waist circumference /cm/	Pre test	15	98.27 ±6.15	14	15.14	0.000*
	Post test	15	95.17±6.15	14		
Right thigh circumference /cm/	Pre test	15	61.32±6.7	14	19.82	0.000*
	Post test	15	59.04±6.7	14		
Left thigh circumference /cm/	Pre test	15	61.37±6.9	14	21.72	0.000*
	Post test	15	59.04±6.7	14		
Right shin circumference /cm/	Pre test	15	35.95±2.5	14	24.97	0.004*
	Post test	15	33.85±2.5	14		
Left shin circumference /cm/	Pre test	15	35.96±2.5	14	2.51	0.002*
	Post test	15	33.86±2.5	14		
Buttock circumference /cm/	Pre test	15	98.26±6.15	14	3.08	0.06*
	Post test	15	95.16±6.15	14		

p<0.05*

Prior to the start of class, the body mass index was calculated by averaging the general physical development of 15 students. The body mass index (BMI) is a measure of how well a person's body weight and height correspond to

each other. We have calculated the body mass index by using "Quetelet index" developed by a Belgian scientist Adolphe Quetelet (BMI = Kg/cm²). The overweight of participants is 28.72.

Table 2. Average level of physical preparation (%)

		n	Mean ± SD	df	t	p
Upper body	Pre test	15	11 ± 4.0	14	4.18	0.000*
Stretching	Pre test	15	28 ±3.0	14		
Middle part of the body Sit-ups	Pre test	15	11 ±2.5	14	0.36	0.000*
	Pre test	15	50 ±6.5	14		
Lower body	Pre test	15	20 ±3.0	14	6	0.000*
Half-sit ups	Pre test	15	95 ±3.0	14		

p<0.05*

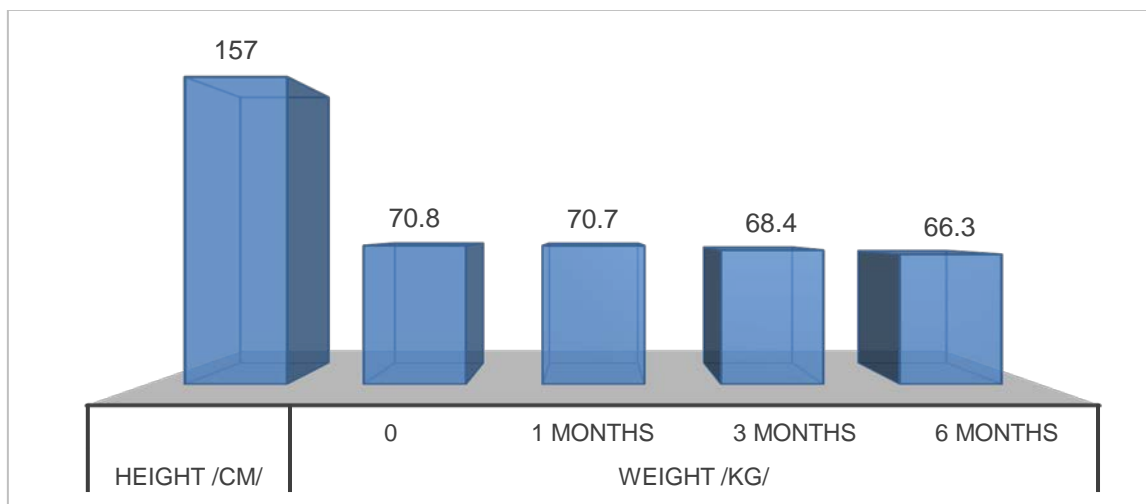


Figure 1. Comparison of body weight of aerobics self-training program students

According to the average body weight of female students having aerobics self-training program, 0.1 kg (0.14%) was lost and the index was 28.68 after 1 month, 2.4 kg (3.38%) was lost and the index was 27.74 after 3 months, and 4.5 kg (6.35%) was lost and the body index was 26.89 after 6 months respectively.

The reason why the body weight is not deducted in the first month is due, primarily to the fact that body and muscles try to adapt to loads and the adipose tissues decompose. This is the reason why students do not lose weight in the first month of self-aerobic training program.

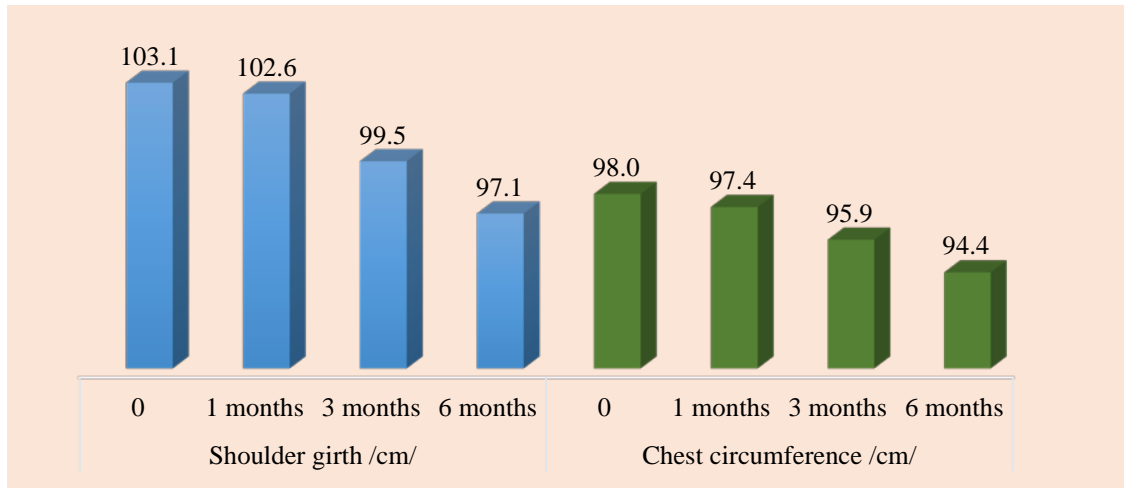


Figure 2. Shoulder and chest average measure of independent aerobic students (cm)

Shoulder circumference reduced by 0.5 cm (0.48%) after 1 month, 3.6 cm (3.49%) after 3 months, and 6 cm ($p < 0.004$) after 6 months.

While chest circumference reduced by 0.6 cm (0.61%) after 1 month, 2.1 cm (2.14%) after 3 months and 3.6 cm ($p < 0.04$) after 6 months.

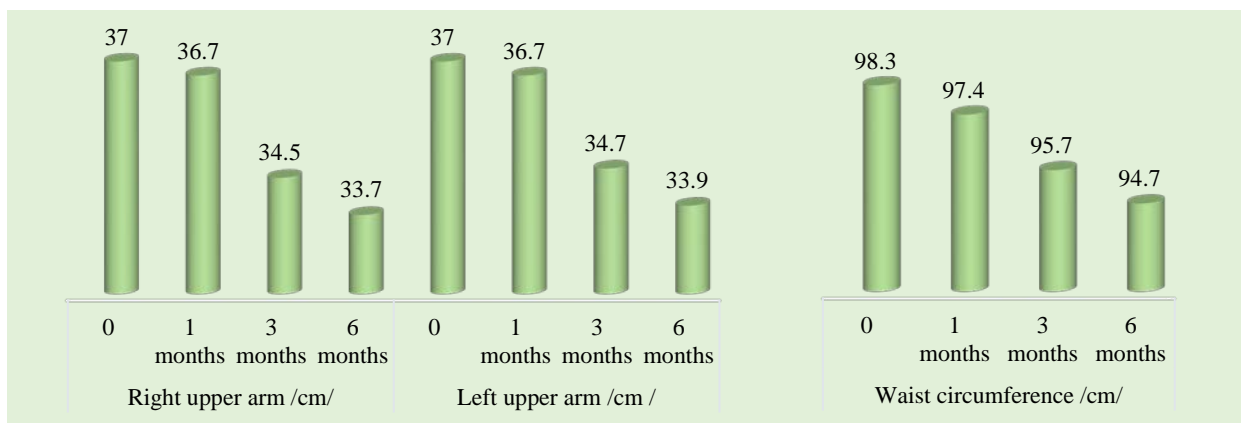


Figure 3. Shoulder and chest average measure of independent aerobic students (cm)

According to the above figure, the upper arm circumference of both hands is the same or 0.3 cm (0.81%) after one month, the right upper arm circumference is 2.5 cm (6.75%) and the left circumference 2.3 cm (6.21%) after 3 months, and the right upper arm circumference is 3.3 cm ($p < 0.003$) and the left circumference reduced by 3.1 cm ($p < 0.01$) after 6 months.

The waist circumference reduced by 0.9 cm (-0.91%) after 1 month, 2.6 cm (-2.64%) after 3 months, and by 3.6 cm ($p < 0.05$) after 6 months respectively.

Comparing these indicators, we find that there is a slight decrease in upper body in the first month, which can be explained by the adipose tissue decomposition between muscles. It is believed that exercises aimed at developing arm and shoulder muscles combined with walking, running, and jumping played an important role.

The difference between the aerobic exercise before and after 6 months is 95-99% ($p < 0.05$), the most probable and significant indicators confirm positive changes in the physical development of learning students.

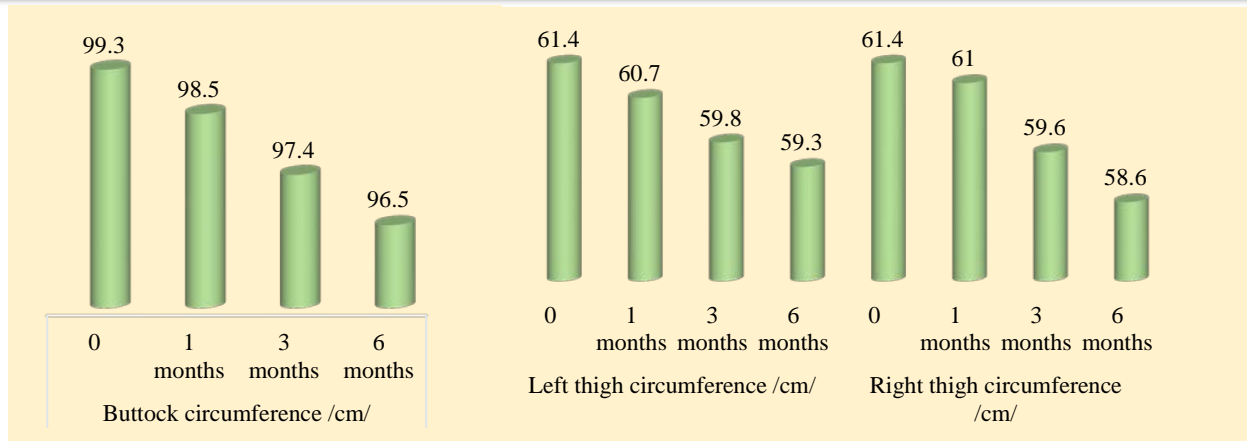


Figure 4. Right and left thigh and backside measure of independent aerobic students (cm)

According to above figure, the buttock circumference reduced by an average of 0.8 cm (-0.80%) in the first month, 1.9 cm (-1.91%) after 3 months and 2.8 cm ($p < 0.07$) after 6 months.

Regarding the thigh circumference, the right thigh circumference reduced by 0.7 cm

(1.14%) after 1 month, by 1.6 cm (2.60%) after 3 months and by 2.1 cm ($p < 0.001$) after 6 months, while the left thigh circumference reduced by 0.4 cm (0.65%) after 1 month, by 1.8 cm (2.93%) after 3 months, and by 2.8 cm ($p < 0.00$) after 6 months, respectively.

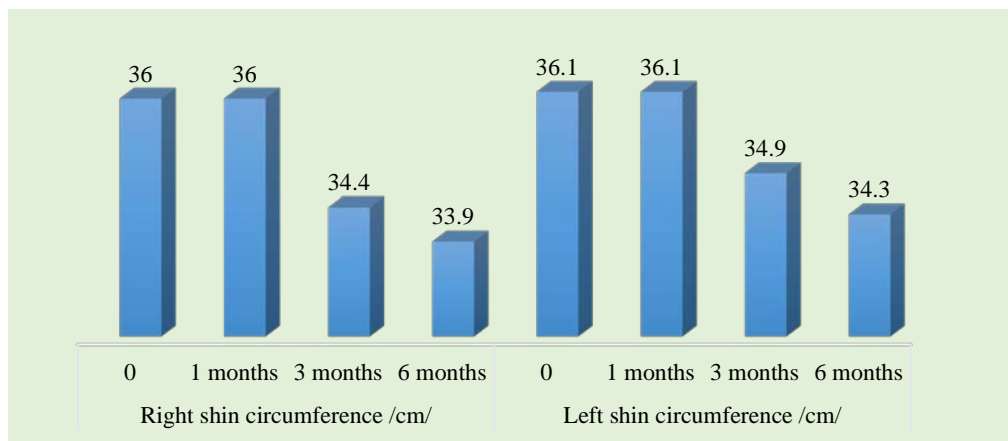


Figure 5. Right and left shins measure of independent aerobic students (cm)

The shin circumference had not reduced after 1 month. However, the right shin reduced by 1.6 cm (-4.44%) and the left shin by 1.2 cm (-3.32%) after 3 months, the right shin by 2.1 cm ($p < 0.004$) and the left shin by 1.8 cm ($p < 0.02$) after 6 months. This shows that the right shin circumference was reduced by an average of 10.27% and the left shin circumference by an average of 8.3%, respectively ($p < 0.004$).

Of these, 30-35% of women with a normal body weight is muscle, 28-30% is adipose tissue, and more fat accumulates around the chest, breasts, hips and pelvis areas [9], which may have caused less weight loss in the first month. The body and muscles are fully

adopted for exercise loads, and the adipose tissues between the skin surface and the muscles is decomposed, becoming more developed and shaped in the next months.

Finally, comparisons between the pretest and post-test measurements of weight, arm, shoulder, chest, waist, leg, hip in the participants were given. In accordance with this, there were statistically significant differences in weight, arm, shoulder, chest, waist, thigh and shin estimations ($p < 0.05$).

The main purpose of the fitness aerobics program is to reduce physical inactivity, promote balanced physical development and to increase muscle strength and muscular endurance. Muscular endurance is determined

by using a "fitness test" developed by Joan Pagano, a fitness expert in sports therapy in the United States.

Before the implementation of a program, the muscular endurance of upper body, which is

biceps and triceps of chest, shoulders and arms, was 55%. It improved after the training and became 65% after 3 months and 85% after 6 months.

Table 3. Correlation between body weight and muscle performance of independent aerobic student

Weight /kg/	Chest circumference /cm/	Shoulder girth	Right upper arm /cm/	Left upper arm /cm/	Waist circumference /cm/	Buttock circumference /cm/	Right thigh circumference /cm/	Left thigh circumference /cm/	Right shin circumference /cm/	Left shin circumference /cm/
	0.99	1.00	0.98	0.98	0.97	0.96	0.95	0.99	0.97	0.99

After six months of healthy aerobic exercise, the student lost weight as well as muscle circumference. When we compare the statistical correlation and significance of body weight and muscle circumference ($r = +.95 > 0$, $r = +.99 > 0$, $r = +1 > 0$), there is a positive and strong correlation. This shows that aerobic exercise has a positive effect on a student's physical development.

Thanks to aerobic exercise, female students' muscles became stronger, their physical circumference decreased and their physical development improved. In other words, body weight, muscle development and circumference are directly and strongly related. It can be concluded that with weight gain, muscle development slows down and circumference increases.

Table 4. Average level of physical fitness of female aerobic students after 6 months of training

Month of measurement	Upper body Stretching		Middle part of the body Sit-ups		Lower body Half-sit ups	
	Times	Percent, %	Times	Percent, %	Times	Percent, %
0	11	55	11	22	20	22
3	24	120	34	68	60	67
6	28	140	50	100	95	106
Increase	13	65	23	46	40	44
	4	20	16	32	35	39
	17	85	39	78	75	83

The middle part of the body includes the abdomen, and the back muscles. The average indicator of this part was 22% of the total students before the program, which increased by 46% after 3 months, and by 78% after 6 months reaching 100% as a result of the training.

Regarding average indicator of lower part of the body, it was 22% at the beginning of the program, which increased by 44% after 3 months, and 39% after 6 months reaching 83%.

According to the results of the students' study, endurance at the time of the initial test

was 22%, which increased to 100% after 6 months. This means that the muscle fibers are fully worked; muscle tissue growth improved increasing the muscular endurance, physical development and training level.

During the implementation of the program, the physical development indicators of the students were summed up and the average body weight was reduced by 4.5 kg or 9.87% ($p < 0.05$), and the other circumference indicators were reduced by 6.03 cm or 6.52% ($p < 0.05$) on an average.

The aerobics program to change the physical development indicators of the students was designed to last 30 to 60 minutes, to do high-intensity exercises for all muscles of the body with a moderate to high speed in the

beginning and the main part of the program, and at the end of the training, do callanetics exercises to tighten the muscles.

CONCLUSIONS

The main purpose of the fitness aerobics program is to reduce physical inactivity of students who work long hours with heavy mental workload, to promote healthy living habits, and to improve physical development. The main purpose of our study has been fulfilled.

Aerobics students were encouraged to do muscle strengthening and strength training in the main part of the training, and stretching and relaxation exercises at the end of the training. Exercises with weights and heavy balls to tighten and shape the muscles during its heat can cause the muscles to cramp. Thanks to stretching and relaxation exercises, the results on muscles will double, joint movement will improve, physical inactivity will reduce, daily work and muscle fatigue will be addressed, and endurance will improve [4]. The motivation and aspiration of the student is the most important factor, and if the goal is clear and the results achieved are realistic, they will have a significant impact on the success and outcome of further learning activities. No materials or special facilities are needed for fitness aerobics.

It can be concluded that students and young people can improve their health, develop their physical fitness, increase their physical activity opportunities, and increase their work energy and ability in order to live a healthy and an active life.

Proposal: Aerobic exercise does not require any special facilities or materials, subsequently it is suitable for students and young people of all ages to train independently under the indirect supervision of physical education teachers. Therefore, it is important for adults to develop good aerobic exercise habits by doing exercises for 30-60 minutes three times a week, which will be important for the development of mass public sports. It is likewise important to plan aerobic training programs that will provide weight loss, positively affect body composition and improve life quality in females for a long term.

Moreover, aerobic exercise contributes to physical development, fitness and health protection, which are important for the country's development by having healthy and energetic citizens.

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