

# Using Fusion Circuit Training to Reduce Overweight (Obesity) Among High School Students

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## Abstract

The search for means to increase the effectiveness of physical education lessons in general education institutions, including the health-improving component, is relevant, since there is an increase in the number of overweight students, chronic diseases, along with regression in their level of physical fitness. One of the solutions to the above-stated problems is the creation of an educational process based on continuous circuit training since this organization allows you to increase the motor density of the lesson, which contributes to an increase in energy costs, in the use of energy substrates and, as a result, in weight correction. The purpose of the study is to evaluate the effectiveness of using continuous circuit training in physical education classes to reduce overweight (obesity) among high school students in general educational institutions. The results of the study proved that the usage of continuous circuit training in physical education classes can reduce the body mass index and increase physical fitness among high school students with varying degrees of obesity.

**Keywords:** Continuous circuit training, Obesity, Physical education lessons, High school students

## INTRODUCTION

According to WHO (World Health Organization), the majority of the population of economically developed countries is overweight (about a third of the population is 20% or more overweight than normal), moreover, this is also observed in people of a relatively young age who lead a sedentary lifestyle [1-3]. In overweight and obesity not without reason they see one of the most common causes of not only the loss of normal capacity and diseases (metabolic and others) but also premature death [4, 5]. According to statistics, among people of a certain age, the mortality rate is proportional to the amount of overweight [6, 7]. Almost twice as many obese people die from cardiovascular diseases than their peers with normal weight [8-11].

The primary role in solving this problem is assigned to physical culture and sports (along with the rationalization of nutrition, of course) [12]. The special value of physical education means in this regard lies in the fact that they allow, even in many cases without resorting to a sharp restriction of nutrition, to normalize the ratio of the structural components of the body based on the expenditure of fat resources for the energy supply of motor activity, the activation of which is associated with a general increase in functional capabilities of the human organism and the proportion of active (muscle) structures [13-18].

In recent years, there have been more and more cases of overweight among high school students. According to the study, 20-25% of high school students need to reduce body

weight [19-21]. However, we have not found a solution to this problem in scientific and methodological works. All this suggests that the problem of preventing and combating obesity is a serious one. The need for weight correction in high school students in physical education classes has therefore become a matter of urgency.

## MATERIALS AND METHODS

### Participants

The study involved students (young men) of the senior classes of SBEI № 1383 in Moscow. The body mass index (BMI - body mass index) is a measurement calculated in 1869 by Adolphe Quetelet, the father of scientific statistics. It determines whether a person's height and body weight match identifies underweight or overweight, and allows a diagnosis

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of a certain degree of obesity to be made [22, 23]. After determining BMI overweight young men were identified. Their total number was 28. Two groups were formed by random sampling, one experimental and one control group of 14.

### Procedure

During the 4 months, the two groups were engaged in physical education classes 3 times a week for 40 minutes in a comprehensive school setting. The classes were organized according to a conventional scheme, consisting of three interrelated parts. The preparatory part took 6-7 minutes, the main part 30 minutes and the final part 3-4 minutes.

In the control group, the classes were conducted according to the usual complex program for pupils in grades 1-11 of the comprehensive school. In the experimental group, the classes were conducted once a week using "fusion circuit training" (in the main part of the class).

This form of "circuit training" was based on continuous, prolonged work of moderate and greater intensity. The exercises composing the "circle" were selected according to the general symbol of "circuit training", i.e. according to the

rule of consistent exposure to all major muscle groups. The exercises were performed in series, repeatedly, without pauses. The time allotted to complete the "circle" and the number of repetitions of the "circles" were determined by the maximum repetition test, the so-called repetition maximum – RM (a preliminary rough estimate of the individually available maximum repetition of each exercise for 1 minute, or a slightly longer or shorter time, depending on the difficulty of the exercise) [24-27].

The initial training time was set so that the boys could complete at least one whole circle in a single class without pauses, repeating each exercise for at least 1/2-1/3 of the RM. Then the number of repetitions of the exercises in the "circle" (e.g. up to 3/4 RM) was increased without prolonging the initial total time of the "circle" if possible, as well as the number of the "circles" (e.g. up to 2-3) [28-30].

## RESULTS AND DISCUSSION

The final stage of our study examined the impact of the experimental technique in physical education lessons on the BMI and physical fitness of high school students. The results are shown in **Tables 1 and 2**.

**Table 1.** Changes in BMI among high school students during the study, (persons)

Degree of obesity	Control group		Experimental group	
	Before the experiment	After the experiment	Before the experiment	After the experiment
Norm (18,50-24,99)	-	-	-	3
Pre-obesity (25,00-29,99)	5	6	6	5
Obesity of the first degree (30,00-34,99)	4	4	2	3
Obesity of the second degree (35,00-39,99)	4	3	4	3
Obesity of the third degree (>40,00)	1	1	2	-

**Table 2.** Dynamics of physical fitness indicators for high school students

Tests	Control group		Experimental group	
	Before the experiment	After the experiment	Before the experiment	After the experiment
6 minute run, min	1028±6,9	1038±5,0	1013±6,8	1153±4,7
30 meters run, sec	5,60±0,08	5,63±0,06	5,65±0,08	5,05±0,03
Pulling up on the high bar, times	1,3±0,3	2,0±0,5	1,0±0,3	6,5±0,8

The study showed that the experimental technique used in physical education classes was quite effective. This is confirmed by the following data: BMI improved in all the boys from the experimental group who were overweight, and in 3 students it even normalized. Whereas in the control group, this indicator remained practically unchanged. The level of physical fitness increased more significantly in the experimental group: in the 6-minute run for 120 meters, in the run for 30 meters – 0.6 sec and in pulling up on the high bar – 5.5 times, in the control group the 6-minute run – 10 meters, pulling up – 0.7 times, and in the run for 30 meters there was

a decrease of 0.3 sec. The changes are statistically reliable ( $P < 0.05$ ).

## CONCLUSION

Firstly, the results of the control tests showed that the overweight boys in the experimental group had a greater reduction in their BMI after four months than the boys in the control group.

Secondly, the use of fusion circuit training in physical education classes led to a significant improvement in the

physical fitness of the experimental group compared with the control group.

Thirdly, "circuit training" based on the type of extensive continuous intensity can be effective. This type of "circuit training", when used systematically, is also an efficient weight normalizing factor, but it is less efficient in increasing the relative index of strength than the "circuit training" based on extensive continuous intensity.

Fourthly, if an excess of fat mass is relatively small, there is no need to resort either to starvation or too sharp dietary restriction, it is enough to temporarily reduce its caloric content so that it is less than energy expenditure and to increase physical activity.

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**CONFLICT OF INTEREST:** None

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**ETHICS STATEMENT:** All procedures met the ethical standards of the 1964 Declaration of Helsinki. Informed consent was obtained from all parents of the children included in the study.

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