

# The Effects of 108-Bae Program on Body Composition and Physical Fitness of Obese High School Students

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## Abstract

This study focused on a program that can help to improve physical fitness and body composition of students whose basic physical fitness have deteriorated due to extreme obesity. First, after 108-Bae training program for 12 weeks, 5 factors were analyzed including muscular strength (grip strength), muscular endurance (sit-ups), power (50m sprint), flexibility (trunk forward flexion) and cardiovascular endurance (long-distance running). And the results show all the factors showed statistically significant improvement. Second, changes in body composition on showed that after 108-Bae training, there was significant decrease in the amount of body fat, BMI, body fat percentage and abdominal fat rate, and there was no significant difference in skeletal muscle mass. Therefore, it is thought that 108-Bae training program for students with obesity and low physical fitness has positive effects on improvement in the change of body composition and physical fitness.

**Keywords:** Body Composition, High School Student, Physical Fitness, Obesity, 108-Bae program

## 1. Introduction

Adolescent period is a preliminary stage to taking an adult role in the society, and it is a period in life when one experiences various changes and development, including social maturity<sup>1</sup>. According to Han et al<sup>2</sup>, adolescent obesity is on the rise every year, and this phenomenon is due to the lack of exercise which is becoming a social issue. There should be a continuous research on the physique, body composition, and changes in physical fitness of the youths in the formative years of growth. Especially as excessive nutritional intake and nutritional imbalances deepen, there is a tendency that the population with obesity and diseases will increase. The World Health Organization mentioned in 2000<sup>3</sup> that the prevalence rate of obesity had gradually increased and classified obesity as a disease. It had become a more important disease than the traditional problems of public health, such as malnutrition and infectious diseases. According to Flegal and

Troiano<sup>4</sup>, 26% of the people in USA are obese (BMI over 30.0%), and 61% are overweight (BMI over 25.0%). Kopelman<sup>5</sup> pointed out that if the current increase continues, 40% of the people in USA will be diagnosed with obesity by 2025. The report by Ministry of Education & Human Resources Development<sup>6</sup> on the youth obesity rates showed that the obesity rates among the students in the elementary, middle, and high schools were 11.62% (light 6.46%, middle 4.32%, extreme 0.84%). This indicated that the obesity rates are on the rise every year, as the obesity rates increased as the students moved upward to higher grade levels; and male students showed higher obesity rates than female students. Adolescent health survey (A survey on youth health Type) also reported that the obesity (overweight and obesity) rates of the middle and high school students were 8.6% in 2005 and 9.6% in 2006. For male students, it was 11.2% in 2005 and 11.7% in 2006; and for female students, it was 5.6% in 2005 and 6.5% in 2006. This showed that the rate increased as the students moved up from middle school to high school<sup>7</sup>.

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The report by the International Obesity Task Force in 2003 showed that 1.7 billion people (25% of the world population) were obese, and 312 million of the obese people were at least 13.4kg overweight than the maximum permissible limit. Recently, due to the great interest in health, many researches have been conducted on the genetic factors of obesity<sup>8</sup>. There have been several reports suggesting that many causes of obesity can be reduced through various exercise programs<sup>9-11</sup>. For this study, 108-Bae training was carried out as an exercise program for students that can consume high-calorie energy in a short period of time; this program not only improves the physical fitness but also fosters the mental stability and patience. The 108-Bae training program can easily be practiced by anyone, at anytime and anywhere, even within a small space of about 0.5 Pyung. Also, it is one of the exercises easier than free exercises that can be done as easily. However, a few journal articles and volumes of books on the studies of 108-Bae training at home and abroad is not enough; furthermore, there is no paper on the effects of clinical trials after continuous practice of this exercise. Therefore, the present study could serve as preliminary data. Especially, the comparison and analysis studies of the changes in physical growth and development of obese adolescents can be helpful for comprehending the actual conditions at school that are effecting on obesity and finding appropriate ways to cope with obesity. Regular and proper 108-Bae training program can help to reduce body fat percentage and increase bone mass and muscle mass. It also helps to maintain health by enhancing the factors related to physical fitness, including muscular strength, muscular endurance, explosive muscular strength, flexibility, and cardio respiratory endurance. Furthermore, it motivates students to become more aware of the development and changes in the body and to participate more actively in the physical exercise. To provide preliminary data for preventing obesity in adolescents, this study arranged a 108-Bae training program over 12 weeks (4 days per week) for obese male high school students. The analysis was carried out on the differences in the items, in order to measure physical fitness according to the current system of PAPS (Physical Activity Promotion System) and to assess the physical fitness (muscular strength, muscular endurance, power, agility, flexibility, cardiovascular endurance) and body composition (weight, amount of muscular strength, amount of body fat, BMI body fat percentage, abdominal fat rate).

## 2. Method

### 2.1 Subject of Study

The subjects of this study were 14 male high school students in Gyeonggi-do area, who had more than 30% of body fat percentage based on the analysis of body composition. The students showed willingness to participate in this 108-Bae training program, and their agreement was obtained to participate in the program. The physical characteristics of the subjects are shown in Table 1.

### 2.2 Research Procedures and Methods

In order to analyze the effects of 108-Bae training program for 12 weeks on the physical fitness and body composition, the present study measured factors of physical fitness and body composition before and after the training. All subjects were reminded to refrain from excessive exercise in the evening before the measurement, and they gathered at the school training field in the morning to take the measurements.

#### 2.2.1 Measurement of Physical Fitness

All subjects were dressed in comfortable clothes for training, and they gathered in the training field to take measurements in the following items on the physical fitness assessment system implemented at school (PAPS): muscular strength, muscular endurance, power, agility, flexibility, and cardiovascular endurance.

##### 2.2.1.1 Muscular Strength

Measurement of muscular strength was carried out by the grip strength test, and the measurement method was as follows. The student stood upright with the feet spread apart in shoulder width, and then the handle of dynamometer was held with the second knuckle. The subjects straightened their arms and pulled the handle as hard as possible, while maintaining the angle of the torso and arms at 15°. The body should not move while performing this. It was conducted twice for the left and right hands, alternatively, to provide the maximum value as a measurement.

##### 2.2.1.2 Muscular Endurance

Muscular strength is the ability of muscle to keep muscular contraction with a certain amount of load or the ability of the muscle to repeat the exercise with same intensity. For this study, sit-ups were measured according to the

procedures as follows. The subjects were laid down on the mat with their heads and backs on the ground. The knees were bent at an angle of 90°, and the arms were spread with the palms on their thighs. Then, following the beep once in 3 seconds, the subjects rolled up their upper bodies so that they could wrap their knees with the palms of their hands; and they immediately returned to the ready position after the subjects touched the hands of the measurer.

### 2.2.1.3 Power

Power refers to the ability to do great amount of work within a limited period of time in exercise, which includes running, jumping, throwing, or moving fast. For this study, 50m sprint was measured.

### 2.2.1.4 Flexibility

For the range of joint motion, sitting trunk flexion was measured by using tool to count the number of bending chest.

### 2.2.1.5 Cardiovascular Endurance

Cardiovascular endurance, also called total body endurance, refers to the ability to continue exercise for a long period of time without feeling exhausted; this indicates a strong development of the heart and lungs. This study measured long-distance running (1,600m).

## 2.2.2 Measurement of Body Composition

Body composition was measured using body composition analyzer (In body) of BIA style for testing machine for measuring weight, BMI, body fat percentage, amount of body fat, abdominal fat rate, and skeletal muscle mass. Because the measurement of body composition is done by electrifying throughout the body, it is based on the moisture content of the body. The subjects were reminded to observe the following guidelines for accurate measurement of body composition.

- To urinate 30 minutes before the test
- Not to exercise for 12 hours before the test
- Not to eat or drink for 4 hours before the test
- To maintain the temperature of the testing room at 25°C before and after the test
- Not to take diuretic for 7 days before the test
- Not to take alcohol for 48 hours before the test
- To choose left or right side of the body and measure the same part throughout the whole test

## 2.3 Training Program

The training program carried out for this study is 108-Bae training program, which was performed in the school training field for 12 weeks, 4 times per week. The warm-up exercise was performed for 10 minutes before the main training, and the cool-off exercise was performed for 10 minutes after the training. The method for implementing 108-Bae training program is as follows:

Put both palms together in front of the heart.

Bend both knees while squatting down in a horse-riding position, and slowly breathe in.

Kneel down and let the heels touch the buttocks.

Put both hands down on the ground, with 10cm of space in between the hands.

Maintain the gap between the hands so that the head can come between the hands when bowing down.

As the forehead touches the floor, the heels should be touching the buttocks.

Elbows should touch the floor, and the palms are facing up while lifting above the ear level.

Sit up to a kneel-down position, and put the palms together at the chest; the heels should be touching the buttocks in a comfortable sitting posture.

While spreading knees, stand up in a horse-riding position.

Keep the palms together in front of the heart.

By using metronome, 108-Bae was done once in every 8 seconds. The total time to complete the training program was about 15 minutes.

## 2.4 Data Analysis

For data analysis for this study, SAS (9.3) statistical program was used. For result analysis, the mean and standard deviation were calculated for all variables of physical fitness and body composition. The differences in the average value for each item, before and after the 108-Bae training program for 12 weeks, were verified based on the 5% significance level using the paired t-test.

## 3. Results

A total of 14 obese male high school students were enrolled in 108-Bae training program for 12 weeks (days per week). The muscular strength, muscular endurance, power, flexibility, and cardiovascular endurance were measured, and the measurements were verified by the paired t-test. The results are shown in Table 2. After 108-

Bae training program, muscular strength (grip strength) showed significant increase from 40.63kg before the training to 41.6kg ( $p < 0.001$ ) after the training; and muscular endurance (sit-ups) also showed significant increase from 29.8 times before the training to 42.3 times after the training ( $p < 0.001$ ). Power (50m sprint) showed significant decrease from 9.66 seconds to 9.18 seconds ( $p < 0.001$ ); flexibility (sitting and bending forward) showed significant increase from 2.85cm to 5.64cm ( $p < 0.001$ ); and cardiovascular endurance (long-distance running) showed significant decrease from 929 seconds to 781 seconds ( $p < 0.001$ ). Therefore, all of the 5 factors in the system used to assess health and physical fitness (PAPS) showed significant improvement in physical fitness after 108-Bae training program for 12 weeks ( $p < 0.001$ ).

week, showed significant improvement in all of the following factors of body composition: amount of body fat, body fat percentage, BMI, and abdominal fat rate. The study by Oh<sup>12</sup>, on the effects of 108-Bae training program for 30 days on the improvement in abdominal obesity, reported with positive effects on abdominal obesity and significant decrease in body fat percentage. Kim<sup>13</sup> also reported that the clinical experiment on a long-term 108-Bae training program had a positive effect on abdominal obesity. Lee<sup>14</sup> reported that after 7 mid-aged females carried out 108-Bae training program for 12 weeks, there was a significant decrease in weight, amount of body fat, and body fat percentage. The comparison of the results in the present study with the results in the previous studies at home and abroad

**Table 1.** The physical characteristics of the subjects

Subject	Height (cm)	Age (year)	Weight (kg)	BMI	Body fat percentage (%fat)	Amount of abdominal fat
Experimental group (n=14)	172.14±6.94	16.71±0.994	95.07±19.33	31.9±5.26	35.26±5.26	0.93±0.30
Standard range (n=14)	172.14±6.94	16.71±0.994	74.93±7.00	24.59±1.42	22.16±5.55	0.90±0.011

**Table 2.**

Component	N	Pre-test	Post-test	Mean difference	SE	t
Skeletal muscle mass (kg)	14	34.28	33.62	-0.66	0.348	-1.91
Amount of body fat (kg)	14	34.3	28.72	-5.57	1.119	-4.98**
BMI(kg/m <sup>2</sup> )	14	31.92	29.43	-2.49	0.537	-4.64**
Body fat percentage (%)	14	35.26	30.72	-4.54	1.303	-3.48*
Abdominal fat rate	14	0.93	0.91	-.001	0.006	-2.68**

## 4. Discussion and Conclusion

In order to analyze the effects of 108-Bae training program for 12 weeks on body composition and physical fitness (PAPS) of obese high school students, this study conducted an experiment on 14 students with extreme obesity, who have more than 30% of body fat percentage; and the results and discussion are as follows. The result of 108-Bae training program, for 12 weeks and 4 days a

related to 108-Bae and aerobic exercises showed an agreement. This shows that 108-Bae training program has a positive effect on body composition and is effective for decreasing the abdominal fat, which is due to lack of exercise or excessive nutrition; this is similar effect as other aerobic exercises. Especially, 108-Bae training has an advantage that it can be carried out in a small space and has a comparatively high effect for the time spent on exercise. The present study did not reset the intensity

eof exercise or modify the program after exercising for a certain period of time. Yet, if the number of performed 108-Bae is increased in further studies, the intensity of exercise will be taken into account, and there should be positive effects on the skeletal muscle mass. All of the factors for physical fitness — muscular strength, muscular endurance, power, flexibility, and cardiovascular endurance — showed significant improvement after 108-Bae training for 12 weeks. Seo<sup>15</sup> reported that after 108-Bae training on 10 dancers for 6 weeks, the comparison of muscular strength of the lower limbs showed significant differences in power. Lee<sup>14</sup> also reported that the effect of 108-Bae training program on 7 mid-aged women on physical fitness showed significant improvement in all of the factors of muscular strength, power, flexibility, and endurance. The results of the previous study and those of the present study showed agreement, which means that 108-Bae training has a positive effect on the improvement of physical fitness in the people with obesity. It seems that the movements in 108-Bae use the entire body continuously, especially the muscles of the lower body and the waist, and there is a great improvement in power and flexibility. Therefore, the 108-Bae training program carried out for the present study has merits as aerobic exercise, which even normal people can easily practice in a small, confined space.

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