



Original Article

The effects of dance music jump rope exercise on pulmonary function and body mass index after music jump rope exercise in overweight adults in 20's

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Abstract. [Purpose] The purpose of this study was to examine the effect of a dance music jump rope exercise on changes Pulmonary Function and body mass index in female overweight subjects in their 20's. [Subjects and Methods] The subjects were randomly assigned to the dance music jump rope exercise group and the stationary cycle exercise group. All subjects have conducted the exercises three times a week for four weeks. Pulmonary function was evaluated using a spirometer, and body mass index was evaluated using an InBody 3.0. [Results] The findings of this study showed significant improvements in the voluntary capacity and body mass index of the experimental groups. Vital capacity was higher in the music jump rope exercise group than the stationary cycle exercise group, and body mass index was lower in the music jump rope exercise group than the stationary cycle exercise group. [Conclusion] This study showed that the dance music jump rope exercise can be used to improve vital capacity and body mass index.

Key words: Vital capacity, Dance music jump roping, Overweight

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INTRODUCTION

Obesity, which refers to the condition of having an abnormally increased amount of fat in the body, can cause adult diseases that result in decreased, decreased physical strength, and decreased cardiopulmonary reserve function¹⁾. Generally, women have more fat than men and require a larger amount of food to produce energy because women have fewer muscles, which consume energy²⁾. Furthermore, women are more vulnerable to obesity than men because women undergo unique biological reactions related to changes in hormones and to mental and environmental effects throughout their lives. Thus, the proportion of obesity in women is more than twice that of men. Obesity is associated with dyslipidemia, type 2 diabetes, and cardiovascular disease, and this association means that obesity affects health in a variety of ways³⁾.

Diet and exercise therapies have been the main recommended treatments for obesity, and many studies have been conducted to reduce or prevent obesity using these therapies. Among these therapies, exercise therapy has been the safest and most economical method, and aerobic exercise forms a large part of exercise therapies. Aerobic exercise has been reported to be effective at improving the respiratory system and the blood lipid metabolism and at preventing coronary heart disease⁴⁾. Furthermore, pulmonary function has been significantly enhanced by increasing the amount of oxygen in the respiratory muscles and the body through respiratory exercise, which requires a large amount of oxygen because this exercise causes a rapid heart rate⁵⁾.

Among the aerobic exercises used to treat obesity, the most economical and widely used exercise is jump rope. Jump rope

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Table 1. General participant characteristics

Groups	Experimentals (n=10)	Controls (n=10)
Age (years)	22.8 ± 2.2	22.5 ± 0.7
Height (cm)	160.8 ± 3.6	162.5 ± 6.4
Weight (kg)	64.8 ± 5.3	69.6 ± 3.2
BP (mmHg)	115.4/73.4	118.3/81.2

Values are presented as the mean ± SD.

BP: blood pressure

Table 2. Dance music jump roping program

Num.	Program	Explain
1	Jumping over a rope	Place the jump on the floor and jump over it to the beat of music.
2	Walking across the turning rope	The rope is turned in a large circle at the back and the subjects naturally walk across the rope when the rope comes below their feet.
3	Jump with a broken rope	Walk or jump using a broken rope.
4	Jump with both feet put together	Turn the rope once and lightly jump the rope with both feet put together.

is a personal exercise that can regulate exercise load and increase physical activity according to a person's physical strength⁶. Music jump rope, which is a special type of jump rope, is a group exercise that is performed with background music. Music jump rope is a coordinated exercise that requires the movements of the hands and feet to be matched to the beat of music, and this type of exercise enhances body control, such as agility, endurance, quickness, and flexibility⁷. Kang reported that music jump rope decreased obesity in elementary students⁸. Oh and Kim showed that music jump rope improved the physical strength of obese female students⁹.

Since obesity has been recognized as a disease, aerobic exercise is essential for people in modern society. The obesity rate has continued to increase due to the increasing prevalence of sedentary lifestyles and westernized eating habits, and many studies have been conducted to overcome the increasing occurrence of obesity. However, most studies have focused on the obesity index, physical strength, and the constitutional effects of obesity, and studies on the relationship between obesity and cardiorespiratory functions are still insufficient. Therefore, the purpose of this study was to investigate the effects of the dynamic jump rope exercise with the addition of fast tempo musical elements on the vital capacity (VC) and body mass index (BMI) of college students in their 20s whose body fat percentage was higher than normal.

SUBJECTS AND METHODS

For this study, 20 students whose body fat percentage qualified as overweight (fat >25.0%) were selected among female college students attending N university in Cheonan, Chungcheongnam-do between May 1 and May 31, 2016. Subjects who had pathological findings (determined using a constitutional examination) other than being overweight (measured using InBody 3.0) were excluded by means of medical inquiry and tests. The subjects understood the purpose of this study and consented to participate in it. This study was approved by the Clinical Bioethics Committee at Korea Nazarene University (KNU IRB 16-1021-03) and was reviewed according to the Declaration of Helsinki. The general characteristics of the research subjects who participated in this study are summarized in [Table 1](#).

The experimental group performed music jump roping for 30 minutes per session in the laboratory, and there were three sessions a week for four weeks. The program was composed of simple techniques (which the general public can easily follow) that were based on rapid tempo dance music, and these techniques were continuously repeated for 30 minutes. The music jump roping program, which was based on a program developed by Kim¹⁰, is explained in [Table 2](#). One instructor and two assistants guided and participated in this exercise. Before participating in the program, the experimental group received adaptation training for a day to become accustomed to the music-based exercise.

The control group performed a fixed cycle exercise using a stationary exercise cycle (RECKTechnik GmbH & Co., Betzenweiler, Germany) for 30 minutes per session in the laboratory, and there were three sessions a week for four weeks. Before the experiment, the experimenter checked each subject's resting heart rate using the radial artery at the right wrist for 15 seconds, and four times the measured value was set as the subject's stable heart rate. Each subject's heart rate was checked during each resting period, which occurred at five-minute intervals after the start of the exercise. And to the speed was set below 2 kilometer per hour and the exercise intensity was adjusted not to exceed the subject's resting heart rate by 20%. Then, a fixed cycle exercise was performed for 30 minutes^{11, 12}.

Measurements were conducted using a spirometer (COSMED, SRL, Italy), which is a measuring instrument used for

Table 3. Comparison of vital capacity and body mass index measurement in experimentals and controls after intervention

	Experimentals		Controls	
	Pre-test	Post-test	Pre-test	Post-test
VC (L)	3.2 ± 0.3	3.8 ± 0.3*	3.5 ± 0.2	3.6 ± 0.1
BMI (%)	26.3 ± 1.2	24.8 ± 1.3*	26.5 ± 1.6	26.3 ± 1.3

Values are presented as the mean ± SD.

*Significant difference from the pre-test value, $p < 0.05$

VC: vital capacity; BMI: body mass index

pulmonary function tests, while each subject was in the sitting position. The experimental group and the control group were instructed to use a mouthpiece, and the subjects' noses were closed during the measurement so that air could not be inhaled or exhaled through the nose. Beginning from expiration, each subject was instructed to breathe out slowly and completely and then breathe in slowly. Subjects' VC was recorded¹³). The measurements were conducted three times before and after the experiment, and the average values of the three measured values were used in the analysis. A resting time of five minutes was given after each measurement.

Each subject's body fat was measured using a body fat analyzer (InBody 3.0, Biopace, USA). The subjects placed their thumbs on the input part of each hand with their hands and stood on the analyzer barefooted, and their body composition was measured by bioelectrical impedance analysis. The subjects took an upright posture on the position indicated on the measuring instrument with their arms and legs slightly open. They then held the electrode handles with their hands and were measured according to the measurement order of the instrument. The measurement time was set to 10 seconds or less.

In this study, SPSS ver. 16.0 was used to examine the general characteristics of the subjects and to obtain the means and standard deviations of the individual groups. A paired sample t-test was used to compare the subjects' vital capacity and body mass index values before and after the intervention, and the exercise and independent sample t-test was used to examine the differences between the measurements taken before and after the experiment in each group. A statistical significance level of 0.05 was chosen.

RESULTS

The experimental group showed significant change in VC and BMI before ($p < 0.05$) and after the experiment, while the control group did not. In the investigation of differences before and after the experiment between the experimental group and the control group, significant differences of independent sample t-test were not found ($p > 0.05$) (Table 3).

DISCUSSION

This study investigated the effects of a music jump rope exercise on pulmonary function and BMI in overweight female college students in their 20s. The music jump rope exercise adopted in this study was based on the research by Sun et al., which showed that the exercise significantly enhanced pulmonary function, strengthened the internal organs to activate their functions, and increased oxygen consumption in the body by strengthening the respiratory muscles¹⁴). For pulmonary functions, vital capacity was evaluated using a VC measuring instrument, and obesity was evaluated by measuring each subject's BMI using a body composition analyzer.

Pulmonary function and BMI measurements were conducted four weeks after the experiment concluded. The experimental group and control group showed significant differences in VC and BMI. The music jump rope exercise improved the circulation of the cardiovascular system through dynamic movements and strengthened deep breathing by activating the movement of the respiratory muscles to improve the circulation of breathing. These physical activities decreased the subjects' obesity index by increasing their basic physical strength and endurance.

In a previous study on pulmonary functions, Jang argued that the jump rope exercise had a great effect on enhancing endurance by developing the cardiopulmonary functions¹⁵). Kim and Kim showed that a 12-week music jump rope exercise program resulted in significant differences in lung capacity, which is a cardiopulmonary function¹⁶). Park et al. reported that their subjects' maximum oxygen uptake increased significantly after 12 weeks of aerobic training¹⁷). It contributed to the improvement of cardiopulmonary functions by injecting more oxygen into active muscles than respiratory muscles, thus increasing the ventilation and supplying the energy source.

Furthermore, in a previous study on obesity, Choi reported significant decreases in body fat percentage and fat mass in obese middle school girls after they completed a jump rope exercise program¹⁸). Yang showed a significant decrease in body weight and BMI after 12 weeks of music jump rope exercise¹⁹), and the body fat percentage of obese children showed statistically significant differences after they completed a music jump rope program²⁰). In addition, Yu reported a statistically significant difference in BMI, body fat mass, and body fat percentage, which all indicate changes in body composition, after

aerobic exercise in obese children²¹). This change was attributed to the decreased size of fat cells, which resulted from the diminished appetite that followed the increasing amount of energy consumption from the aerobic exercise²²).

These previous studies showed similar results in pulmonary function and BMI improvement to those obtained in this study. Therefore, the results of this study suggest that music jump rope exercise is effective for the improvement of pulmonary function and the decrease of BMI, and this exercise can help reduce obesity and improve pulmonary function according to their physical strength.

However, this study has some limitations: The research subjects included only women in their twenties, and the experiment was implemented using only rapid dance music. In the future, further studies that include subjects from diverse age groups and male subjects should be conducted when using the research methods of this study.

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