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## Original Article

# The Effect of Six-Week Aerobic Training Program on Cardiovascular Fitness, Body Composition and Mental Health among Female Students

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## ABSTRACT

**Background:** The purpose of the present study was to evaluate the effects of six-week aerobic training program including running and rope skipping on cardiovascular fitness, body mass index (BMI), and mental health among female students at the University of Isfahan, Iran.

**Methods:** In this interventional study we included 30 female students in academic year 2011-12. The participants were randomly assigned in experimental group (n=15, mean  $\pm$ SD for age=26.06 $\pm$ 1.18, weight (kg)=57.43  $\pm$ 5.67, height (cm)=160.06  $\pm$ 4.16) and control group (n=15, mean  $\pm$ SD for age=26.33  $\pm$ 1.30, weight=57.66  $\pm$ 5.08, height=161.86  $\pm$ 3.29). Pre-test and post-test measurements include VO2 max with Queen Step test; BMI and General Health Questionnaire-28 as a measure of mental health were done. Analysis of covariance (ANCOVA) was used to test the effects of aerobic training as intervention ( $P<0.05$ ).

**Results:** There was statistically significance difference between experimental and control groups after adjustment for their own baseline values concerning cardiovascular fitness ( $P=0.004$ ), BMI ( $P<0.001$ ) and mental health indices ( $P<0.001$ ).

**Conclusions:** A six-week aerobic practice improves cardiovascular strength, mental health and BMI considerably and could be more encouraged at universities.

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## Introduction

Mental health has to deal with healthiness of different characteristics of an individual such as intelligence, mind, mood, and thought, all of which influence physical health as well<sup>1</sup>. Following social development and with women taking more and more social roles, their traditional tasks are now carried out by the whole society. High expectations regarding women, given their physical and emotional nature, intensify social-mental pressures on women, which also influences all aspects of health (physical, mental, and social). Thus, mental health of women deserves more attention. In addition to psychological interventions, doing regular physical exercises can also be helpful. Hawker (2012) noted in a study that motivating university students to do physical activities improves their self-reliance and reduces rate of anxiety and depression among them<sup>2</sup>. Given the role of sport on cutting stress, it is considered as an effective intervention to ensure mental health<sup>3</sup>. Physical practice triggers biological and biochemical changes in body that leads to improvement of mental health so that amateur athletes usually have better mental health than others<sup>4</sup>. Sport is an effective intervention on body and mental health<sup>5</sup>.

Aerobic practices helps cardiovascular readiness and also increase immunity to cardiovascular diseases. High cholesterol and triglyceride and poor cardiovascular readiness increase chance of cardiovascular diseases and reduce life expectancy. As pointed out by Noordsy and Pajonk (2012), doing sport cuts cholesterol and triglyceride among schizophrenia patients and also improves their cardiovascular readiness, which leads to higher life expectancy<sup>6</sup>. Cardiovascular diseases (CVDs) are one of the causes of mortality all around the world. Although, such diseases are undeniably a function of genetics and age, other factors such as blood pressure, high blood cholesterol, diabetics, and life style also have a role in CVDs. Healthy habits such as not smoking, healthy diet, and physical activities are of main factors in prevention and treating CVDs<sup>7</sup>. VO2max is used to determine cardiovascular health. This indicator is important in determining mortality rate among healthy people and cardiovascular patients<sup>8</sup>.

Recent decades have been featured with increasing rate of obesity in the world, so that obesity is now a warning signal of blood pressure diseases, arthritis, cancer, diabetics (II), and CVDs<sup>9</sup>. Doing sport is a physical and mental intervention<sup>5</sup>.

and recent studies have warned about reduction of physical activities among university students<sup>10</sup>, so lack of physical activities leads to obesity and chronic diseases such as CVDs<sup>11,12</sup>.

Aerobic exercise is among the activities with positive effects on human health. Concerning physical health, following a physically active life style is recommended to avoid heart attacks and many other heart diseases. Heavy to moderate physical activities are recommended to be done regularly<sup>12</sup>. This introduction and critical role of women and young girls' health in particular (physical, mental, and social), when social-mental pressures have increased<sup>6</sup>, explain the necessity of this study.

## Methods

### Participants

Thirty female students of 200 student volunteers at University of Isfahan, central Iran, during 2011- 2012 academic year were selected and randomly assigned in experimental and control groups equally including 15 participants in each group. Random allocation was implemented using block randomization with a fixed block size (Block=2). Participants signed the informed consent letter and those with specific diseases (e.g. heart diseases) were excluded.

### Measurements

Physiologic indices including cardiovascular fitness and BMI were measured using Queen Step test and weight/height test. VO2max for women was determined using Queen Step test and cardiovascular readiness of the participants was also measured. VO2 max equaled to 65.81- (heart beat rate per min\*0.1847)<sup>13</sup>. GHQ-28 mental health questionnaire was used to evaluate psychological index of mental health. The indices were measured as pre-test and post-test with Queen Step test and weight/height test. Pretest was performed prior to the implementation of the training program and post-test was performed after six-weeks of exercise training program.

The experiment group practiced running and rope skipping throughout three one-hour sessions for 6 weeks. The exercise program was designed to train the participants the correct way of running and rope skipping followed by steady practices of running and rope skipping, the intensity of the exercises increased gradually based on Borg scale. Each practice session included 10 min warm up, 40 min exercise, and 10 min cool down. The 40 min of exercising was designed as a different set of running and rope skipping and gradually by cutting number of the sets running speed and intensity of rope skipping were gradually increased based on Borg scale.

### Statistical analyses

Interested outcomes like the magnitude of cardiovascular fitness, BMI and mental health indices were described as mean (SD) among groups before and after intervention. Analysis of covariance (ANCOVA) was used to test the effects of aerobic training as intervention. IBM SPSS version 20 was used to performing statistical analyses and *P* values less than 0.05 were considered statistically significant.

## Results

The mean of age ( $\pm$ SD) in experimental and control group were 26.06  $\pm$ 1.18 and 26.33  $\pm$ 1.30 yr, respectively. Mean and

SD of other baseline variable in experimental group were 57.43  $\pm$ 5.67 for weight (kg) and 160.06  $\pm$ 4.16 for height (cm). The corresponding values among control groups were 57.66  $\pm$ 5.08 for weight and 161.86  $\pm$ 3.29 for height.

Descriptive statistics of cardiovascular fitness, anthropometric and mental health indices among the subjects is shown in Table 1. Mean cardiovascular fitness of experiment group before and after the study were 37.54 and 59.30, respectively. In addition, BMI for this group before and after the study were 22.37 and 22.06, respectively.

**Table 1:** Descriptive statistics of cardiovascular strength, anthropometric and mental health indices among study participants

Indices & Stage		Group	Descriptive Statistics		P Value
			Mean	SD	
Cardiovascular Strength (ml/kg/min)					
VO2max					
Before	Experiment	37.54	1.66	0.308	
	Control	36.85	1.95		
After	Experiment	59.30	0.43	0.028	
	Control	58.90	0.52		
Anthropometric Index					
Body Mass Index					
Before	Experiment	22.37	1.60	0.568	
	Control	22.01	1.86		
After	Experiment	22.06	1.48	0.971	
	Control	22.03	1.83		
Mental Health Indices					
Physical Health					
Before	Experiment	3.87	3.29	0.032	
	Control	7.20	4.66		
After	Experiment	2.20	2.39	0.022	
	Control	5.47	4.65		
Anxiety and Sleep Disorder					
Before	Experiment	5.20	3.29	0.211	
	Control	7.33	4.66		
After	Experiment	2.80	2.39	0.005	
	Control	6.73	4.64		
Social Function					
Before	Experiment	7.00	2.29	0.250	
	Control	8.07	2.65		
After	Experiment	5.87	2.16	0.017	
	Control	7.87	2.16		
Depression					
Before	Experiment	4.00	1.80	0.434	
	Control	5.33	5.20		
After	Experiment	3.91	2.39	0.065	
	Control	4.33	4.45		
Total score					
Before	Experiment	20.07	9.51	0.114	
	Control	27.93	16.09		
After	Experiment	12.67	5.82	0.004	
	Control	24.40	12.61		

As indicated, there were no statistical significance differences between experimental and control group before intervention except to physical health (*P*=0.032). However, cardiovascular fitness, BMI and indices of mental health indices include physical health, anxiety disorder, social function, depression and mental health's total score were significant differences between study groups after performing intervention (Table1).

According to ANCOVA, there was statistically significance difference between experimental and control groups after adjustment for their own baseline values concerning

cardiovascular fitness ( $P=0.004$ ), BMI ( $P<0.001$ ) and all of mental health indices which encompass physical health, anxiety and sleep disorder, social function, depression and mental health's total score ( $P<0.001$ ). Table 2 shows the results of analysis of covariance more in details (Table 2).

**Table 2:** Analysis of covariance for cardiovascular strength, anthropometric and mental health indices among study participants

Indices & Group	Descriptive Statistics		P Value
	Mean	SD	
<b>Cardiovascular Strength (ml/kg/min)</b>			0.004
Experiment	59.30	0.43	
Control	58.90	0.52	
<b>Anthropometric Index</b>			
<i>Body Mass Index</i>			0.001
Experiment	22.06	1.48	
Control	22.03	1.83	
<b>Mental Health Indices</b>			
<i>Physical Health</i>			0.001
Experiment	2.20	2.39	
Control	5.47	4.65	
<i>Anxiety and Sleep Disorder</i>			0.001
Experiment	2.80	2.39	
Control	6.73	4.64	
<i>Social Function</i>			0.001
Experiment	5.87	2.16	
Control	7.87	2.16	
<i>Depression</i>			0.001
Experiment	3.91	2.39	
Control	4.33	4.45	
<i>Total score</i>			0.001
Experiment	12.67	5.82	
Control	24.40	12.61	

## Discussion

The current study to evaluate the effect of aerobic training on cardiovascular fitness, BMI and mental health of study participants showed this factors improved by aerobic training. Cardiovascular fitness ( $P=0.004$ ) increased and total score of mental health ( $P<0.001$ ) improved and BMI ( $P<0.001$ ) decreased.

Lack of physical activities is one of the causes of obesity and chronic diseases such as CVDs<sup>11,12</sup>. Doing aerobic exercises such as running and rope skipping on regular bases makes the large muscles engage in the activity and also improves cardiovascular fitness. In addition, such exercises bring mental health along with physical health as these two types of health are interrelated<sup>5</sup>. Goodwin (2003) showed negative relationship between mental disorders such as depression, anxiety, and physical activity among American adults<sup>14</sup>.

As the results showed, six-week aerobic exercises made a small contribution in improving cardiovascular fitness so that its effect was significance. However, the exercises had significant effect in reducing BMI. These findings are consistent with some studies. Amiri Farsni and Rezaei manesh (2011) studied the effect of six consecutive weeks of aerobic practices on some types of blood fats and VO2max<sup>15</sup>. Wong et al. (2008) surveyed the effect of 12 weeks exercising on aerobic readiness, body combination, blood pressure and reactor protein C on juvenile between 13 to 14 yr old suffering from obesity. The control and experiment groups included 12 participants each. The exercise program included 2 days practice per week and each session took 45-60 min of strength practices along aerobic exercises with 65-85% of max heart beat

rate. The results showed that the practices improvement BMI and also brought in physiological advantages for controlling obesity among juveniles or preventing return of obesity<sup>16</sup>.

Sloan et al. (2009) argued that aerobic practices significantly increased aerobic capacity and reduces heart beat rate of the participants. Aerobic practices improved heart self-control performance, although gender is an important factor in preservation of heart by doing sport<sup>17</sup>. Pribis et al. (2010) examined obesity, BMI, and physical readiness of boy and girl students between 1998 and 2008. Their aim was to find the relationship between physical readiness on one hand and obesity and BMI on the other hand. By physical activity, they referred to daily normal juggling or assigning specific time in a day to do physical activities. Their results showed an indirect relationship between VO2max and obesity among boys and girls; and that physical readiness of the students had followed a descending trend while fatty mass of their bodies increased<sup>18</sup>.

Murphy et al. (2006) indicated that aerobic practices such as juggling increase Vo2, cuts weight, BMI and body fat. Juggling also decreases risk of CVDs<sup>19</sup>. Strassing et al. (2011) examined 117 schizophrenia patients between 2005 and 2008 (41% men) by conducting exercise tests. They measured VO2max, cardiovascular readiness, and physical capacity of the patients. Heart respiratory readiness was measured using Brus Protocol. Their results showed that the participants in obesity group had lower heart respiratory readiness and low heart respiratory readiness of the patients who also suffered from obesity increased risk of CVDs<sup>20</sup>. Noordsy and Pajonk (2012) surveyed the effect of physical practices on cardiovascular health of schizophrenia patients and concluded that cardiovascular readiness of the participants in sport group was improved more than that of participant in professional-therapy group<sup>6</sup>. In the present study aerobic exercise was effective on cardiovascular fitness and BMI of female students, according to some of the beneficial effects of aerobic exercise on the above researches.

Taking into account the findings, six-week aerobic exercise program was significantly effective on mental health. This is consistent with other studies. Among them, Boustani and Sayar (2011) are notable. They found that doing sport is positively effective on psychological performance<sup>21</sup>. Kiani et al. (2011) argued that there is significant difference between mental health and vivacity of athletes and ordinary individuals. Physical activity induces biological and biochemical changes in body that leads to better health condition. Thus, the athlete has better health condition than others<sup>4</sup>. Doing groups exercises in particular have positive impacts on mental health. Asztalos et al. (2009) showed that group exercising reduces stress and regret<sup>22</sup> motivating university students to do physical activities reduces the risk of anxiety and depression through improving self-reliance among the students. In this study, nutrition and exercise program of subjects outside the training program was not controlled. Therefore more studies are needed to achieve better results.

According to authors' knowledge, the main challenge of this work is assuring about long period of training.

## Conclusions

The effect of six weeks aerobic training on cardiovascular fitness, body composition and mental health among female

students are considerable. Accordingly, such aerobic training should be more encouraged at universities.

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## Conflict of interest statement

The authors declare that they have no conflicts of interest.

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