

The effects of the academic performance of college students whose major is sports on body composition and abdominal fat rates

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The subjects of this research are 30 students of Dong-Eui Institute of Technology in Busan city, who were grouped into two categories after applying the curriculum of the second semester of the freshman year to their classes: those whose academic performance was at the top 20% (15 students) and those whose academic performance was at the bottom 20% (15 students). For the measurement items, we measured their weight, body fat mass, body fat rates, body mass index, and abdominal fat rates by using a body composition testing machine. We then analyzed the *t*-test results by using the IBM SPSS ver. 18.0 program.

Through this research, we found that there was a significant difference among those in the group of students whose academic performance was at the top 20% in terms of body fat mass and body fat rates, which means that academic performance has relatively little effect on body composition and abdominal fat rates.

Keywords: Sports major, College student, Academic performance, Body composition, Waist size

INTRODUCTION

Recently, due to the development of automation in addition to economic growth, modern Korean society has experienced convenient lifestyles, and Koreans' dietary life has also changed into a Western one. As a result, both excessive food intake and insufficient exercise have particularly led to a sharp increase in the weight of Korean college students (Hill et al., 2003; Sheehan et al., 2003), which illustrates that there is a desperate need for the treatment and prevention of obesity.

The research conducted by Lloyd-Jones et al. (2007) showed that college students whose body mass index (BMI) has increased for the past 15 yr are more likely to suffer from cardiovascular diseases than those whose BMI has decreased or has remained unchanged. Moreover, they concluded that weight maintenance at the early stages of adulthood could be an essential factor in cutting down or lowering the risk of developing chronic diseases.

Adolescence, the transitional period between childhood and

adulthood, is defined as the period from ages 13 to 23 yr. During the earlier half of adolescence, rapid body change and cognitive development take place, whereas during its latter half, ego identity is established, which can be said to be a period in which adolescents prepare for their adult life. Therefore, those who are in the latter half of their adolescence period, that is, freshman and sophomore college students, are the most likely to be caught in a chaotic lifestyle as they have just gone through the pressure and stress commonly faced in the lives of middle and high school students. This stress is brought about by the tremendous demand for them to pass university entrance exams. In this regard, this kind of lifestyle in such a crucial period has a detrimental effect on the health of college freshmen and sophomores and could increase their risk of having a variety of lifestyle-related diseases. The study conducted by Sacheck et al. (2010) emphasized that regular physical activities, proper weight maintenance, and sufficient skeletal muscle mass during this period are indispensable elements for the prevention of college students in developing metabolic syndrome.

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Metabolic syndrome, which is caused by unhealthy lifestyle habits, has been reported to raise the risk of cardiovascular diseases (Zhu et al., 2004). In line with this, as mentioned in previous studies (Löllgen et al., 2009; Nocon et al., 2008), aerobic exercise should be recommended to today's men and women who lead a sedentary lifestyle.

In addition, Toth et al. (2005) showed that, when insufficient exercise breaks down the balance of body composition, muscle strength decreases, leading to sarcopenia. Furthermore, Janssen et al. (2002) stressed how significant body composition is, stating that an increase in the amount of body fat could lead to obesity.

In particular, Banz et al. (2003) showed that the kinds of aerobic exercises generally recommended, such as swimming, badminton, and other sports, should improve both physical and mental health, and should treat obesity. These exercises were included in the practical subject program of this research.

Similarly, it is believed that the management of the body composition of college students is pivotal to the prevention of cardio-

vascular and metabolic diseases as well as to the improvement of their health. Therefore, the aim of this research is to identify the effects of academic performance on the body composition and abdominal fat rates of college students whose major is sports, and who are more regularly engaged in physical activities in comparison with other students during the latter half of their adolescence period. With this, this research is set to be beneficial in the development of effective curriculums that could improve body composition.

MATERIALS AND METHODS

Subjects

The subjects of this research are students who attend Dong-Eui Institute of Technology in Busan city, with no previous medical history and with sound physical and mental health. Stratified sampling was conducted to select the subjects, who are composed of 15 students whose academic performance was at the top 20% and 15 students whose academic performance was at the bottom 20%, by adding up their school records for 3 yr before and after applying the curriculum of the second semester of the freshman year to their classes. The physical characteristics of the subjects are shown in Tables 1-3.

Measurement items

The measurement items of this research are as follows: body composition (weight [kg]), body fat mass (kg), body fat rates (%), muscle mass (kg), and abdominal fat rates (%).

Measurement method

To determine body composition, we measured the weight, body fat mass, body fat rates, BMI, and abdominal fat rates of the subjects. They were asked to remove any form of metal from their body and to wear simple clothes, as well as to control their food intake 3 hr before and to take rest 30 min before their measurement. The InBody 4.0 Body Composition Testing Machine man-

Table 1. Physical characteristics of the research subjects

Variable	Academic performance group	
	At the top 20%	At the bottom 20%
Age (yr)	20.73 ± 1.50	20.87 ± 0.00
Height (cm)	173.40 ± 5.50	174.33 ± 7.50
Weight (kg)	71.06 ± 6.65	71.61 ± 8.55
Body mass index (kg/m ²)	23.67 ± 0.80	23.45 ± 1.00

Values are presented as mean ± standard deviation.

Table 2. Sports major practical subjects class program

Year	Practical subjects offered	Total No. of students
2011	Golf (2), band and ball fitness, training exercise (2), tennis (2)	13
2012	Golf (2), band and ball fitness, swimming (3), training exercise (2)	8
2013	Golf (2), band and ball fitness, swimming (3), training exercise (2), Pilates (2), sports life dance (2)	12

Table 3. Exercise schedule for 15 weeks

Term	Contents	Intensity	Time (min)	Frequency
Before exercise	Warm-up	40% HRR (7–9 RPE)	10–20	5 times/week
1st–6th Week	Main exercise	50–60% HRR (9–11 RPE)	50	
7–12th Week	Main exercise	60–70% HRR (11–13 RPE)	50	
12–15th Week	Main exercise	70–80% HRR (13–15 RPE)	50	
After exercise	Cooldown Static stretching and light walking	40% HRR (7–9 RPE)	10–20	

HRR, heat release rate; RPE, rating of perceived exertion.

Table 4. Results of body composition and abdominal fat rates according to academic adaptability

Item	Academic performance group	Premeasurement	Postmeasurement	t-test
Weight (kg)	At the top 20%	70.97 ± 6.65	70.39 ± 3.15	0.13
	At the bottom 20%	69.61 ± 8.25	71.61 ± 8.55	-0.57
	t-test	-0.303		
Body fat mass (kg)	At the top 20%	14.62 ± 0.20	14.11 ± 1.35	0.29
	At the bottom 20%	12.26 ± 2.70	13.98 ± 2.75	-1.70*
	t-test	0.082		
Body fat rates (%)	At the top 20%	20.76 ± 1.30	20.15 ± 2.65	0.26
	At the bottom 20%	17.53 ± 1.85	19.43 ± 1.65	-1.96*
	t-test	0.394		
Muscle mass (kg)	At the top 20%	52.58 ± 6.05	52.77 ± 4.20	-0.05
	At the bottom 20%	53.79 ± 5.45	53.80 ± 5.20	-0.00
	t-test	-0.310		
Abdominal fat rates (%)	At the top 20%	0.82 ± 0.00	0.83 ± 0.01	-0.06
	At the bottom 20%	0.83 ± 0.01	0.83 ± 0.01	-1.82
	t-test	-0.651		

Values are presented as mean ± standard deviation.

* $P < 0.05$.

ufactured by BioSpace (Urbandale, IA, USA) was used for the measurement.

Data processing

The data we obtained in this research were processed in a way that the mean value and the standard deviation of the measurement items were calculated by using the IBM SPSS ver. 18.0 (IBM Co., Armonk, NY, USA). The verification of the differences between the premeasurement processing data and the postmeasurement processing data among the students in each group was carried out using paired *t*-test, whereas the verification of the major effects on the differences among the groups was conducted using independent *t*-test. The level of significance (α) for all the statistical data was set at 0.05.

RESULTS

The verification results of the differences between the premeasurement processing data and the postmeasurement processing data among the students in each group and among the groups according to academic adaptability at the top 20% and at the bottom 20% showed that there was no significant difference in terms of weight, muscle mass, and abdominal fat rates. Moreover, the verification results of the differences among the groups according to academic adaptability at the bottom 20% showed that there was a significant difference ($P < 0.05$) in terms of body fat mass and body fat rates. On the other hand, the verification results of the differences between the premeasurement processing data and

the postmeasurement processing data among the groups showed that there was no significant difference in terms of body fat mass and body fat rates (Table 4).

DISCUSSION

We identified the effects of body composition according to academic performance on body composition and abdominal fat rates when the curriculum practically used in the sports department of a junior college was applied to the second semester of freshman year, which led to a discussion, as follows.

Body composition quantitatively measures the amount and distribution of body components. Its ratio can be calculated by measuring body components, which can be largely divided into body fat rates and body fat mass, as they are essential elements for the health and physical strength of an individual. In addition, body fat mass, which has an effect on increased blood flow as well as on bone density through muscular activities, is directly linked to motor ability. Abdominal fat resulting from an increase in the amount of body fat leads to the development of intra-abdominal fat, which is related to a number of ailments such as metabolic diseases, heart diseases, and arthritis (Carr, 2003).

In carrying out this research, the verification results of the differences between the premeasurement processing data and the postmeasurement processing data among the students in each group and among the groups according to academic adaptability at the top 20% and at the bottom 20% showed that there was no significant difference in terms of weight, muscle mass, and ab-

dominal fat rates. Moreover, the verification results of the differences among the groups according to academic adaptability at the bottom 20% showed that there was a significant difference ($P < 0.05$) in terms of body fat mass and body fat rates. On the other hand, the verification results of the differences between the premeasurement processing data and the postmeasurement processing data among the groups showed that there was no significant difference in terms of body fat mass and body fat rates.

The results illustrate that the amount of body fat in an individual's body composition is highly dependent on exercise and that, while body fat increases when the energy consumed is less as compared to the food taken in, the amount of body fat decreases when there is a great amount of physical activities that cause fat to be burned (Astrand and Ryhming, 1954).

Previous studies related to this research concluded that regular exercise directly burns body fat and has a positive effect on an increased amount of body fat (Shahid and Schneider, 2000), which could prevent and even treat cardiovascular diseases and diseases related to a sedentary lifestyle, as well as on blood lipids (Jacobs et al., 2006; Mestek et al., 2006). In addition, the research by Mougios et al. (2006) concluded that 12-week aerobic exercise led to improved results in all the body composition variables, whereas the research of Patel et al. (2003) concluded that beneficial physical activities aimed at weight loss are aerobic exercises and resistance exercises.

Furthermore, the research by Slentz et al. (2005) found that the amount of abdominal fat decreased by identically responding to the amount of both moderate-intensity and high-intensity exercise, and the research by Gutin et al. (2002) found that training exercise for young people led to a drop in the amount of abdominal fat. This research, however, found conflicting results in comparison with the previous studies, which may arise from the fact that college students frequently enjoy drinking alcoholic beverages, suffer from an unhealthy dietary life, and fail in controlling stress related to class adaptation.

As a result, given that college education also belongs to the education industry, it should seek for various changes in line with the tendencies and lifestyle of today's men and women. The practical subjects need to be developed to enhance academic adaptability while reflecting the problems of the modern society to the curriculum applied to regular classes and considering the interests of students whose major is sports. In other words, the learners' satisfaction with their classes has a positive influence on the spread, continuation, and accomplishment of learning (Machado et al., 2011).

In the end, it is believed that the academic performance of college students whose major is sports has relatively little effect on body composition and abdominal fat rates.

The subjects of this research are students who attend Dong-Eui Institute of Technology in Busan city. The students selected are composed of 15 students whose academic performance was at the top 20% and 15 students whose academic performance was at the bottom 20% after applying the curriculum of the second semester of the freshman year to their classes. The measurement items of this research, which include weight, body fat mass, body fat rates, BMI, and abdominal fat rates, were measured using the InBody 4.0 Body Composition Testing Machine. The data obtained were then analyzed using *t*-test by using the IBM SPSS ver. 18.0, which led us to drawing the following conclusions:

- (1) The verification results of the differences among the groups according to academic adaptability at the bottom 20% showed that there was a significant difference in terms of body fat mass and body fat rates.
- (2) The verification results of the differences between the premeasurement processing data and the postmeasurement processing data among the students in each group and among the groups according to academic adaptability at the top 20% and at the bottom 20% showed that there was no significant difference in terms of weight, muscle mass, and abdominal fat rates. Moreover, the verification results of the differences among the groups according to academic adaptability at the top 20% and at the bottom 20% showed that there was no significant difference in terms of body fat mass and body fat rates.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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