

The relationship between body composition, anthropometry, and physical fitness in female university students

EFTEKHAR MOHAMMADI¹, AMIN SABERI²

Abstract

Introduction. Body composition, anthropometry and physical fitness are considered the most important indicators of health assessment, and are widely implemented in different sports. **Aim of Study.** The aim of this study was to examine relationships between body composition, anthropometry and physical fitness of female students of the Khorramshahr University of Marine Science and Technology in Iran. **Material and Methods.** The study sample comprised 156 randomly selected female university students attending a general physical education course at the Khorramshahr University of Marine Science and Technology in the years of 2015-2016. The AAHPERD test was used for physical fitness assessment. Data were analyzed using the SPSS software, descriptive statistical methods and Pearson's correlation coefficient at the level of statistical significance of $p \leq 0.05$. **Results.** The results showed a significant correlation between physical fitness, body composition and anthropometry in the female students ($p > 0.05$). The statistical analysis confirmed their mean physical fitness level of 16.85 ± 1.9 . **Conclusions.** The results of the study revealed a statistically significant relationship between physical fitness, body composition and anthropometry in female students. Also, the study showed that regular exercise improved physical health. It is suggested that more attention should be paid to sport programs as well as to the development of university students' physical fitness and general health. It is recommended that students should participate in health promoting activities. University authorities should be expected to provide their institutions with sport and welfare facilities.

KEYWORDS: physical fitness, anthropometry, body composition, university students.

Received: 2 January 2016

Accepted: 22 May 2016

Corresponding author: mohammadi@kmsu.ac.ir

¹ Khorramshahr University of Marine Science and Technology, Iran

² University of Mazandaran, Department of Physical Education and Sport Sciences, Iran

What is already known on this topic?

Physical fitness play an important role in public health and a decent basis for the implementation of various sports activities. This study survey relationship between body composition and anthropometry with physical fitness in female student.

Introduction

Active lifestyles promoting physical fitness have become subject to various research studies. The results of recent studies show that most adults agree that safe and enjoyable activities are very important in regular plans of physical exercise. Several components of physical fitness can be distinguished according to different levels of functionality and relations to health and motor skills [1]. They include muscular endurance, flexibility, body composition and muscular strength, coordination, balance, power, agility, speed, and reaction time associated with motor-related abilities. Anthropometric traits are body composition, including body fat, and body size [2]. Physical fitness allows development of suitable physical abilities necessary to perform activities of daily living [3]. Physiological factors such as age, sex, body fat,

lean body mass, as well as genetic factors related to cardiorespiratory fitness, muscular endurance, flexibility and agility, all influence physical fitness [4]. Anthropometric variables of body composition and physical fitness are considered the most important predictors and indices of success in elite sports [5]. Decreased physical activity and physical fitness are both causes and effects of weight gain. In addition to obesity, other diseases, especially those commonly affecting the middle-aged and the elderly, may also occur [6]. Physical activity protects the human body from the incidence of cardiovascular diseases, overweight, physical illnesses and psychological disorders such as high blood pressure, osteoporosis, breast and colon cancer, depression, anxiety and stress [7]. The purpose of physical activity and regular exercise is to maintain a healthy body and longer life [8]. Decreased physical activity and, consequently, a reduced level of physical fitness could cause overweight, which is the onset of many physical ailments [9]. The state of physical fitness resulting from physical activity and practicing sports also forms the basis of mental health. Research results show that exercise greatly improves mental conditions such as depression, anxiety and self-confidence [10]. The better compatibility with the need to balance the individual's fitness there is, the better body composition. If individuals display good physical condition and body composition, they will not experience withdrawal, pessimism and isolation, which disturb mental balance [11]. Students must acquire sufficient knowledge about the effects of physical activity and adequate mobility. The aim of this study is to examine the relationship between body composition, anthropometry and physical fitness in female students of the Khorramshahr University of Marine Science and Technology in Iran.

Material and Methods

The study sample comprised 156 female university students aged 18 to 24 years, who volunteered to participate in the study. Their mean body height was 160.55 ± 5.93 cm and mean body mass 58.5 ± 9.94 kg. None of the participants reported any medical conditions. All participants underwent body composition measurements. They avoided excessive eating or drinking 12 hours before the tests. Their body mass and stature were measured with a digital scale and a stadiometer with the accuracy of 0.1 kg and 1 mm, respectively. Body composition, including bioelectrical impedance analysis of body fat, lean body mass and basic metabolic rate, was assessed (INBODY 0.3, Korea). The anthropometric measurements (waist, hips, abdomen circumferences) were then performed (m).

Bioelectrical impedance analysis (BIA) is a commonly used method for estimating body composition. Since the advent of the first commercially available devices in the mid-1980s the method has become popular owing to its ease of use, portability of equipment and relatively low cost compared to some other methods of body composition analysis [12].

The physical fitness tests were carried out at the Khorramshahr University of Marine Science and Technology, and they included: aerobic capacity (540 m run), anaerobic power (push ups), explosive power of the legs (Sargent Jump Test), agility (4×9 m run), abdominal muscle endurance (sit-ups in a minute), and flexibility (sit and reach test).

Descriptive statistical methods were used to describe the collected data. The Kolmogorov-Smirnov test was used to confirm normality of data distribution, and then the Pearson's correlation coefficient was applied to determine correlations between variables. All statistical calculations were made with the use of SPSS software (ver. 21).

Results and Discussion

The physical fitness of female students was assessed after one semester using a modified AAHPERD test (540 m, push ups, sit-ups, sit and reach), 4×9 m run test and Jump Sargent Test. The results of the tests were recorded as fitness scores. Students' demographic characteristics, anthropometric and body composition measurements, and descriptive statistics are presented in Table 1.

Table 1. Students' demographic characteristics, anthropometrics and body composition

Variables	Mean \pm standard deviation	Minimum	Maximum
Age (years)	21.7 ± 1.66	18	24
Body mass (kg)	58.5 ± 9.94	36	103
Body height (cm)	160.55 ± 5.93	143	175
BMI (kg/m ²)	22.52 ± 3.45	15.18	34.41
Waist	0.7355 ± 0.082	56	102
Hip	0.9132 ± 0.0717	42	76
Waist-Hip Ratio (WHR)	0.81 ± 0.054	0.67	0.94
Lean body mass (kg)	18.73 ± 5.85	6.20	40
Percent body fat (%)	31.51 ± 5.66	18	28

BMI – Body Mass Index, WHR – Waist-Hip Ratio, LBM – Lean Body Mass

The students' physical fitness characteristics (AAHPERD test) are given in Table 2.

Table 2. Students' physical fitness characteristics (AAHPERD test)

Variables	Mean \pm standard deviation
Sit-ups (muscular endurance)	31.66 \pm 9.16
Flexibility	16 \pm 7.57
Jump Sargent Test (explosive power of the legs)	29.1 \pm 4.50
4 \times 9 m test (agility)	12.70 \pm 0.64
540 m run (aerobic capacity)	2.01 \pm 0.25
Push ups (anaerobic power)	21.83 \pm 6.1
Physical fitness (mean)	16.85 \pm 1.90

Table 3. Correlations between physical fitness and selected anthropometric parameters

Variables	Correlation coefficient	p-value
BMI (kg/m ²)	-0.20	0.024*
Waist-Hip Ratio (WHR)	-0.21	0.015*
Lean body mass (kg)	0.18	0.043*
Percent body fat (%)	-0.24	0.0006*

* ($p > 0.05$)

Table 3 presents students' physical fitness and body composition parameters and anthropometric correlation coefficients. There was a significant correlation between physical fitness and body composition, and anthropometric parameters in the female students of Khorramshahr University of Marine Science and Technology ($p > 0.05$).

Conclusions

This study aimed to examine the relationship between body composition and anthropometry, and physical fitness of female students of the Khorramshahr University of Marine Science and Technology in Iran. The results of this study revealed a statistically significant relationship between the students' physical fitness and body composition (16.85 \pm 1.9).

Several studies showed correlations between anthropometric indices and body composition, and physiological and psychological characteristics, skills, and health [13, 14]. The results of the present study are consistent with the findings of Changizzadeh and

Nabizadeh [15], Zanovec et al. [16], Pribis and et al. [17], Samaras et al. [18], Khoshdel et al. [19], and Rennie et al. [20]. The results indicated the effects of regular physical activity and fitness level on mental health, and confirmed that physical activity improved mental health.

A number of studies have pointed to significant differences in health levels between athletes and non-athletes. However, in the present study, the participants were students who were not engaged in specific sport activities.

It is suggested that stressing the importance of physical exercise at universities and in academic courses in training will contribute to the health of future generations. The knowledge of the benefits of exercise can definitely strengthen and affect the course of physical education as well as the development of students' physical fitness. Creating an environment suitable for sports and student activities, and providing adequate facilities will minimize problems related to physical education courses. The results of the study can be of use to sport coaches, counselors and mental health professionals and help them encourage students to exercise.

It can be concluded that physical activity as a strategy, approach, and a convenient and inexpensive factor, is critical for the improvement of university students' physical health.

Due to a relatively small sample size in the present study the students' exercise performance and its impact on their body composition could not be verified in a more comprehensive way; however, the observed effects of exercise on students' bodies show that various exercise combinations are highly recommended.

What this study adds?

In this study showed that, reduced physical activity leads to a reduction in physical fitness level is the low level of physical fitness to body composition is effective. It was a significant correlation between physical fitness and body composition and anthropometry among the female students.

Acknowledgements

We would like to thank the Khorramshahr University of Marine Science and Technology for supporting this project as part of research grant no. 87, 9/11/2014. Also words of thanks go to all the students who took part in this research.

References

1. Guying L, Kim ShU, Kang HS. Relationship between cardio/respiratory fitness (CRF) and metabolic risk factors in South Korea. *Public Health*. 2009; 8(4): 655-664.
2. Sheikh M, Shahbazi M, Tahmasebibrujandi Sh. Evolution and measurement in physical education and sport sciences. Publication: Tehran University; 2010.
3. Napradit P, Pantaewan P. Physical fitness and anthropometric characteristics of Royal Thai Army personnel. *J Med Assoc Thai*. 2009; 92(1): S16-21.
4. Agha Alinejad H, Delfan M, Mirzaei Rabar M, Lotfi Sh, Molanouri Shamsi M, Mirakhoori Z. Effects of age, gender, body composition on cardiorespiratory fitness in students aged 8-11 years using the FFMI-FMI regression model. *Iran J Endocrinol Metabol*. 2009; 3: 301-306.
5. Gil S, Ruiz F, Irazusta A, Gil J, Irazusta J. Selection of young soccer players in terms of anthropometric and physiological factors. *J Sports Med Phys Fitness*. 2007; 47: 25-32.
6. Lopes PC, Prado SR, Colombo P. Risk factors associated with obesity and overweight in school children. *Rev Bras Enferm*. 2010; Jan-Feb, 63(1): 73-78.
7. United States Department of Health and Human Services. Physical activity and health: a report of the surgeon general. Washington, DC: US Government Printing Office: 1996. DHHS publication [S/N 017-023-00196-5]. [24 <http://www.cdc.gov/nccdphp/sgr/sgr.htm>]; [Cited 2004 August 15].
8. Duncan GE, Li SM, Zhou X. Prevalence and trends of a metabolic syndrome phenotype among 2000 U.S adolescents, 1999. *Diabetes Care*. 2004; 27(10): 2438-2443.
9. Ginter E, Simko V. Adult obesity at the beginning of the 21st century: epidemiology, pathophysiology and health risk. *Bratisl Lek Listy*. 2008; 109: 224-230.
10. Hemayat Talab R. Study of mental health and happiness of the athlete and non-athlete students of Tehran University of Payam Noor, master's thesis. Tehran University. 1980.
11. Hasel H, Boldsen JL. Childhood condition and adult height. *J Biosoc Sci*. 1991; 23: 10.
12. Mohammadi E, Shakerian S. Comparison of body composition assessment in women using skinfold thickness equations, bioelectrical impedance analysis and underwater weighing. *SPCT*. 2010; 17(3): 223-230.
13. Lago-Peñas C, Casais L, Dellal A, Rey E, Domínguez E. Anthropometric and physiological characteristics of young soccer players according to their playing positions: relevance for competition success. *J Strength Cond Res*. 2011; 25(12): 3358-3567.
14. Gabbett TJ, Jenkins DG, Abernethy B. Relative importance of physiological, anthropometric, and skill qualities to team selection in professional rugby league. *J Sports Sci*. 2011; 29(13): 1453-1461.
15. Changizzadeh M, Nabizadeh M. The relation between physical fitness and body composition and general health in overweight and obese high school student girls. *Int J Sport Stud*. 2014; 4(7), 738-743.
16. Zanovec M, Lakkakula AP, Johnson LG, Turri G. Physical activity is associated with percent body fat and body composition but not body mass index in white and black College Students. *Int J Exerc Sci*. 2009; 2(3): 175-185.
17. Pribis P, Burtneck CA, McKenzie SO, Thayer J. Trends in body fat, body mass index and physical fitness among male and female College Students. *Nutrients*. 2010; 2: 1075-1085; doi: 10.3390/nu2101075.
18. Samaras K, Kelly PJ, Chiano MN, Spector TD, Campbell LV. The effect of physical activity on body fat. *Ann Intern Med*. 1999; 130: 873-882.
19. Khoshdel AR, Emami A, Kordi MR, Najafipour F. Evaluation of physical fitness and body composition Indices in Iranian Military Officer Trainees. *J Arch Mil Med*. 2013; 1(1): 39-42.
20. Kirsten L Rennie, M Barbara E Livingstone, Jonathan CK Wells, A McGloin, W Andrew Coward, Andrew M Prentice, Susan A Jebb. Association of physical activity with body-composition indexes in children aged 6–8 y at varied risk of obesity. *Am J Clin Nutr*. 2005; 82: 13-20.