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Relationship between Physical Fitness and Anthropometric Indicators in Non-athlete Students

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ABSTRACT

The aim of this study was to relationship between physical fitness factors and anthropometric indicators (BMI and WHR) among non-athlete students of Qom University. For this purpose, 220 non-athlete female students and 222 non-athlete male students from Qom University who had physical education unit 1 were selected as accessible research participants. Then, physical fitness factors including (horizontal bars, flexibility, sit-up, Swedish swimming, 160 and 540 meter running and anthropometric indicators (BMI and WHP) were taken from the participants and Pearson correlation was used to analyze the data in SPSS software, version 16. The results showed a significant and negative correlation between 540 and 1600 meter running and horizontal bar on the one hand and WHR on the other and a positive and significant correlation between swimming test and WHR among female students. There was also a negative and significant correlation between 540 meter and station running and BMI in female students while flexibility, sit-up and swimming tests did not show any significant correlation with BMI. The obtained results of this study showed a negative and significant correlation between physical fitness factors in non-athlete female and male students and BMI and WHP anthropometric indicators so that it can be stated, with increasing BMI and WHR, physical performance decreased. Therefore, in order to improve physical performance of non-athlete students, it is recommended for coaches to design and implement their training programs to improve and control body composition in students and perform their assessment based on the situation of body composition in students.

Keywords: Physical fitness , Anthropometric indicators, Non-athlete students

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INTRODUCTION

Nowadays, there are many diseases induced by poverty of mobility due to the increased welfare so that indulgence has caused many muscular and orthopedic disorders, cardiovascular-respiratory diseases and decreased scores even in simple physical fitness training and tests[1-3].

The studies conducted in the last decade of past century have shown that obesity and manner of fat distribution in body, especially in the middle part of body (waist and abdomen) are good predicators for suffering from diseases in future [2,4-6]. According to the results of these studies, the most important health problems which have a relationship with increased body fat, especially in waist and abdomen, include hypolipidemia, hypertension disease,

type II diabetes, coronary heart diseases, breast, uterine and prostate cancer, respiratory disease, high blood urea, increased blood viscosity and decreased fibrinogen capacity and structural and functional abnormalities of heart and depression [2.5-7]. On the other hand, some researchers have identified the relationship between body fat, especially in the abdominal part, and mortality [4,8].

In addition, the importance of body composition and its relationship with health cannot be ignored. In recent years in which sports records are moved in epsilons (small amounts), body and its composition have an important role in the success or failure of athletes. Thus, professional athletes always keep their weight at a desirable and relatively constant level. This issue is important not only for participating in sport fields but also for living a healthy and lusty life [9].
One method for assessing body composition is to use the waist hip ratio (WHR). This assessment has been introduced as a suitable symptom in relationship with the disease related to excess fat distribution and there is a significant relationship between upper body and abdominal fat and risk of disease and mortality caused by these diseases [3,8,10]. The importance of this indicator is due to its high correlation with internal intestines and viscera [4,8] and seemingly is acceptable indicator for intra-abdominal fat[4].

As weight and height can be effective in athletic records, WHR can be also effective. Therefore, many researchers have considered measuring waist to hip ratio as a suitable indicator for assessing obesity and its effect on gaining weight and exercise and movement performance [10-13]. On the other hand, increased WHR indicates overweight. Many observations have shown a high correlation between WHR and weight and cardiovascular-respiratory diseases [4,10,12,13].

Moreover, specialists also use body mass index (BMI) for determining physical characteristics of body which include body weight ratio (in kg) to square of height (in meter) [4,8]. It seems that BMI has a direct relationship with body fat. Due to easy measurement of BMI, many studies with a large number of participants have used BMI as the body fat indicator. The main weakness of BMI as an obesity indicator is that it ignores one possibility that muscle tissue compared with fat tissue can have a more share in adding body weight compared with height [4]. Among body builders and football players who are muscular, BMI is shown at a moderate or at risk level which indicates weakness of this indicator. Here, body shape and waist hip ratio must be used which is the best method for detecting health level and proper weight for this group [9].
The conducted studies on the relationship between physical fitness factors and body composition showed a negative and significant correlation between these factors [14-19], which was similar to the findings of Kwok-kei (2010) who reported a significant and weak relationship between sit-up and BMI among 12-18 year old boys from Hong Kong [20]. But, according to the point that physical fitness factors and body composition are affected by factors such as participants' age, gender, race and geographic and climatic conditions and also due to the difference in types of physical fitness tests in these studies, the purpose of this study was to investigate the relationship between physical fitness factors and anthropometry indicators (BMI and WHR) in non-athlete students of Qom University.

MATERIALS AND METHODS

Subjects

The studied participants included non-athlete female and male students of Qom University with the age range of 19 to 25 years old. The participants were 220 girls and 222 boys. Of course, this number was regardless of the participants who were excluded from the study due to different reasons such as not performing many items. Due to the low number of population, all the participants were considered as samples. Tables 1 and 2

Table 1- Mean and standard deviation of research variables for female students

	Age (month)	BMI	WHR	Flexibility (centimeter)	540m running (second)	Sit-up (number)	Swimming (number)	Station(second)
Mean±SD	244.97±16.27 n=220	22.52±3.53 n =220	.82±.067 n =220	37.18±7.33 n =222	164.49±13.33 n =202	19.78±3.53 n =211	42.40±6.57 n =215	54.10±5.58 n =212

Table2- Mean and standard deviation of research variables for male students

	Age (month)	BMI	WHR	Flexibility (centimeter)	Sit-up (number)	Horizontal bar (number)	1600 m running (second)
Mean±SD	244.81±15.81 n =222	23.38±3.89 n =222	.83±.054 n =222	37.59±8.51 n =222	38.73±7.99 n =222	21.70±7.72 n =222	476.99±79.29 n =222

Physiological Measurement:
To measure height and weight, a 44440 wall-mounted Stadiometer made by Kaveh Company and a German digital scale were used, respectively. Body mass index was calculated by putting the numbers related to height and weight in the equation (weight in kg/ square of height in meter) and waist to hip ratio (WHR) was calculated using this following equation[11].

WHR= waist circumference (in cm) / hip circumference (in cm)
In order to measure physical fitness factors in boys, some tests were used which included 1-horizental bars to measure endurance of scapula (number in unlimited time), 2- Wells Flexibility test for the flexibility of back muscles (cm), 3- bent-knee sit-up test for endurance of abdominal muscle (number per mi). Also, cardiovascular endurance was calculated using 1600 m light running (second).

For measuring physical fitness factors in girls, tests including 1-sit-up with basketball ball (number in 30 second) for assessing endurance of abdominal muscles, 2-wall push up (number per minute) for assessing endurance of scapula muscles, 3-Wells Flexibility test for flexibility of back muscles 4- 540 m running for assessing cardiovascular endurance and 5- station test for assessing a series of physical fitness factors were performed.

Statistical Methods
To analyze the researches data, descriptive statistics was used to state mean and standard deviation of the variables. In order to evaluate the correlation between research variables, Pearson correlation was used in SPSS software, version 16.

RESULTS

The results of analyzing the research data using Pearson correlation showed a significant and negative correlation between 540 m running test and WHR and a significant and positive correlation between swimming and WHR in female students. But, there was a very weak relationship between these tests and WHR rate while there was no significant relationship between flexibility tests, sit-up and station on the one hand and WHR on the other.

Table 3-WHR correlation with female tests

		Flexibility	Sit-up	Swimming	540 m running	Station
WHR	Pearson correlation	0.066	-0.014	*0.163	**-0.213	-0.056
	Significance level	0.331	0.845	0.015	0.002	0.421
	Number	220	211	215	202	212

Significance level of 0.05
****Significant level of 0.01***

Results of analyzing the data using Pearson correlation showed a significant and negative correlation between 1600 m running and horizontal bar in male students; the relationship level of WHR was low and moderate with horizontal bar and 1600 m running, respectively. Flexibility tests and sit-up exercises did not demonstrate a significant correlation with WHR.

Table 4- WHR correlation with male tests

		Flexibility	Sit-up	Horizontal bar	1600 m running
WHR	Pearson correlation	-0.071	-0.096	**-0.243	**-0.462
	Significance level	0.291	0.153	0.000	0.000
	Number	222	222	222	222

****Significance level of 0.01***

Results of analyzing the data using Pearson correlation showed a significant and negative correlation between 540 m running and station running among female students; the relationship level of BMI with station test and 540 m running was low and moderate, respectively. Also, flexibility test, sit-up and swimming did not show a significant correlation with BMI.

Table 5- BMI correlation with girls test

		flexibility	Sit-up	Swimming	540 m running	Station
BMI	Pearson correlation	0.102	-0.109	-0.105	**-0.414	*-0.160
	Significant level	0.130	0.113	0.123	0.000	0.020
	Number	220	211	215	202	212

Significance level of 0.05
****Significance level of 0.01***

Moreover, the results of analyzing the data using Pearson correlation indicated a significant and negative correlation between 1600 m running, horizontal bar and sit-up exercises and BMI in male students; the BMI relationship level with sit-up tests and horizontal bar and also with 1600 m running was low and moderate, respectively. Flexibility test did not show a significant correlation with BMI.

Table 6- BMI correlation with male tests

		Flexibility	Sit-up	Horizontal bar	1600 m running
BMI	Pearson correlation	-0.048	** -0.181	** -0.279	**-0.559
	Significance level	0.007	0.007	0.000	0.000
	Number	222	222	222	222

****Significance level of 0.01***

DISCUSSION

The obtained results of this study showed that horizontal bar and 1600 m running in male students and 540 m running in female students had a significant and reverse correlation with WHR, respectively. It means increasing WHR was associated with lower score of these tests. However, among female students, swimming test had a significant and positive correlation with WHR. Although some tests did not have a significant correlation with WHR; in female students, sit-up and station-tests and, in male students, flexibility and sit-up.

Pascal Bovet (2007) observed a significant relationship between WHR and sit-up test which was in line with the present research. But he did not report any significant relationship between WHR and horizontal bar and 1600 m running, which was not in line with the current results [21].

Robert et al. (2011) and Chen et al. (2008) observed a significant and reversed correlation between total scores of physical fitness test and WHR, which was also observed in this study for 540 m running, horizontal bar and 1600 m running [15,18].

Moreover, data analysis showed a positive and significant correlation between WHR and swimming (on the wall) ($p< 0.05$); however, there has been no tests with these conditions in the conducted studies to compare the findings. The correlation between WHR and physical fitness tests has been often reversed. Probably, the reason for being positive and significant is that wall push up test was standing, not lying, and WHR could not have a negative effect on the push up record.

The research results showed a negative relationship between BMI and all the tests, except flexibility test in girls; i.e. increasing BMI was in line with lower scores in these tests. Out of 9 correlation cases between BMI and female and male tests, 5 cases (female's 540 m running, station-race and sit-up tests and male's 1600 m running) had a significant and reversed correlation, which was in line with the results of Kwok lei (2010), Robert (2011) and Xianwen shang (2010)[18-20].

The results of some researches demonstrated a positive and significant correlation between BMI and age and a reversed and significant correlation between age and sit-up tests, horizontal bar and 1600 m running, which was in line with the results of this study [13,14,16,22].

CONCLUSION

The results of this study showed a negative and significant correlation between physical fitness factors among male and female non-athlete students and anthropometric indicators (BMI, WHR) so that, with increasing BMI and WHR, physical performance decreased; therefore, in order to improve physical performance, it is recommended for couches to design and implement training programs for improving and controlling student's body composition and perform their assessment according to the situation of student's body composition.

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