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Evaluation of cardiorespiratory, musculoskeletal and body composition changes in 8-18 year old female students in Ghaemshahr

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Abstract

Background and Aim: The best way to maintain health and increase the possibility of a healthy and longer life is to have a healthy lifestyle and a life with mobility. A sedentary lifestyle is the cause of many diseases and this path should be considered throughout life. Accordingly, the purpose of this study is to investigate the level of cardiovascular, skeletal-muscular and physical fitness of 18-8 year old girls in Ghaemshahr who were studying in the academic year 2012-2013.

Research Methodology: According to the general purpose of the research, 556 people from the statistical population (students of different educational levels in Ghaemshahr city) (23262 people) were determined as the sample size using the information of Odinski table. After determining the sample size, cluster sampling was performed according to random sampling method and the samples were compared in terms of cardiorespiratory fitness, musculoskeletal fitness and body composition.

Results: Based on the results of the trend of changes in waist size (WC) in percentage of fat, (WHR) waist to hip ratio, (BMI) body mass index, body, maximum aerobic capacity, abdominal, back, shoulder girdle and hamstring flexibility And shoulder belt was significantly different between all age groups.

Conclusion: According to the results, cardiovascular, skeletal-muscular fitness and physical composition of female students aged 8 to 18 years in Ghaemshahr have changed significantly in different age periods, which in some cases can be a concern for the health of people that should Try to improve people's condition with proper physical activity programs.

Introduction

High body fat in children and adults is often a sign of permanent obesity. Obesity is the cause of many diseases [1]. A sedentary lifestyle predisposes to obesity, adult-onset diabetes, osteoporosis, and even some cancers. One of the most important components of physical fitness is aerobic endurance or cardiorespiratory fitness, which is the ability to perform dynamic physical activities from medium to high intensity using large muscle groups. Defined for a long time. Physical activity through increasing muscle mass, endurance, flexibility, improving cardiorespiratory function, helping to relieve stress, depression and anxiety, helping to lose weight and reducing the risk of health-threatening diseases such as cardiovascular disease, diabetes and some types Cancers help maintain and maintain health [2-6].

Recent studies have shown that cardiovascular fitness is a major factor in the prevention of cardiovascular disease. Even light physical activity, if done for 30 minutes daily, can significantly reduce the risk of cardiovascular disease [7-11].

Cardiorespiratory endurance and body composition are two important components of physical fitness. High cardiorespiratory endurance and low body fat are valuable tools for the athlete to resist fatigue. Also, increasing the percentage of body fat or in other words obesity by reducing the risk of coronary heart disease, high blood pressure, type 2 diabetes and respiratory diseases, reduces life expectancy. On the other hand, very low body fat endangers health, because the body for physiological function Naturally, it needs certain amounts of fat [12].

Lack of knowledge and awareness of the dangers of reduced physical activity, ignorance of physical condition and the level of physical fitness and lack of continuity in physical education programs to maintain proper physical fitness based on scientific correctness are the main reasons that people generally suffer from muscle weakness and Has the above diseases [13].

Although the symptoms of cardiovascular disease appear in middle age or later, researchers believe that these diseases begin in childhood. Even in childhood, there is a strong link between obesity and the risk factors for adult coronary heart disease. Body fat has a major effect on the relationship between physical fitness and risk factors for coronary heart disease.

Although poor endurance performance of heavyweight subjects has been reported in association with aging, does aging alter cardiovascular, musculoskeletal, and physical fitness? Based on this and to answer such questions, the researcher in the present study intends to study the cardiovascular, musculoskeletal and physical fitness of 8 to 18 year old students in Ghaemshahr.

Research Methodology

In this research, the causal research plan after the occurrence has been used. The researcher evaluated the changes resulting from the independent variable (aging) on the dependent variables (WHR, BMI, WC, body fat percentage, maximum aerobic capacity, abdominal, back, shoulder girdle and hamstring and shoulder girdle flexibility). The statistical population of the study was 8 to 18 year old female students of Ghaemshahr city who were studying in the academic year 2012-2013, which included 23262 people who were studying in primary, middle and high school. Udinsky 556 people were selected. After determining the statistical sample size and obtaining the approval of the Education Research Council of Ghaemshahr city according to the stratified random sampling method with the substitute, the samples were selected from among the students. According to the number of students in each grade, the number of samples in that grade was determined and according to the number of students studying in different grades, the number of samples in each grade was also determined. 15 schools from different educational levels of Ghaemshahr city were selected to cover all parts of the city. Then, by referring to the schools and the statistics office of each school, the required number of students is randomly determined and in terms of WHR, BMI, WC body fat percentage, VO2max, abdominal, back, shoulder girdle and hamstring flexibility and shoulder girdle flexibility. Were compared. Before the tests, the necessary explanations about the test process and its objectives were provided to each of the subjects. In this way, individuals participated in the study with full knowledge of how the experiments were performed and with the signature of a written consent.

To measure height, a tape measure was mounted on the wall and the subjects stood barefoot on the wall and meters without shoes, then with a ruler that was placed parallel to the ground and tangential to the subject, the height was recorded in centimeters. To measure weight, the undressed subject with the least coverage stood on the scales and the weight in kilograms was recorded. Waist circumference was measured using a tape measure at the top of the iliac crest and on the navel in centimeters. Also, hip circumference was measured using a tape measure in the thickest part of the hip in centimeters. To calculate the WHR, the waist size was divided by the hip circumference.

To obtain BMI, weight in kilograms divided by height in meters was divided by two. To measure subcutaneous fat, the thickness of triceps and calf muscle was measured using an American-made

caliper. After measuring the subcutaneous fat of three soldiers and calves, the percentage of body fat was calculated for girls using the Slater et al. formula.

Fat percentage= 0/610 × (The sum of the thickness of the subcutaneous fat of the three arms and legs)+5.1

To obtain the maximum oxygen consumption, the 20-meter reciprocating test 5 was used. This test estimates aerobic capacity through the number of cycles completed by the subject. In this test, the subject was instructed to run a length of 20 meters when hearing the sound of a cassette tape. After reaching the end of 20 meters, hearing the sound of the second beat, go around and return to the starting line. The speed was 8.5 km / h in the first minute and 0.5 km / h was increased every minute. The test ended when the subjects reached the start and finish line 20 meters again after hearing the beat. The number of laps, the running time of the subjects were recorded and then the maximum oxygen consumption was calculated using the following formula.

VO2max= 31.025+ speed (3.239)- age(3.248)+ (age * speed* 0.1536)

Modified elongation and sitting test were used to measure abdominal muscle endurance. In this test, subjects lay on their backs on a mattress with their knees at a 140-degree angle to the floor. The hand was stretched out next to the body so that the palm was facing the ground. Draw a line from the fingertips to a distance of 15 cm on the ground and the subjects performed a long movement and sitting (adjusting the sitting and sitting in 3 seconds) at a speed set and in harmony with the beat. The subject would rise to the point during the sit-down performance

Reach the second line with your fingertips. The subject continued this movement until exhaustion and the number of sit-ups was recorded.

Trunk hyperextension test was used to measure the endurance of the back muscles. In this test, the subject lay on his back with his arms fully extended to the side. Then, using the back muscles, he lifted his upper body as gently as possible and maintained this position as much as possible, the duration of maintaining this position was recorded for the subjects. Subjects were instructed to focus their eyes on points on the ground during the test. This movement was repeated twice, the average of two repetitions was recorded.

Two Swedish swimming tests and adjusted horizontal bar were used to measure shoulder belt endurance. The shoulder flexibility test was also used to measure shoulder flexibility. In this test, the subject was instructed to touch the fingertips of one hand, from above the shoulder, the fingertips of the other hand, which are brought from the bottom to the top. This test was performed once for each shoulder and whether or not the fingers reached each other was recorded separately for each shoulder.

The forward flexion test was used to measure the flexibility of the hamstring muscles. In this test, the subject sat and rested the sole of one foot completely, leaning on the test box. The other leg was bent at the knee and the sole of the foot was on the ground. He then slowly leaned forward as far as possible from the sitting position on the test box. Subjects repeated the movement four times and remained in the same position for at least one second on the fourth time to record the distance traveled. This test was repeated for the other leg.

Descriptive statistical methods were used to determine the central indicators and dispersion and to determine the percentage ranks. Also, one-way analysis of variance was used to compare variables at different ages, which was performed by SPSS software. The significance level or error rate in this statistical analysis is considered to be five percent ($p \leq 0 / 05$).

Findings

The aim of this study was to evaluate the trend of changes in cardio-respiratory, skeletal-muscular and physical fitness of female students aged 8 to 18 years in Ghaemshahr. From 556 students participating in this study, information about WC, body fat monitoring, WHR, BMI, VO2max, strength and endurance of abdominal muscles, back, shoulder girdle and hamstring flexibility and shoulder girdle were recorded. Based on statistical analysis, the following results were obtained.

There is a significant difference between cardio-respiratory fitness (maximum aerobic capacity) of female students aged 8 to 18 years in Ghaemshahr city (Table 1). According to these findings, cardiorespiratory fitness has increased from the age of 8 to 14, but has gradually decreased from the age of 14 to 18.

Table 1 Results of one-way analysis of variance statistical test on cardiopulmonary fitness variable

Inferential statistics	**F test**	**P value**
Source of changes		
Intergroup (two round trips) (VO2max)	19/61	0/001

There is also a significant difference between musculoskeletal fitness (muscle strength and endurance of abdomen, back, shoulder girdle, paw, hamstring flexibility and shoulder girdle) of female students aged 8 to 18 years in Ghaemshahr (Table 2). Based on these findings, a large number And the meeting among female students aged 8 to 18 years in Ghaemshahr city had relatively constant changes. It increased by 16 years and decreased by 16 to 18 years. The number of horizontal stretches has increased from 8 to 13 years and has decreased from 14 to 18 years Dropped.

Table 2 Results of one-way analysis of variance statistical test on musculoskeletal fitness variables

Inferential statistics	**F test**	**P value**
Source of changes		
Intergroup (sitting and sitting)	14.72	0/001
Intergroup (Swedish swimming)	22.02	0/001
Intergroup (horizontal)	13.55	0/001
Intergroup (forward flexion of the right leg)	14.04	0/001
Intergroup (Left forward leg flexion)	14.52	0/001
Intergroup (hyper extension)	12.95	0/001

Also, there is a significant difference between body composition, WHR, BMI (total thickness of subcutaneous fat of triceps and calf, fat percentage, waiFst circumference, hip circumference) of female students aged 8 to 18 in Ghaemshahr (Table 3). BMI Percentage of body fat, total subcutaneous fat of the triceps and calf increased from 8 to 18 years of age and WHR decreased.

Table 3 Results of one-way analysis of variance statistical test on body composition variables

Inferential statistics	**F test**	**P value**
Source of changes		
Intergroup (BMI)	22.59	0/001
Intergroup (WHI)	10.52	0/001
Intergroup (Total triceps and calf fat)	19.39	0/001
Intergroup (Percentage of total body fat)	18.91	0/001
Intergroup (Waist)	16.12	0/001
Intergroup (Hip circumference)	73.79	0/001

A. Cardio-respiratory preparation

According to the findings of the present study, cardiorespiratory fitness among female students aged 8 to 18 years in Ghaemshahr has had changes that these changes had an upward trend from 8 to

14 years and a downward trend from 14 to 18 years. So that its value has increased from 43.634 ± 1.27 in 8 years to 27.16 ±4.969 in 18 years.

Trout et al. (2004) studied maximal aerobic power in American girls and found that changes in maximal aerobic power among non-athletic girls were relatively constant and declining. DeForgue et al. 2003 in Australia, Antonio et al. 2003 Mozambique, Westerstal et al. 2003 Sweden, Eisenmann & Malnia 2002 Canada, Brooke et al. They realized the changes.

All the mentioned researches confirm the results of the present study and indicate that the subjects in this factor of physical fitness in the age groups of 8 to 18 years have relatively constant changes and a downward trend.

The reason for the decline in VO2max with age can be due to weight gain during this age period and possibly a decrease in physical activity and genetic differences.

B- body composition

According to the findings of the present study, BMI among female students aged 8 to 18 years in Ghaemshahr has had relatively constant changes and an upward trend, so that its value has increased from 16.35± 2,708 in 8 to 21.228 ±2.643 in 18 years.

Stephen et al. Studied BMI in American girls in 2004 and found that BMI changes with age (86). Auckland et al. 2004 USA, DeForch et al. 2003 Australia, Antonio et al. 2003 Mozambique, Wisterstal et al. 2003 Sweden, Motta et al. 2002 Portugal, Hasket et al. BMI changes with age.

All the mentioned researches confirm the results of the present study and indicate that the subjects have relatively constant changes in BMI index and an upward trend. The reason for increasing BMI with increasing age can be due to weight gain during this age period and possibly decreasing physical activity. Be.

According to the findings of the present study, WHR had relatively constant changes among 8 to 18 year old female students in Ghaemshahr city and had a downward trend, so that its value reached from 0.829 ±0.048 in 8 years old to 0.742± 0.051 years old in 18 years.

Ross et al. 2003 studied the prevalence of obesity in American girls and found that the WHR changes with age (80). Stephen et al., 2004, USA, Auckland et al., 2004 United States, Deforch et al., 2003 Australia, Antonio et al. Age varies in both sexes and WHR increase in women is relatively less than in men. All the mentioned researches confirm the results of the present study and indicate that the subjects in this WHR index have relatively constant changes and a downward trend. The reason for the decrease in WHR with age can be due to the accumulation of more fat in the buttocks due to puberty during this age period.

According to the findings of the present study, the percentage of body fat among female students aged 8 to 18 years in Ghaemshahr has relatively constant changes and an upward trend. So that its value has increased from 32,002 ± 8,382 at the age of 8 to 5/899 ± 47,393 at the age of 18.

Ross et al. Studied the percentage of fat in American girls in 2003 and found that body fat percentage also increases with age (80). Trout et al. (2004); Stephen et al. (2004); USA; Akbari (2004) Tehran, found a significant relationship between the increase in the percentage of colleagues (Portugal), Ramp and colleagues buttock fat. The mentioned studies confirm the results of the present study and indicate that the subjects have relatively constant changes in body fat percentage index and an upward trend. The reason for increasing body fat percentage with increasing age can be due to weight gain, physical inactivity and substance use. Foods rich in fat.

According to the findings of the present study, the total subcutaneous fat of the triceps and calves in 8-year-old female students in Ghaemshahr has relatively constant changes and an upward trend, so that its amount has increased from 45/747 ± 12.742 in 8 to 69.333± 14.097 in 18 years.

Defourch et al. (2003) studied the total percentage of subcutaneous fat in three-armed Australian girls and found that with age, the total subcutaneous fat of three soldiers and legs changes . Alkand et al. (2004) found that et al. (2004), Motta et al. (2002) Portugal, Wang et al. (2004) Firelock The total

subcutaneous fat of the triceps and calf changes at different ages. All the mentioned researches confirm the results of the present study and indicate that the subjects have relatively constant changes in the total subcutaneous fat index of the triceps and calf and the ascending trend. Increased body mass, consumption of high-fat foods during this age period, and possibly decreased physical activity.

According to the findings of the present study, height and weight among female students aged 8 to 18 years in Ghaemshahr city. The changes have been relatively constant and ascending as the height from 124.321 ± 6.9997 at the age of 8 to 154.27 ± 43.59 at the age of 18 and the amount of weight from 6.397 ± 26 at the age of 50 to 50. Has reached 50 ± 6,262 at the age of 18. Antonio et al. (2003) examined Mozambican subjects and found that height and weight gain were significantly associated with chronological age (17). Hesket et al. (2004); Deforej et al. (2003) Australia; Trout et al. (2004); USA; Motta et al. (2002); Portugal; Brooke et al. (2005); (2002) examined changes in height and weight at different ages.

All the mentioned researches confirmed the results of the present study and indicate that the subjects had relatively constant changes in height and weight indices and an upward trend. The reason for increasing height with age can be due to puberty and weight gain due to increased BMI and nutrition and possibly lack of exercise at this age.

C) Musculoskeletal preparation

According to the findings of the present study, the length and sitting factor among female students aged 8 to 18 years in Ghaemshahr had relatively constant changes that these changes had an upward trend from 8 to 16 years and a downward trend from 16 to 18 years. So that its value has increased from 17.05 ± 8.139 at the age of 8 to 12.28. ± 6.574 at the age of 18.

Elaine Rush (2004) studied musculoskeletal fitness in New Zealand girls and found that the number of repetitions of sitting and sitting was associated with age and changed under its influence. DeForch et al. (2003 Australia, Bowen et al. 1997 Belgium, Hakimi Zanjani (1378) Zanjan, Aline Rush (2004) studied the factors of physical fitness and found that the sitting length factor changes at different ages.

All the mentioned researches confirm the results of the present study and indicate that the subjects have had significant changes in this factor of musculoskeletal fitness at different ages. It is due to puberty and puberty, and the reason for prolonged sitting with age can be due to an increase in BMI and possibly a decrease in physical activity during this age period.

According to the findings of the present study, the Swedish swimming factor has changed among 8 to 18 year old female students in Ghaemshahr. These changes were accompanied by an upward trend from 8 to 16 years and a downward trend from 16 to 18 years. 12.075 ± 4,052 at the age of 8 has reached 10,92 ± 7,085 at the age of 18. Bonnie et al. (1997) studied musculoskeletal fitness in Belgian girls and found that Swedish swimming performance changed with age.

Elaine Rush (2004), Deforch et al. (2003) Australia, Hakimi Zanjani (1996) Zanjan, Dernicard et al. 2001), observed and studied the changes in subjects' Swedish swimming performance at different ages. All the mentioned researches confirmed the results of the present study and indicate that the subjects had relatively constant changes in this factor of musculoskeletal fitness at different ages. The upward trend in the Swedish swimming factor between the ages of 8 and 16 is due to an increase in muscle strength during puberty and puberty, and the downward trend from 16 to 18 years can be due to an increase in BMI and possibly a decrease in physical activity during this age.

According to the findings of the present study, the horizontal factor among female students aged 8 to 18 years in the city of Ghaemshahrdah has been changes that these changes from 8 to 13 years with an upward trend and from 14 to 18 years with a downward trend. So that its value has increased from 8,547 ± 2,798 at the age of 8 to 8.18 ± 4,303 at the age of 18. Westerstal et al. (2003) studied physical fitness in Swedish students and found that horizontal performance was associated with age and changed.

Ribery et al. (2004), DeForch et al. (2003) Australia, Bonnie et al. (1997) Belgium, Hakimi Zanjani (1999) Zanjan, studied the factors of physical fitness and found that the horizontal factor changes with age. All the mentioned researches confirmed the results of the present study and indicate that the subjects had relatively constant changes in this factor of musculoskeletal fitness at different ages. The reason for the upward trend of the horizontal factor is due to the increase in strength in the pre-pubertal period and the reason for its decline in the age of 14 to 18 years is partly due to muscle weakness of the shoulder and back belt due to lack of physical activity and excessive BMI and poor nutrition.

According to the findings of the present study, bending forward of the right and left foot in female students aged 8 to 18 years in Ghaemshahr has had changes that these changes from 8 to 16 years upward trend and from 16 to 18 years with a trend It was accompanied by a decline. Nicard et al. (2001) studied musculoskeletal fitness and flexibility in Belgian girls and found that flexion of the front of the legs changes with age. Zanjan, Brooke et al. (2005) found that the flexion of the front of the legs changes at different ages. All the mentioned researches confirmed the results of the present study and indicate that the subjects had relatively constant changes in this factor of musculoskeletal fitness at different ages. The reason for the downward trend of bending forward of the right and left foot at the ages of 16 to 18 is due to weight gain, lack of exercise and muscle weakness of students during this age period, and the upward trend from 8 to 16 years is probably due to high energy This is the age and strength of the muscles in the pre-pubertal period.

Conclusion

In the present study, the trend of changes in cardiopulmonary, musculoskeletal and physical fitness of female students aged 8 to 18 years in Ghaemshahr was obtained. According to the results of this study, which to some extent clarifies the strengths and weaknesses of movement programs, physical activity, lifestyle, type of nutrition and many such factors in all three levels of schools in Ghaemshahr, is a good and useful guide for those involved in education. And education in physical education and parents and health officials to try to increase health and vitality in society with a special look at active lifestyle and cultural background and increase awareness about physical activity. Also, the results of this research can be an incentive for similar diagnoses in other places and in different educational levels. Such researches better clarify the role of physical education teacher and educational space facilities in different stages, especially in primary school. Because all obesity and muscle weakness and heart-respiratory unpreparedness go back to childhood.

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