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The effects of heredity on the body composition and cardiorespiratory fitness of parents and children

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ABSTRACT

The purpose of this study was to determine the effects of heredity on the body composition and cardiorespiratory fitness of parents and children. Thus, body mass index (BMI), waist-to-height ratio (WHR), waist-to-hip ratio (WSR), percent of subcutaneous fat, and VO₂max of 30 family members of Neishabur City with a range of height fathers: 171.60 ± 6.61 cm, weight: 73.13 ± 9.25 kg, and Body Mass Index (BMI): 24.9 ± 3.07 kg/m², and range of height in mothers: 160.06 ± 6.30 cm, weight: 67.46 ± 9.62 kg, and Body Mass Index (BMI): 26.28 ± 3.35 kg/m², and range of height in girls: 152.96 ± 12.92 cm, weight: 66.46 ± 12.39 kg, and Body Mass Index (BMI): 22.06 ± 5.47 kg/m² was measured. The subjects were selected using purposive and convenience sampling. Pearson correlation and correlation between the two variables were applied for data analysis. The results of Pearson correlation and correlation between the two variables revealed: there are a significant correlation between the height of tall girls with fathers ($r = 0.059$), and there are a significant correlation between the height of tall girls with mothers ($r = 0.3$). The results of Pearson correlation and correlation between the two variables revealed: there are a significant correlation between the weight of fathers with his girls ($r = 0.04$) and there are a significant correlation between the weight of mothers with her girls ($r = 0.52$). The results of Pearson correlation and correlation between the two variables revealed: there are a significant correlation between the Body Mass Index of fathers and mothers with his girls ($r = 0.38$) and there are a significant correlation between the weight of mothers with her girls ($r = 0.48$). The results of Pearson correlation and correlation between the two variables revealed: there are a significant correlation between the VO₂max of fathers with his girls ($r = 0.46$) and there are a significant correlation between the VO₂max of mothers with her girls ($r = 0.52$). The results of Pearson correlation and correlation between the two variables revealed: there are a no significant correlation between the waist-to-height ratio (WHR) of fathers with his girls ($r = 0.21$) and there are a significant correlation between the waist-to-height ratio (WHR) of mothers with her girls ($r = 0.007$). The results of Pearson correlation and correlation between the two variables revealed: there are a significant correlation between the waist-to-hip ratio (WSR) of fathers with his girls ($r = 0.145$) and there are a significant correlation between the waist-to-hip ratio (WSR) of mothers with her girls ($r = 0.289$). The results show that a significant correlation between the body fat of fathers with his girls ($r = 0.08$) and there are a significant correlation between the body fat of mothers with her girls ($r = 0.013$). The results of the present research showed that genetics factors may play an important role in body composition and cardiorespiratory fitness of parents and his/here children, and suggest that environmental factors can be a more significant than heredity parameters.

Keywords: heredity, body composition, cardiorespiratory fitness, parents, Children

INTRODUCTION

The increase in childhood overweight and obesity is a public health concern in developed countries [11,8]. Central obesity may be a better predictor than overall obesity for the risk of cardiovascular disease and type II diabetes, and in adults it seems to be a strong predictor of morbidity and mortality independent of body mass index (BMI) [11,8]. Most metabolic disturbances associated with central adiposity, such as undesirable lipid and insulin concentrations, show their onset during childhood [1]. Therefore, the study of central adiposity at these ages and its relationships with modifiable factors that may influence it is important from a health promotion perspective. In this context, a better understanding of the relative role of physical activity (PA) and other determinant factors for the development of total and central overweight/obesity at young ages is needed. Other factors such as time spent in television (TV) viewing, a high or low birth weight[7,8], the level of maternal education [3,10] and parental overweight [15] seem to be associated with the adiposity level in young people, and require further research. The relationship of levels and patterns of PA with total and central adiposity in children and adolescents is unclear [9,14], which may be due to the different methodologies used to measure PA. Studies using objective methods to assess levels and patterns of PA have recently been published [13,16]. However, a better understanding of the association between PA and overweight and abdominal adiposity is still required. Since childhood obesity is a complex pathological condition that is affected by multiple variables, the analysis of a number of established determinant factors when aiming to study the potential effect of one specific factor on adiposity (e.g. PA) is fundamental. In this regard, comprehensive insights are needed on the associations between objectively measured PA variables and overweight and central adiposity, accounting for several proposed determinant factors, such as TV viewing, birth weight, maternal educational level and parental overweight in young people. The aim of this report was to study the effects of heredity on the body composition and cardiorespiratory fitness of parents and Children [1,2,13,16].

MATERIALS AND METHODS

Participants:

The participants of the present research are 30 family members of Neishabur City with range of height fathers: 171.60 ± 6.61 cm, weight 73.13 ± 9.25 kg, and Body Mass Index (BMI): 24.9 ± 3.07 kg/m². and range of height in Mothers: 160.06 ± 6.30 cm, weight 67.46 ± 9.62 kg, and Body Mass Index (BMI): 26.28 ± 3.35 kg/m², and range of height in Girls: 152.96 ± 12.92 cm, weight 66.46 ± 12.39 kg, and Body Mass Index (BMI): 22.06 ± 5.47 kg/m². It must be noted that all the participants were completely healthy and took no medications. Before selecting the participants, all the purposes and dimensions of the research, the testing procedures, and the risks were fully explicated to the subjects in an introduction session.

Test Procedures:

To examine the purpose of this study was to determine the effects of heredity on the body composition and cardiorespiratory fitness of parents and Children, then the samples were arranged in the site according to the work list. 1- Weight of subjects were measured. 2- Date of birth and age of subjects was recorded. 3- Subjects were instructed that after warm up and stretch for five minutes, subjects keep speed themselves. 4- Immediately after testing (1600m), heart rate of subjects were measured by the doctor who was present at the site. 4- After completing the test asked to subjects that with walk and stretch for five minutes to perform cool up. 5- VO₂max was estimated with usage of the following formula: VO₂max for Girls = $108/94 - 8/41 \times (\text{Time to Minutes}) + 0/34(\text{Time to Minutes})^2 + \text{age}/21 \times (\text{Gender} - 0/84(\text{BMI}))$.

VO₂max for Parents = $132/853 - (0/0769 \times \text{weight}) - (0/3877 \times \text{age}) + (6/315 \times \text{Gender}) - (3/2649 \times \text{Time to Minutes}) - (0/1565 \times \text{Heart rate})$.

Both equations Gender for women was considered zero and for men was considered one. [5,6,12,18,19].

Data Collection:

Measurement of blood pressure:

Systolic and diastolic blood pressure were measured using a mechanical pressure gauge. To measure blood pressure of subjects at rest and after ten minutes of sitting without moving, blood pressure was measured for twice.

Assessment of anthropometric and body composition:

Measure height: Height was measured from feet to head per centimeter.

Measurements of body mass: Analog scales was used for measurement of body mass with an accuracy of 0/1 kg.

Determination of Body Mass Index: Body mass index is defined as the individual's body mass divided by the square of his or her height. The formulae universally used in medicine produce a unit of measure of kg/m^2 .

Measure of Environment of Waist: Tape is placed at the highest point of horizontal of waist so that the horizontal would be measured at the end of a normal exhalation.

Measure around the hip: Tape is placed at the highest point of hip Meters does not enter any pressure to the soft tissue when measuring.

Measuring waist-hip ratio (WHR) or the distribution of body fat: Distribution of body fat, waist divided by the hip circumference

Body fat measurement: Percent body fat for women By measuring the thickness Subcutaneous fat triceps Above the iliac and femoral, and for Girls in two points Leg and tricep, For fathers Three points on the chest and abdomen, thigh Skinfold thickness was calculated by the following formula:

percentage of Body fat in children: $0/61$ (Total thickness of the two points) $5/1$

In parents Body density was calculated as first and then the body fat percentage calculated from the formula:

Women body density: $1/0994921-0/0009929$ (Total thickness of the three-point) $+0/000023$ (total of three points) $2-0/0001329$ (Age in years).

Fathers body density: $1/109380-0/0008267$ (total of three points) $+ 0/000016$ (total of three points) $^2 -0/0002574$ (Age in years).

Percent of body fat in Parent: $=[(4/57/\text{Body density})-4/142]\times 100$

Estimation of maximum oxygen uptake(VO_2max) with Test of One-mile run and walk test: Subjects were performed 1600 meter run and walk[5,6,12,18,19].

Statistical analysis:

Descriptive and inferential statistics have been used for data analysis. All the data obtained in the present research has been reported based on mean and standard deviation. First, normal distribution of the data was examined using Kolmogorov- Smirnov test and due to the normal distribution, Correlation method For related survey variables between parents and children at ($p < 0.05$) was applied. All the statistical operations were done using SPSS 16.

RESULTS

As it has been shown in table1, The results showed that there are a significant correlation between the Height of tall girls with fathers($r= 0.059$).and there are a significant correlation between the Height of tall girls with Mothers ($r= 0.3$). and there are a significant correlation between the weight of fathers with his girls($r=0.04$)and there are a significant correlation between the weight of Mothers with her girls($r=0.52$). on the other hand there are a significant correlation between the Body Mass Index of fathers and mothers with his girls($r=0.38$)and there are a significant correlation between the weight of Mothers with her girls($r=0.48$). Regarding VO_2max the results showed a significant correlation between the VO_2max of fathers with his girls($r=0.46$)and there are a significant correlation between the VO_2max of Mothers with her girls($r=0.52$).results showed a no significant correlation between the Waist-to-height ratio(WHR) of fathers with his girls($r=0.21$)and a significant correlation between the Waist-to-height ratio(WHR) of Mothers with her girls($r=0.007$) .on the other hand there are a significant correlation between the Waist-to-hip(WSR) of fathers with his girls($r=0.145$)and there are a significant correlation between the Waist-to-

hip(WSR) of Mothers with her girls($r=0.289$). The results show that a significant correlation between the Body fat of fathers with his girls($r=0.08$) and there are a significant correlation between the Body fat of Mothers with her girls($r=0.013$).

Table1: The results of correlation between the variables

Heredity	r2	P	R	measurments
0.25%	0.0025	0.045	0.059	correlation between the Height of tall fathers with girls
9%	0.09	0.031	0.3	correlation between the Height of tall Mothers with girls
16%	0.16	0.02	0.4	correlation between the weight of fathers with his girls
27%	0.2704	0.03	0.52	correlation between the weight of Mothers with his girls
14.44%	0.144	0.035	0.38	correlation between the BMI of fathers with his girls
23.04%	0.2304	0.007	0.48	correlation between the BMI of mothers with his girls
21.16	0.2116	0.023	0.46	correlation between the VO2max of fathers with her girls
27.04	0.2704	0.003	0.52	correlation between the VO2max of mothers with her girls
0.41%	0.0441	0.245	0.21	correlation between the WHR of fathers with his girls
0.0049%	0.000049	0.969	0.007	correlation between the WHR of mothers with his girls
1.96%	0.196	0.043	0.145	correlation between the WSR of fathers with his girls
7.48%	0.0784	0.021	0.289	correlation between the WSR of mothers with his girls
0.64%	0.0064	0.017	0.08	correlation between the Body fat of fathers with his girls
0.0169%	0.000169	0.047	0.013	correlation between the Body fat of mothers with his girls

% Body fat	WSR	WHR	VO2max	BMI	Weight	Height	
0.08	0.21	0.145	0.46	0.38	0.4	0.059	father and girl
0.013	0.007	0.289	0.52	0.48	0.52	0.3	mother and girl

DISCUSSION

The purpose of this study was to determine the effect of heredity On the body composition and cardiorespiratory fitness of parents and Children. Interestingly, the results showed that there were a significant correlation between the weight and Height of tall girls with fathers and there were a significant correlation between the weight and Height of tall girls with Mothers Various studies have demonstrated that under optimal conditions of nutrition and health, genetic factors play an important role in influencing variations in growth and development [4] on the other hand ,we found that there were a significant correlation between the Body Mass Index of fathers and mothers with his girls and there were a significant correlation between the weight of Mothers with her girls. Central obesity may be a better predictor than overall obesity for the risk of cardiovascular disease and type II diabetes, and in adults it seems to be a strong predictor of morbidity and mortality independent of body mass index (BMI) [11,8]

Another interesting finding was VO2max, that showed there were significant correlation between VO2max of fathers with his girls and there were a significant correlation between the VO2max of Mothers with her girls The probable reason of this observation is that obesity or adipose tissue by connected with aerobic potentiality of an individual. In fact lungs and O2 extraction power of muscles finally contribute to aerobic capacity of an individual and the single important measure of such potentiality is VO2 max.[7] Another interesting finding was Waist-to-height ratio(WHR),results showed a no significant correlation between the Waist-to-height ratio(WHR) of fathers with his girls and a significant correlation between the Waist-to-height ratio(WHR) of Mothers with her girls, In this context Some papers suggest that a better understanding of the relative role of physical activity (PA) and other determinant factors for the development of total and central overweight/obesity at young ages is needed. on the other hand there are a significant correlation between the Waist-to-hip(WSR) of fathers with his girls and there are a significant correlation between the Waist-to-hip(WSR) of Mothers with her girls,and The results show that a significant correlation between the Body fat of fathers with his girls and there are a significant correlation between the Body fat of Mothers with her girls. Ortega et al.,(2006), studied the effects of physical activity (PA) and other factors predisposing to overweight, with overweight and central adiposity in children and adolescents, The results indicated that Children and adolescents who had a low level (first tertile) of vigorous PA, were more likely to be overweight (including obesity) and to have a high-risk waist circumference, than those with a high level (third tertile) of vigorous PA.and Those subjects who had two overweight parents were more likely to be overweight and to have a high-risk waist circumference independently of PA variables, compared to those whose parents were not overweight.[14] The data show that body composition not only affects the physical activity (PA), but it Maybe alters its response to a physical activity, gene is Strong impact on the structure but no effect on the functioning that Which can be influenced by environmental. These findings show the athletes to be concerned about the effects of heredity

On the body composition and cardiorespiratory fitness. The results of the present research showed that Genetics Factors may play an important role in body composition And cardiorespiratory fitness of parents and his/here Children, and suggest that Environmental factors can be a more significant than heredity Parameters.

CONCLUSION

Finally, considering the findings of the present research we can come to the conclusion that any of the variables studied ranged between parents and children, therefore there can be the inherited factor involved in shaping the children's body composition and level of Cardiorespiratory fitness children's . It would be suggested that the results of the current study can be used as a potential candidate for the Prediction of athletic success and genetics Factors may play an important role in body composition And cardiorespiratory fitness of parents and his/here Children, and It seems that environmental factors can be a more significant than heredity Parameters

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