The comparison of body composition bioelectrical impedance analysis method of primary school students who do and don't do exercise.

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Abstract

In this study, we aimed to compare elementary school boys' (10-13 age group) body composition that exercise and do not exercise by the method of bioelectrical impedance analysis (BIA). Totally 38 male student of primary school level took part in the study. Experimental group consists of 22 male students whose age average 11.27 ± 0.63 year, height average 142.7 ± 8.06 cm, weight average 37.95 ± 7.68 and who regularly practice football 2 hours in a day and 3 days in a week. Control group comprise of 16 male student whose age average 11.87 ± 1.40 year, height average 147.0 ± 10.99 cm, weight average 37.55 ± 11.04 kg and who isn't regularly exercise. Experimental and control group's body composition evaluated by the method of bioelectrical impedance analysis. We have found significant differences on body mass index, body fat mass of the experimental and control group's (p<0.001), resistance measurement value and the phase angle (p<0.005). As a result, regular exercise has positive effect on the body composition at children.

Keywords: Elementary school boys, Sports, Bioelectrical impedance, Body composition.

Introduction

One of the main factors to be healthy is to have balanced body composition and to maintain it. Exercise is important to ensure this balance and protect it. Athletes body composition is an important criterion in determining the optimal body profile that is required for optimal health and performance for many branch of sports [1,2]. Adolescent and pre-adolescent of body fat, Lean body mass (LBM) and fast growth is that childhood [3]. In addition to that, exercise has the potential to change the body composition of children and young. Bioelectrical impedance (BIA) method can be used by athletes such as values obtained from assessing changes in body composition measurement tool has its own formula, formulas developed can be used to measure the impedance value of the BIA. Sex, ethnicity, leanness rate, health status and age are important while the selection of this formula [4,5]. Bioelectrical impedance method used to determine the body composition, is a technique which a very low level stimulating electrical current (500 μ) given the body then measured whether the resistance shown against the electric current. Bioelectrical impedance analysis is a non-invasive, easy, cheap, portable and effective method to determine body composition. While the Fat-free body tissues which contain more water and more electrolyte (73%) provide a good conductivity for electric current, fat tissues which contain less water and electrolytes are the poor conductor of electrical current environment. Lean body tissue (LBT), Total Body Fluid (TBF) and body fat rate (BFR) can be calculated by using this method. However, the events such as changes in eating and drinking habits, dehydration, exercise and events that cause changes in body water content and menstruation can affect BIA measurements

[6]. Total Body Fluid (TBF) and Lean body tissue (LBT) are the two major factors that determine the total amount of water in the body. While the total amount of water in the body is inversely proportional to the outer fat tissue, it is proportional to the tissue. Regular exercise affects the body fat and muscle mass. In this regard, it has been demonstrated that regular exercise reduces fat in the body and causes an increase in muscle mass [7]. This study aimed to compare the body composition of primary school male students' who are regularly doing exercise and aren't regularly doing exercise by using bioelectrical impedance analysis (BIA) method.

Materials and Methods

38 male student of primary school level took part in the study. Experimental group consists of 22 male students whose age average 11.27 ± 0.63 year, height average 142.7 ± 8.06 cm, weight average 37.95 ± 7.68 and who regularly practice football 2 hours in a day and 3 days in a week. Control group comprise of 16 male student whose age average 11.87 ± 1.40 year, height average 147.0 ± 10.99 cm, weight average 37.55 ± 11.04 kg and who isn't regularly exercise which were summarised in Table 1.

Inclusion criteria: The ones with no factors that will affect as hyperlipidemia, active or passive smoking, drug use, alcohol use, anemia, chronic disease, recently passed surgical intervention, heart disease, cerebrovascular diseases, diabetes, hypertension hyperlipidemia weren't included in the study.

Anthropometric measurements: Data collection Age detection the ages, years of birth of the subjects were asked to them and determined as years. Height was measured to the

nearest 0.1 cm by a calibrated audiometer and weight was measured to the nearest 0.1 kg using standard procedures as previously, Body-mass index. BMI was estimated by dividing weight (kg) by height (m^2).

Bioelectrical impedance analysis: Biodynamic 450 device has used for bioelectrical impedance analysis. Electrodes were tied to clean hands and feet. The measurements were performed by applying to 500 micro amps current. As a result of this process, phase angle, total cell mass, body fat mass, lean body mass, basal metabolic rate, intracellular fluid, extracellular fluid, total body water and resistance were measured.

Statistical methods: In the study, arithmetic means (X) and standard deviations (SD) were calculated for determining the changes the measurements between experimental group and

control group. An independent sample t-test was used to determine the difference between arithmetic means in independent groups 0.01 to 0.05 significance level. Statistical procedures were performed with SPSS 21.0 for Windows software as shown in Table 2.

Table 1. *Subject Characteristics.*

Parameters	Experimental	Group (N=22) Mean ± SD	Control Group (N=16) Mean ± SD
Age (Years)		11.27 ± 0.63	11.87± 1.40
Height (Cm)		142.72 ± 8.06	147.00 ± 10.9
Body Weight (Kg)		37.95 ± 7.68	37.55 ±11.04
BMI (kg/m^2)		18.49 ± 2.40	16.96 ± 3.07

Table 2. *Comparison of the measured values the experimental group and of the control group subjects.*

Parameter	Experimental Group (N=22)	Control Group (N=16)	P
Phase Angle	6.94 ± 1.53	5.76 ± 90.5	p<0.005**
Cell Mass	14.71 ± 2.54	15.45 ± 3.56	P>0,005
BMI	18.49 ± 2.08	16.8 ± 2.76	p<0.001*
Body Fat Mass	9.86 ± 3.42	6.10 ± 2.71	p<0.001*
Lean Body Mass	22.33 ± 4.43	24.38 ± 6.49	P>0,05
Basal metabolic rate	955.95 ± 183.70	1008.81 ± 277.45	P>0,05
Intracellular water (liters)	14.71 ± 2.54	15.45 ± 3.56	P>0,05
Extracellular water (liters)	15.39 ± 3.02	16.79 ± 4.47	P>0,05
Total body water (liters)	22.33 ± 4.43	24.38 ± 6.49	P>0,05
Resistance (ohms)	699.90 ± 104.7	641.21 ± 77.66	p<0.005 **

*p<0.001, **p<0.005

Discussion

Doing regular exercise leads to a positive effect on children's basal metabolic rate and body composition. While the experimental group of subjects phase angle was 6.94 ± 1.53, the control group of subjects phase angle was 5.76 ± 90.5. There is a significant differences between experimental group's phase angle and control group's (p=0.005). Phase angle: It reflects the permeability of the cell membrane. Phase angle reduces if cell membrane permeability is corrupted. It can be said, increase in the durability of the cell membrane with phase angle increases because of twelve week exercise program. It determined that the cell mass of the test group, 14.71 ± 2.54, while the cell mass of the control group was 15.45 ± 3.56. The difference between the control group and the experimental group of cell mass values was not significant (P>0.005). It was determined that BMI of the experimental group was 18.49 ± 2.08 and body fat mass was 9.86 ± 3.42. It was determined that BMI of the control group was 16.81 ± 2.76 and body fat mass was 6.10 ± 2.71. The difference between the values of body mass index and body fat mass of experimental and control

group was p<0.001 level was significantly in favour of the control group. Similar to some studies, doing regular exercise has no effect on BMI and body fat mass [8-10], while some studies reported by researchers to reduce [11,12]. It is known fact that regular exercise reduces the Body Mass Index and fat in the body. In our study, doing sports associations Body Mass Index and body fat mass values higher than the control group may be due to differences in duration and intensity the type of exercise used in this study. While the lean body mass values of the group who regularly exercise was 22.33 ± 4.43, control groups' was 24.38 ± 6.49. And there wasn't significant difference. The studies indicate that fat out of working creased [13-15], or did not change the mass is present [16]. While the basal metabolic rate of the experimental group was 955.95 ± 183.70, it was 1008.81 ± 277.4 for control group Regular 12-week exercise program showed no significant changes in terms of energy spent if the body is at rest. The values of the subjects who do sports athletes were found lover than the values of the subjects who aren't exercise on the bioelectrical impedance analysis with the intracellular, extracellular and total body water. But it wasn't significant. There are studies indicating an

increase in liquids after the exercise program [7,16,17]. While the resistance values of the experimental groups' subjects were 699.90 ± 104.7, control groups' was 641.21 ± 77.66. There was a significant difference ($p<0.005$). Resistance reflects the electrical resistance of the body. It can be said that after the 12-week exercise program increases the body's electrical resistance due to significant higher emergence of resistance values of the experimental group subjects. As a result, it was determined that lead to positive effects on body composition in the 10-12 age group boys after regular exercise.

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