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THE IMPACT OF AEROBIC EXERCISE ON SOME MORPHOLOGICAL MEASUREMENTS ON THE ENDURANCE OF CARDIOVASCULAR AND RESPIRATORY SYSTEMS AMONG BOYS AT THE AGE OF (10-12) YEARS

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Abstract: The problem of the study was to investigate the possibility of decreasing the body weight using aerobic exercises and the impact of such exercises on some morphological measurements among boys at the age of (10-12) years. The study aims at examining the impact of aerobic exercises on some morphological measurements, endurance of the cardiovascular and respiratory systems, among boys at the age of (10-12) years. Experimental approach is used for it is appropriate to the nature of the study. The study sample consisted of (20) primary schools obese students with the ages (10–12) years. They were divided into an experimental group (12 students) and a control group (8 students). The study considered the following variables: (Height, Weight, Body Surface Area, BMI, bio-impedance, lean weight, lean weight percentage, the ratio of lean weight to fat weight, weight of total water, weight of fats, percentage of body fat, the predicted weight). The study procedure included pre and post tests including endurance test (Bruce Protocol), bio-impedance measurement. The training program was applied on the experimental group and lasted for two months using 3 training units per week. The researcher used the Mean, standard deviation, paired T test, independent T test, source of variance (CV), relative change, absolute change. as statistical tools. The study concluded that aerobic exercises have positive impact on the morphological measurements on the endurance of cardiovascular and respiratory systems

Introduction:

Obesity is of the most common diseases that is caused by various factors including less movement, not practicing sports, consuming fatty foods, hormones disorders and genetics.

Reduction of energy intake and enhancement of physical activity is thought to be the key to the prevention of obesity and the reduction of body mass in overweight people.

Over the past 50 years, numerous studies have examined changes in total body adiposity in different ages. Some studies used diet program to get rid of obesity(3). Others adopted physical activity as a way to get rid of obesity(16), (11), (7) and (1). While others combined the two above methods to get rid of obesity (2), and (13).

All the above mentioned studies have dealt with various classes of the society in particular the older people. Children are regarded as an important class and should be targeted in the training programs in order to decrease weight. The problem related to obesity for children is that "body in this stage start to build the fatty cells and when completing this process, the number of cells will be the same in all the other age stages thus generating a natural trend to gain weight" (6: 44-45).

Many studies have been made to examine the changes for children bodies due to physical exercises (22),(14). However, through reviewing other studies, we noted that they use complicated tools and special places to perform exercises. There have been some studies examining physical sports class in the school and its simple exercises that could be scientifically used to be the best way to get rid of the excessive weight in children and reach a typical body composition free of obesity.

The study problem deals with obesity in children through adopting a program consisting of easy and applicable aerobic exercises using simple tools in order to examine the impact of such exercises in treating obesity in boys (10–12 years).

Aims of the study:

The study aims at:

- 1- Examining the impact of aerobic exercises on some morphological measurements among boys at the age of (10-12) years.
- 2- Examining the impact of aerobic exercises on the endurance of the cardiovascular and respiratory systems among boys at the age of (10-12) years.
- 3- Examining the differences between the experimental and control groups in some morphological measurements among boys at the age of (10-12) years.
- 4- Examining the differences between the experimental and control groups in the endurance of the cardiovascular and respiratory systems among boys at the age of (10-12) years.

Materials and Methods:

Study Approach:

Experimental approach is used for it is appropriate to the nature of the study.

Study Sample:

The study sample consisted of (20) primary schools obese students(*) with the ages (10–12) years. They were divided into an experimental group (12 students) and a control group (8 students) after homogeneity in age , height , weight , body surface area (BSA) and body mass index (BMI). No significant differences existed between the two groups. Parents approval was taken and medical examination was made for the selected students (Table 1).

(*) BMI was used as a primary indicator to select the obese students. Bio-impedance results were used in selecting the final sample.

Table 1. Characteristics of the study sample

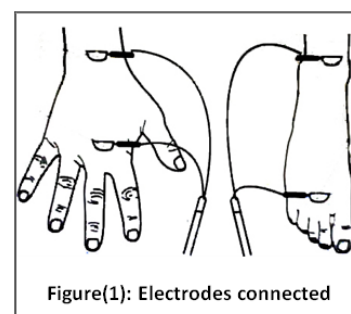
		Age (yr)	Height (cm)	Weight (kg)	BSA (m ²)	BMI (kg m ⁻²)
Experimental	mean \pm SD	10.09+0.54	137.92+10.93	44.33+11.28	0.21+1.28	22.91+2.47
	CV	0.05	0.08	0.25	0.16	0.11
Control	mean \pm SD	9.65+0.52	135.63+8.37	39.25+7.74	1.20+0.15	21.19+2.45
	CV	0.05	0.06	0.20	0.12	0.12

Data Collection:

Test and measurements were used as tools for collecting data. In order to measure the endurance, Bruce protocol was used (Evans & White, 2009, 46-47). Weight (kg) and height (m) were measured and body surface area (BSA)(m²) and body mass Index (BMI) were calculated (18: 264, 580).

Morphological Measurements (Body Components):

bioelectrical impedance analysis (BIA) was used to assess body component. Measurement is done through passing an low intensity electrical current (800 μ A) with a frequency (50hz) to measure impedance to current flow. Fat-free mass, due to its high water and electrolyte content, is highly conductive whereas adipose tissue contains little water and is therefore a poor conductor (i.e. higher impedance) (12:34-35). Electrodes are connected as shown in Figure (1).



Figure(1): Electrodes connected

Prior to testing, all subjects were instructed to adhere to the following traditional BIA guidelines: (a) no food or drink within 4 h of the test,(b) no exercise within 12 h of test, (c) empty bladder within 30 min of the test, and (d) no diuretic medications within 7 d of the test(23: 87-98) (9: 156-157). Subject compliance to these guidelines was confirmed prior to each experimental trial. BIA measurements were determined using a Bio- impedance body fat analyzer model (Vacumed, Model. 17081) .

After making each bio-impedance measurement, data (age, height, weight, electrical current value, right arm length, chest, abdomen, right thigh and right leg circumferences) were input into (Health Management System). This system will show the morphological data including: (Impedance (ohms), Lean Body Mass (kg), Lean Body Mass (%), Lean Body Mass to Fat Ratio, Total Body Water (kg), Fat Mass (kg), and Body Fat (%).

Main Experiment:

Pre measurements, including Bruce protocol and bio-impedence measurement, were applied on both the experimental and the control groups.

The training program (aerobic exercises) was applied on the experimental group. The training program consisted of aerobic physical exercises and lasted for (8) weeks with (3) units in the week, with (45) minutes for each unit. Graduation in the difficulty of the approach was followed through increasing the consumed calories where a system was used to calculate the approximate consumed calories. This system (<http://www.brianmac.co.uk/excel/energyexp.xls>) depends on the exercise duration and subject weight where exercise type and intensity are determined thus automatically calculating the consumed calories.

Post measurements, including Bruce protocol and bio-impedence measurement, were applied on both the experimental and the control groups.

Statistical Means:

Mean, standard deviation, paired T test, independent T test, source of variance (CV) , relative change, absolute change.

Results and Discussions:

Table 2. Means, Standard Deviations for the Study Variables

	Experimental (n=12)		Control (n=8)		Control	Experimental
	pre	post	Pre	post		
Impedance (ohms)	602.66+46.37	571.91+48.03*	665+139.33	667+135.31	2.00+18.11	30.75+28.74*
Lean Body Mass (kg)	33.49+8.67	33.5+8.61	30.52+6.4	31.17+6.18	0.65+1.36	0.02+0.74
Lean Body Mass (%)	75.71+3.63	80.15+3.46*	77.52+4.16	75.75+4.09	1.78+2.27	4.43+1.88*
Lean Body Mass to Fat Ratio	3.19+0.63	4.15+0.8*	3.6+0.85	3.25+0.81	0.35+0.41	0.97+0.46*
Total Body Water (kg)	24.7+5.47	25+6.18	22.35+4.45	22.72+4.43	0.38+0.87	0.30+1.68
Fat Mass (kg)	10.84+3.12	8.51+2.49*	8.85+2.61	9.94+2.33	1.10+1.47	2.33+1.18*
Body Fat (%)	24.24+3.59	20.02+3.27*	22.47+4.16	24.25+4.09	1.78+2.27	4.22+2.05*
Endurance (minute)	8.61+0.91	9.66+0.54*	8.73+1.30	7.84+0.44	0.884+1.153	1.057+0.809*

All values are mean \pm SD. *P< 0.05.

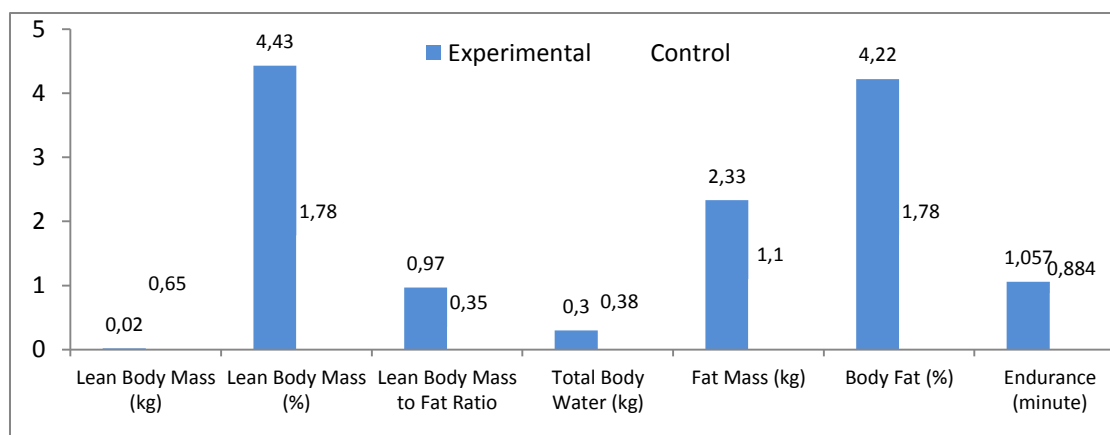


Fig. 2. Means for the study variables for Experimental and Control groups

Results:

Table (2) Fig. (2) Shows the following:

- There are significant differences between the pre and post tests for the favor of post tests for experimental group students regarding bio-impedance, lean body mass (%), Lean Body Mass to Fat Ratio, fat mass, body fat and endurance at $p < 0.05$.
- There are no significant differences between the pre and post tests for the for regarding lean body mass and total body water $p < 0.05$.
- There are significant differences between the experimental and the control groups and for the favor of the experimental group regarding bio-impedance, lean body mass (%), Lean Body Mass to Fat Ratio, fat mass, body fat and endurance at $p < 0.05$.
- There are no significant differences between experimental and the control groups students regarding lean body mass and total body water $p < 0.05$.

Discussions :

The researchers attribute this positive change in some of the morphological measurements to the efficiency of the physical exercises as they have a great impact on body composition. Studies have confirmed the efficiency of various forms of aerobic training in decreasing excessive weights and get rid of fats. (4)(1)(16)(2).

Bio-impedance decreasing value is attributed to the decrease of fats body due to the positive impact of the training program and this confirms with (Bray, 1983) and (Oscari & Miller, 1986).

Lean body mass to fat ratio increasing value is attributed to the increase of muscular mass. Kenrick & Ball pointed out that exercises burn calories thus increasing the muscular mass compared with fats (17:3). The long duration of exercises (45 minutes) for two months increased energy consumption and helped in decreasing fat mass and percentage as large muscle groups (trunk, thighs, shoulders) were the main target of the exercises. Wilmore and Cosfill (1988) indicated that physical

exercises and physical activity help in making some changes that increase fats metabolism with oxygen including adrenalin and noradrenalin secretion (24: 94).

Despite there was no significant difference in total body water, there is an increase in total body water value. This is confirmed with Shierman & Haycock,1981 where they showed that water resulting fat oxidation will replace fatty cells and the burn of one gram of fat will block three grams of water(21 :29). The increase lean body mass that contain large rate of water compared to the fatty cells.

The decreasing values of the control group is attributed to energy imbalance. Al Hazaa (2000) confirmed that energy imbalance in body that result in positive energy balance(when intake calories are more than consumed calories) and less physical activity will lead to weight increase thus obesity(4: 7).

The positive change of cardiovascular and respiratory systems endurance confirm with (Moyna et al.,1996) and (Al Muzaine, 1999) where they show that medium intensity physical activity develop physical fitness and motor activity for children. Hashim et al. (2005) pointed out that increasing cardiovascular and respiratory systems endurance through medium intensity training for long periods lead to the opening of blood vessels in lungs and increase the amount of blood surrounding the alveolar due to increasing cardiac output(15: 13). This will lead to time increase on the treadmill.

Conclusions and Recommendations:

The study sums up with the following:

1. Aerobic exercise had a role in developing morphological variables (lean weight, the ratio of lean weight to fat weight, weight of fats, and percentage of body fat) and Endurance of Cardiovascular and Respiratory Systems
2. The experimental group was better than the control group as related to study variables.

The study recommends the necessity of adopting aerobic exercises as there is no need for large places and various complicated tools and their positive impacts on the body physiology.

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