Abstract

The effect of functional training on some health-related fitness components and blood lipoprotein for children who suffer from obesity

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Introduction and research question:

Children obesity is considered one of the most dangerous health problems in the twenty-first century where it takes international dimensions as it impacts countries of mid-to-low incomes, specially their urban sectors. (1)

This phenomena's wide spread ratio has shown a dangerously high rate, as estimations show that the number of children who suffer from obesity was over 110 million around the world in 2013, and it is important to mention that 35 million of those children are living in developed countries.(2)

Mahshed Dehghan et.al 2005 mentioned that children obesity has a major effect on both the physical and psychological health, and that the reasons for obesity in childhood are the excessive use of calories, and the lack of physical activity.(3)

Some studies show the relation between the levels of physical activities and apathy of obese children. It shows that overweight children are less active than their healthy peers, and that the healthy children have lower rates of body fats. (4) (5)

That’s why physical activities are considered one of the reasons for maintaining weight loss and obesity curing for primary school

students on the long run as physical activity causes the raise of the calorie consumption of the body.(6)

Functional training is training the body in an international way to emulate the movements in the daily life. It aims to prepare the body for movements in all directions and contains complex-movements to join different muscular groups. It requires integrated movements for the entire body. (7)

Functional training provides an extremely high rate of fat burning, using total body trainings that improve strength, endurance and increase metabolism. (8)

The importance of knowing the body fat ratio is that it gives us accurate information whether a person is obese or not. It is known that obesity is considered a cause of other extreme health problems and illness; as well as that knowing the ratio of obesity in the society is also important, a health indicator that should be reviewed from time to time. Knowing the body fat ratio helps us recognize the changes that happen to the body as a result of engaging in physical activity or going on a certain diet to lose weight where the real goal is to reduce the fat mass and keep the muscle mass.(9)

Kenneth et.al 1990 refers to cholesterol as an organic composition from within the asteroids type and has a great importance as it consist the composition of mainly the cell's plasma membranes as well as in the composition of lipoprotein existing in the blood and transports fats from the blood to the various body organs either to be oxidized in order to gain power or to be stored in some cells like the fat cells. The increase of LDL levels leads to the increase of atherosclerosis chances , and there is a reciprocal relation between the blood LDL level and HDL level; the natural blood LDL level is less than 180mg/100mlitliter.(10)(11)

Triglyceride is a type of fats that exists in the blood stream and fat tissues, the more of that type of fat the higher are the chances for arteriosclerosis and narrow arteries which increase the danger of heart attacks and strokes as well as some illnesses such as diabetes.

Obesity raises the triglyceride levels in the blood; the natural level of it in blood between the ages of 1 to30 years old is less than 150dl/mg. (12)

Lila El-Sebaây 2000 mentioned that raising the physical and body efficiency by physical activities helps in raising the physical fitness and activity restoration.(13) Numerous studies noted to the positive effect of sports training on weight reduction, body fat ratio, fat oxidization, and blood lipoprotein concentration.(14)(15)

As previously shown, there are numerous reasons of poor physical activity in children; the main reason of such is the failure to allocate time for training. In primary schools in the Arab Republic of Egypt, only two physical classes are allocated per week which leads to a high ratio of obesity among children of that school stage. Here emerged the idea of performing this research that aims at designing a functional training program without the interference of diet in primary school children who suffer from obesity in order to improve their level of physical fitness and to reduce the rates of body fat and lipoprotein.

Research objectives:

Designing a functional training program for children in the primary school stage who suffer from obesity and comprehending its effect on

1- Weight and other body composition variables such as the body fat ratio, body mass without fat, body fat weight, muscle weight, and fat burning rate
2- Blood lipoprotein such as the total cholesterol rate, the high and/or low density protein, and the blood triglyceride
3- Some elements of physical fitness related to health such as muscle strength in arms and shoulders, abdominal muscle strength, flexibility, and muscular endurance

Research hypotheses:

1- There are leading evidences between pre-, between- and post-measurements for the research sample in weight variables and

other body composition variables (under investigation) in favor of the post-measurement.

2- There are leading evidences between pre-, between- and post-measurements for the research sample in blood lipoprotein (under investigation) in favor of post measurement.
3- There are leading evidences between pre-, between- and post-measurements for the research sample in some fitness elements related to health (under investigation) in favor of post measurement.

Research procedures

- **Research methodology**

The researchers used the experimental method because of its suitability to the nature and goals of the research itself, using the experimental design with pre-, between- and post-measurement for a single group.

- **Research sample**:

The research society was chosen deliberately of the primary male students who suffer from obesity at the ages between 9 to 11 years. Then the researchers took the main random sample of 15 male students from the research society as well as assigning 8 students randomly from the original research society and out of the main research sample to proceed with the reconnaissance study on them. They were chosen for the following reasons:

1- Students and parents approval to participate in the three month program and to carry out measurements on them
2- Not to practice any physical training or diet
3- Not to undergo any medical treatment

- **Research sample homogeneity:**

The researchers did the homogeneity between the research society of (23) students in the variables of age, height, weight, body mass indicator, and some of the body composition variables such as body fat ratio, body mass without fat, body fat weight, muscle weight, fat burning ratio; blood lipoprotein such as the total cholesterol rate,

high and/or low density protein, and blood triglyceride, and some other body variables such as muscle strength in arms and shoulders, abdominal muscle strength, flexibility, and muscular endurance, as shown in table (1)

Table (1)

Homogeneity for research sample in basic variables and health – related fitness components and lipoproteins

(n=23)

Variables	UM	Mean	Median	SD	Skewness
Age	**Year**	10.16	10.20	0.58	-0.203
Height	**Cm**	151.87	151.00	3.58	-0.229
Weight	**Kg**	69.82	69.80	1.22	0.287
BMI	**Kg/m2**	30.43	30.12	1.10	0.387
PBF	**%**	40.81	41.09	1.08	-0.136
FFM	**Kg**	39.23	39.11	1.16	-0.119
Body fat weight	**Kg**	41.42	41.56	1.04	-0.598
Muscle weight	**Kg**	21.67	21.76	0.99	-0.242
BMR	**Kcal**	1255.20	1256.00	81.23	0.85
CHO	**Mg/dl**	169.30	169.10	1.64	0.612
HDL	**Mg/dl**	41.44	41.36	1.25	-0.186
LDL	**Mg/dl**	76.33	76.31	1.37	-0.020
TG	**Mg/dl**	140.76	140.40	1.63	0.335
Muscle strength of arms & shoulders	**Number**	2.13	2.00	0.74	-0.227
Abdominal muscle strength	**Number**	20.80	21.00	1.08	-0.328
Flexibility	**CM**	4.840	5.000	0.75	-0.698
Muscle endurance	**number**	11.40	11.00	1.12	0.112

UM=unit of measurement; SD=standard deviation; SC= skewness coefficient

As shown in table (1), the skewness rate in the research sample is between (±3) which refers to the moderation of the research sample within these variables.

The reconnaissance study:

The researchers made the first reconnaissance study from 01/10/2015 to 06/10/2015 on a sample of 8 students from the research society and away from the main research sample. The study

aimed to assure the sufficiency of the devices and tools used in this test and to be assured of the scientific procession (Honesty –Stability) of the physical tests (under investigation).

Data collection tools and means

First: Tools and devices used:

Alrstamitr device to measure the total height of the body, a medical scale to measure the weight, (body composition analyzer in body 170), a device to measure the body composition of muscles, fat, fat distribution areas in the body, the BMR. This device depends on the bioelectrical impedance analysis by passing a small electrical current through the body and measuring the body electrical resistance.

Measurement procedures:

- Feeding the device with data of clothes weight, sex, age (year), height (cm).
- The inspected steps on the device by putting his feet on the platform and his hands on the handles
- The device starts to function for (30) seconds
- The inspected remains on the device until the result is automatically printed out
- Stopwatch 1/100 sec, Swedish seats
- Plyo-metric equipment (3 boxes, 30, 45, 60 cm)
- VIPR, kettlebells, dumbbells, cones, speed ladders, 1X10 Rung
- Test tubes to preserve blood samples - plastic syringes – anticoagulant - ice pack

Second: physical tests (under investigation)

- Strain on the horizontal bar to test the muscle strength of arms and shoulders
- Legs bending upper body to test flexibility
- Set repose for 30 seconds to test abdominal muscle strength
- Set on fourth swaying legs backwards (30 sec) to test muscle endurance

Third: the proposed functional training program

Goals of the proposed program:

Designing a functional training program for primary school children who suffer from obesity to improve their physical fitness related to health and to decrease their body fat ratio and their blood lipoprotein

Program foundation bases:

- For the program to achieve the goals concerning the accurate formation of the weight (strength/size) wise, and concerning the personal differences in the research sample in accordance to diversity and scaling from easy to hard.

Functional program content:

- The researchers reviewed the scientific literature and took experts' opinions to determine the components of the proposed functional training, and to measure if the proposed trainings were adequate for the age of the research sample by determining the group of trainings for muscle strength, flexibility, and agility using medical balls, elastic ropes, and other polymeric devices.
- There are 36 training units within the program
- The application duration was 12 weeks as for three units a week (Saturday, Monday, and Wednesday).
- The duration of training unit was about 60-70 min.
- The training intensity varied between 60 – 85% for a maximum repetition per child according to the experts' opinions, as Mufti Ibrahim 2009 indicated the necessity of scaling resilience in the muscle strength trainings for children and teenagers and that it is not recommended to lift weights or push resistant rapidly or compete to lift more weight without scaling.(16)
- Total program time is approximately 2340 min

Table (2)

Distribution of the total volume of program

Week	Number of units	Unit duration (Minutes)	Weekly period (minutes)	Load Intensity (%)
1st	3	60	180	60%
2nd	3	60	180	65%
3rd	3	60	180	70%
4th	3	70	210	65%
5th	3	65	195	65%
6th	3	65	195	70%
7th	3	70	210	60%
8th	3	60	180	60%
9th	3	65	195	65%
10th	3	65	195	70%
11th	3	70	210	75%
12th	3	70	210	85%
Total	**36**		**2340**	

Regularization of training-load intensities:

Training load intensity was regularized using pulse rate and applying the following equation:

- Target heart rate (THR) = rest pulse + (training ratio×(maximum pulse - rest pulse)) ; where:
- Average age of the sample = 11 years
- Average rest-pulse rate of the sample = 74p/m
- Maximum pulse of the sample = 220 – age = 220-11= 209p/m
- Margin pulse of the sample = maximum pulse rate – rest pulse rate = 209-74=135p/m
- The components of the training unit for day one, two and three of the first week to the twelfth are divided into three sections.

The first section: warming up for functional training (15 - 20 min)

The exercises vary from 7 – 10 exercises for day one and two, 10 – 15 for day three, each exercise taking 30 seconds; the number of groups is between 1 – 2 groups, the number of repetition is 2 – 5 for day one and two; 5 – 7 for day three using the circle training method of positive ease (walking) for the groups (30 sec).

The next exercises are to be performed - walking with knees lifting up, jumping with knees lifting up, running with knees lifting up, jumping with straight legs, running backwards, and walking forward while stabbing.

The second section: functional training exercises (20 - 49 min).

The exercises vary from 7 – 10 exercises for day one and two, 10 – 15 for day three, each exercise taking 30 seconds, the number of groups is between 1 – 2 groups , the number of repetition is 8 – 10 for day one and two, 10 – 12 for day three using the circle training method of positive ease (walking) for the groups (30 sec); a gradual increase in weight starting from 60% and ending at 85%.

The following exercises are to be performed: pushing a ball forward, pushing weight forward in different directions, sequential steps forward, moving forward while lifting hips up and carrying a medical ball, sitting with crossed legs and moving forward, curvy lying down and moving forward.

The third section: cooling down exercises (5 – 10 min).

Aiming at getting students to their normal state after the efforts exerted in the exercises. The exercises for cooling down consisted of tranquilization while rocking and arm circling, walking, easy running, and breathe organizing.

Biochemical measurements: it is required to fasten for about 12 – 14 hours to measure the total cholesterol CHO, high density protein HDL, and low density protein LDL, Triglyceride TG.

Research practical procedures

First: The Pre-measurements:

The researchers made the between-measurements for the research sample from 14/10/2015 to 16/10/2015 as shown next:

- Measuring weight and some other body component variables such as the body fat ratio, body mass without fat, body fat weight, muscle weight and the fat burning ratio, Wednesday 14/10/2015.

- Measuring the body lipoprotein, the total cholesterol rate, high and/or low density protein, and blood triglyceride, Thursday 15/10/2015.
- Some other body variables such as muscle strength in arms and shoulders, abdominal muscle strength, flexibility, and muscular endurance, Friday 16/10/2015

Second: Applying the proposed program:

The proposed training program was applied on the research main sample of 15 male students who suffer from obesity aged between 9 and 11in a time period starting from Saturday 17/10/2015 till 06/01/2015 in the field course of El-Salam privet school in Tanta, Gharbia, out of the school day.

Third: The Post-measurements

The researchers made the post-measurements for the research sample from 07/01/2015 till 09/01/2016 in the same order and requirements of the pre- measurements.

Statistical procession

The arithmetic mean, standard deviation, median, skewness coefficient, analysis of variance (ANOVA), test of the least valuable differences (L.S.D) and rates of change

First: The results:

Table (3)

Analyzing variations among the three measurements (pre-, between- and dimensional) in some body component variables and blood lipoprotein (under investigation).

Variable	Source of variation	Sum of Squares	Degree of Freedom	Mean squares	F value

Weight	Between groups Within groups Total	587.035 62.737 640.772	2 42 44	289.018 1.494	193.485
PBF	Between groups Within groups Total	1227.357 65.178 1292.535	2 42 44	613.678 1.552	395.445
FFM	Between groups Within groups Total	248.091 55.396 303.488	2 42 44	124.046 1.319	94.048
FAT	Between groups Within groups Total	595.738 44.906 640.644	2 42 44	297.869 1.069	278.590
Muscle	Between groups Within groups Total	206.425 35.746 242.170	2 42 44	103.212 0.851	121.272
BMR	Between groups Within groups Total	1209172.65 259661.479 1468834.130	2 42 44	604586.325 6182.416	97.791
CHO	Between groups Within groups Total	17141.467 132.859 17274.326	2 42 44	8570.734 3.163	2709.43
HDL	Between groups Within groups Total	467.753 48.379 516.132	2 42 44	233.877 1.152	203.040
LDL	Between groups Within groups Total	6199.475 63.300 6262.775	2 42 44	3099.738 1.507	2056.70
TG	Between groups Within groups Total	4210.954 86.583 4297.537	2 42 44	2105.477 2.062	1021.33

F<0.05

Table (3) shows that there are significant statistical differences when the calculated (F) was bigger than tabled (F) on theoretical level of 0,05 in some body variables and blood lipoprotein (under investigation).

Table (4)

The value of LSD for the three measurements (Pre, Between, and Post) in some body compositions and blood lipoprotein

Variable	Measurements	Mean	Difference of averages			LSD
			Pre	Between	Post	
Weight	Pre	69.82	-----	*3.9800	*8.7667	0.882
	Between	65.84		-----	*4.7867	

	Post	61.05			-----	
PBF	Pre	40.82	-----	*6.05933	*12.78667	0.882
	Between	34.76		-----	*6.72733	
	Post	28.03			-----	
FFM	Pre	39.24	-----	*-2.03400	*-5.67600	0.823
	Between	41.27		-----	*-3.64200	
	Post	44.91			-----	
FAT	Pre	41.42	-----	*5.14133	*8.87533	0.744
	Between	36.28		-----	*3.73400	
	Post	32.55			-----	
Muscle	Pre	21.67	-----	*-2.03133	*-5.2046	0.666
	Between	23.71		-----	*-3.17333	
	Post	26.88			-----	
BMR	Pre	1255.20	-----	*-176.664	*-400.597	56.27
	Between	1431.87		-----	*-223.933	
	Post	1655.80			-----	
CHO	Pre	169.31	-----	*24.1000	*47.8067	1.27
	Between	145.21		-----	*23.7067	
	Post	121.50			-----	
HDL	Pre	41.45	-----	*-4.03400	*-7.89667	0.764
	Between	45.48		-----	*-3.86267	
	Post	49.34			-----	
LDL	Pre	76.33	-----	*13.78667	*28.74267	0.882
	Between	62.55		-----	*14.95600	
	Post	47.59			-----	
TG	Pre	140.77	-----	*12.1013	*23.6933	1.019
	Between	128.67		-----	*11.5920	
	Post	117.07			-----	

Table (4) shows the difference between the pre- and between-measurements in favor of the between-measurements, and the between- the between- and post-measurements in favor of the post-measurements in some body component variables and blood lipoprotein (under investigation).

Table (5)

Analysis of variance between the three measurements (pre-, between-, and post-) in health related fitness components

Variable	Source of variation	Sum of squares	Degree of Freedom	Mean square	F value
	Between groups	78.978	2	39.489	70.676
	Within groups	23.467	42	0.559	

Muscle strength of arms and shoulders	Total	102.444	44		
Strength of abdominal muscle	Between groups	2603.911	2	1301.956	921.609
	Within groups	59.333	42	1.413	
	Total	2663.244	44		
Flexibility	Between groups	407.177	2	203.589	314.427
	Within groups	27.195	42	0.647	
	Total	434.372	44		
Muscle endurance	Between groups	929.733	2	464.867	414.824
	Within groups	47.067	42	1.121	
	Total	976.800	44		

F<0.05

Table (5) shows that there are significant statistical differences when the calculated (F) was bigger than tabled (F) on the theoretical level of 0,05 in some components of physical fitness related to health.

Table (6)
Significant differences (LSD) between the three measurements (Pre – Between – Post) in health related fitness components

Variable	Measurement	Mean	Difference of average			LSD
			Pre	Between	Post	
Muscles strength of arms and shoulders	Pre	2.13	-----	*-2.067	*-3.200	0.529
	Between	4.20		-----	*-1.133	
	Post	5.33			-----	
Strength of abdominal muscles	Pre	20.80	-----	*-7.600	*18.533	0.842
	Between	28.40		-----	*10.933	
	Post	39.33			-----	
Flexibility	Pre	4.840	-----	*-3.5533	*-7.3667	0.568
	Between	8.393		-----	*-3.8133	
	Post	12.21			-----	
Muscular endurance	Pre	11.40	-----	*5.467	*-11.133	0.764
	Between	16.87		-----	*5.667	
	post	22.53			-----	

Table (6) shows the difference between the pre- and the between-measurements in favor of the between-measurements, and the between- and the between- and post-measurements in favor of the post-measurements in some components of physical fitness related to health

Table (7)

The percent of changes between the three measurements (Pre-Between-Post) in the average variables of some health related and lipoprotein fitness components

Variables	Difference ratio % Pre and Between	Difference ratio % Between and post	Difference ratio % Pre and Post
Weight	5.70	7.27	12.56
PBF	14.82	19.36	31.31
FFM	5.20	8.82	14.48
FAT	12.40	10.28	21.41
Muscle weight	9.37	13.42	24.04
BMR	14.08	15.64	31.92
CHO	14.23	16.33	28.23
HDL	9.75	8.49	19.06
LDL	18.05	23.92	37.65
TG	8.59	9.02	16.83
Muscle strength of arms & shoulders	97.18	26.90	150.23
Strength of abdominal muscle	36.54	38.49	89.08
Flexibility	73.35	45.53	152.27
Muscle endurance	47.98	33.55	65.98

Table (7) shows the percentage of differences between the three measurements (pre-, between- and post-) in averages of sum variables of physical fitness related to health and blood lipoprotein.

Results discussion:

Tables 3 & 4 show that there are differences of statistical nature between the three measurements (pre- between- post) in the variable of weight and some other variables of body composition like the body fat ratio, body mass without fat, body fat weight , muscle weight, and fat burning ratio in favor of the post-measurement. Table 7 shows the percentage of change between the three measurements (Pre, Between, and Post) in the body weight change average, that the weight changed from the pre- to the between-measurement by 50.70%, from the between- to the post- measurement by 7.27%, and from the pre- to the post-measurement by 12.56%; as for the body fat ration from the pre- to the between-measurements by14.82%, from the between- to the post-measurement by19.36%, and from the pre- to the post-measurement by 12.56%. The body mass without fat

showed changes from the pre- to the between- to the post-measurements of 5.20%, 8,82%, and 14.48%. The body fat weight also decreased on the research sample for the three measurements by 12.40%, 10.28%, and 21.41%, respectively, and the muscle weight was changed as well, the change ratio between the three measurements (Pre-, Between-, and Post-) was 9.37%, 13.42, and 24.04%, respectively. The body fat burning ratio for the research sample and the change ratio between the three measurements were 14.08%, 15.64&, and 31.92%, accordingly. The researchers indicates these changes and ratios to be due to the exercises within the proposed training program which was constructed on scientific bases regarding the bases of sportive training and physiological bases which reflected positively on the body variables. The program was characterized by containing a group of muscle strength, endurance, and flexibility exercises, using medical balls, elastic ropes, and other plyometric devices in consideration of scaling the strength of the exercises from 65% to85% for the most repetition per child using the circle training methodology and other scientific methods like scaling and waving gradually fitting the research sample children's progress.

Alguni & Azmi 2007(17), assure that the ratio of general oxygen consumption rises by 20 times during any physical activity of the body, and this ratio could be higher for working muscles. Getting the needed power in this case could be attained by using the muscles attached to the skeleton by ratios higher than the average from the triglycerides and glycogen stocks, in addition to the free fatty acids extracted from the disintegration of glucose in adipose tissues which lead to a body weight reduction; thus, the decreased body mass index (BMI) and decreased body measurements. This is compatible with the findings of Jihan Yahia 2005, (18), Iman Mahmoud et al 2008, (14), Iman Najm Eldien et al 2013, (19), who assure that organized sport activities reduce the body fat ratio and increase the fat free mass of the body.

As previously mentioned, the first hypotheses of the research were verified ,which indicates :

There are significant statistical differences between the pre-, between- and the post-measurements for the research sample in weight and some body composition variables (under investigation) in favor of the post- measurement

Tables 3 & 4 also show statistical differences between the three measurements (Pre-Between-Post) in blood lipoprotein, (the total cholesterol, high and low protein density, and blood triglycerides) in favor of the post-measurement. Table 7 shows the percentage of changes between the three measurements (Pre-Between-Post) in the average of blood lipoprotein (total cholesterol, high and low protein density, and blood triglycerides) that the CHO was decreased and this reduction percentage between the pre- and the between-measurement was at 14.23%, between the between- and post-measurement it was at 16.33%, and between the pre- and post-measurement it was at 28.23%. The HDL was increased and the risen percentage between the pre- and the between-measurement was at 9.75%%, between the between- and the post-measurement it was at 8.49%%; between the pre- and post-measurements it was 19.06%. Also, the LDL was reduced and this reduction between the three measurements was 18.05%, 23.92%, 37.65%, respectively; as well as for the triglycerides that decreased in the three measurements to 8.59%, 9.02%, 16.83%, respectively. The researchers attribute that result to the proposed functional training program that led to the increase of the HDL level which main function is to eliminate the LDL and Triglycerides in the blood and transfer it to the liver which transforms the LDL and triglycerides to the yellow gull slat. Although CHO is an important component of the cell formation cover tissue and we need it to form building hormones, the high concentration of cholesterol in plasma leads to heart diseases. For that we should secure ourselves by performing sports, because of the dependency of the power production on the fat burning. There is another function of contra transportation of the cholesterol from blood vessels to the liver and though that variable is related to the decreased hazard of heart strokes that the organized three days a week functional training exercises are related to the concentration of HDL. The contra

transportation consists of the motion of cholesterol by the HDL particles from the surrounding tissues to the liver where the deconstruction takes place, as for the TG, it is to be absorbed by the guts and stored in large particles of Clio-microns livers in the blood stream. These particles react with D to decompose the TG in the liver by the HSL enzyme which is activated by physical activities plus activating the fat burning process to produce power leading to a decrease in the concentration of (CHOL, LDL, TG) and an increase in the concentration of (HDL). The most recent researches refer to the positive direct link between the physical activity levels and the HDL & LDL ratios. Abu El-Ella Abd El-Fattah 2003, (20) referred to the fact that with a higher level of organized physical activities, the ratio of blood fat decreases and therefore it could be considered an aiding factor in decreasing the risks of heart diseases, improving the body weight and decreasing obesity. This is in accordance with the studies of Abeer Abd-ElRahman 2003, (21), and Jihan Yahia 2005, (18) who confirms that organized physical activities lead to a reduced total cholesterol, LDL, and TG which reduce the heart disease risks.

As previously mention the second hypotheses of the research were verified, which indicates :

There are significant statistical differences between the pre-between- and post-measurements for the research sample in lipoprotein (under investigation) in favor of the post-measurement

Tables 5 and 6 also show a statistical difference between the three measurements (Pre-Between-Post) in some body variables of the muscle strength of arms and shoulders, the abdominal muscle strength, flexibility and muscle endurance in favor of the post-measurement. The researchers due this differences to the reduction of the body fat ratio, the total cholesterol reduction, LDL, and TG which were reflected positively in the improvement of the bodies of the research sample. Table (7) shows that the percentage of changes between the three measurements (Pre-Between-Post) in the average variable of the muscle strength of arms and shoulders, the abdominal

muscle strength, flexibility and muscle endurance, that the muscle strength of arms and shoulders is higher and the ratio of change between the pre-and between-measurements was at 97.18%, between the between- and the post- measurement it was 45.53% and between the pre- and the post-measurements it was 28.23%. The increase of the abdominal muscle strength and the ratio of change between the pre- and the between-measurements was 36.54, between the between- and the post-measurement it was 38.49% and between the pre- and the post-measurements it was 98.08%. The researchers due the progress in the muscle strength variable, which is considered an important index and active component in physical fitness, to health and it was noticeably progressed due to the functional training program that contained exercises and compound movements that are preformed in all directions with participant different muscle groups as the functional training requires a complex movement of the body. This was done by the proposed functional training program that depended on different methods like reactive devices, free weight, elastic ropes and by using the body weight itself during pulling upward or jumping downward (deep jumping) and the nature of power exercises during the program which concentrated on performing the most possible number of repetitions for muscle contractions during a given period of time in this matter. Dave Schmitz 2003, (22) assured that the significant character of the functional training is to concentrate on the center where the center muscles link the upper to the lower ends. In addition, the functional training contains multi dimensional movements with concentration on one end which makes it the best exercises used to improve the center muscle strength (body center).

Table (7) also refers to the percentage of changes between the three measurements (Pre-Between-Post) in the variable of flexibility and the changes in the percentage between the three measurements gradually were at 152.27%, 45.53% and 73.35%. The researchers due this to the progression of the proposed program and what it contains of static, dynamic, swinging and free exercises which improve the components of flexibility. The stretching exercises, which

focus primarily on muscles considering that its flexibility resemble the most important goal of the training, are also important in taking the right position and the duration of stillness improves the appropriateness of the results, this was confirmed by Iman Nijm ElDenn et al, 2013, (19), Mohammed Abed Hamad.2013, (23), as the link between stretching exercises and power exercises should be considered to insure working on a balanced improvement of the body motion organs and to avoid improving only one side, that the widen in motion range for the joints by positive stretch means increasing the level of static muscle power.

It is also obvious form table (7) that the percentage of changes between the three measurements (Pre-Between-Post) in the variable of muscle endurance and the changes in the percentage between the three measurements gradually was 65.98%, 33.55%, and 47.98%. The researchers link this to the efficiency of the functional training in developing the muscle endurance, that the proposed program contains exercises characterized by accumulated movements of lifting, waking and running; all those are performed by multiple joints and muscles working together as a result of their perfect connection. These results are in agreement with the late results of both Abeer Abd ElRahman 2003, (21), and Mohammed Sad 2013, (24).

As previously mentioned the third hypotheses of the research were verified, which indicates:

There are significant statistical differences between the pre-, between- and the post-measurements for the research sample in health related fitness variables (under investigation) in favor of the post-measurement.

Conclusions

According to the research results, the researchers reached these conclusions,

- The functional training program affected the improvement of the post- measurement more positively than the between- and the pre-measurements for the research sample in the variable of weight and

other body construction variables (under investigation) in favor of the post-measurements.

- The proposed training program positively affected the decreasing of the concentration of total cholesterol, LDL, and TG for the research sample and the increase of the concentration ratio of HDL.
- The functional training program affected other variables of health related physical fitness positively (under investigation)

Recommendation

Within the limits of the research sample and according to its findings, the researchers are recommending:

The attention to functional training to develop levels of health related physical fitness for school children of all stages, in addition to carrying out measurements of blood lipoprotein in school children of all stages to put training programs in order to improve their status and to conduct studies on body composition to know its impact on the physiological and physical condition of school students of all academic levels.

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