Effect of Treadmill Training Versus Short Circuit Exercises on Total Cholesterol For Obese Children

By

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Introduction

Obesity is on the rise among adults, adolescents and children worldwide including populations living in developing countries. When the body mass index of adolescents from Egypt and Mexico evaluated in attending public schools, the girls were overweight and 6%of boys and 8% of girls were obese.**(Martinez et al., 2006).** Due to the rising prevalence of obesity in children and its many adverse health effects, it is being recognized as a serious public health concern **(Peter, 2005).**

According to Mayo Clinic childhood obesity occurs when a child is well above the normal weight for his or her age and height. Childhood obesity is particularly troubling because the extra pounds often start kids on the path to health problems that were once confined to adults such as diabetes, high blood pressure and high cholesterol. As methods to determine body fat directly are difficult, the diagnosis of obesity is often based on body mass index (BMI) **(Wilson, 2013).**

The previous studies demonstrated that the unfit girls and boys have hypercholesterolemia and low level of the high density lipoproteins (HDL) cholesterol by comparison to their moderately and high fit beers. Few studies examined the effect of exercise interventions on changes in blood lipids and lipoproteins (**Janssen and LeBlanc, 2010**).

Aerobic exercise:

Is defined as constant moderate intensity work that uses up oxygen at a rate in which the cardio respiratory system can replenish oxygen in the working muscles. Examples of such activity are exercises like stationary bike riding or walking. It is a good activity for fat loss when done in the right amounts **(Sagiv, 2012).**

Treadmill training :

Treadmill activity may not only increase aerobic capacity but may increase lower limb strength as well. Treadmill training is not usually thought as a strength training activity but can be effective in this regard if one has been accustomed to do lower body weight training. Walking on a treadmill seems different initially from free walking **(Fiatarone, 2000).**

short circuit exercise :

The short circuit exercise training consists of series of resistance training exercises performed in succession with minimal rest (15-30 seconds) between exercises. The circuit training program can vary depending on the goals of the program. The number of circuit can be increased as the person adapts to the training. Examples for a total body circuit weight training as leg extension, arm curl, push up, squatting, overhead press and back extension **(Fleck and Kraemer, 2014).**

Statement of the problem:

Does the treadmill training exercise program differ from the short circuit training exercises program on the total cholesterol level for the obese children with borderline?

Purposes of the study:

The purposes of this study were to study:

- The effect of treadmill training program on total cholesterol level for obese children.
- The effect of short circuit exercises on total cholesterol level for obese children.
- A comparison between the effects of treadmill training program on total cholesterol level and the effect of short circuit exercises on total cholesterol level for obese children.

Significance of the study:

- Childhood obesity is a potent indicator of obesity in adulthood .It is important to study fat in children which potentially unaffected by sex hormones that may play a role in metabolism during adolescence **(Whitaker et al., 2004).**
- Using the aerobic exercise program is one of the best ways to improve the aerobic fitness and limit the amount of acquired fats decreasing the risks of congenital heart disease **(Loftin et al., 2004).**
- There are few studies that examined the effects of circuit exercises training in young elderly overweight individuals **(Paoli et al., 2013).**

- Finally, the possibility of improving, or even normalizing, a hyperlipidemic profile through exercise intervention during childhood or adolescence cannot be ignored. This may provide a fruitful and rewarding area of research in future studies **(Tolfrey et al., 1999).**
- Obesity and Overweight are becoming problems among Egyptian adolescents so, the information about the risk factors associated (increased and border line total cholesterol values) with excessive weight gain during childhood and preadolescents periods is a first step towards proposing prevention strategies.

Delimitations:

This study was delimited to: forty obese children of both sexes. They were selected from New Ramses College School-Ghamra, Cairo according to the following criteria:-

- Their ages ranged from 6-10 years.
- Fasting total cholesterol level was examined in Laboratory (ranged from 170-199 mg/dl) (lab. exam).
- BMI was equal to or greater than 95th percentile.
- Treadmill exercise training program was performed for children of study group I.
- Short circuit exercises program was conducted for children of study group II.

Limitations:

This study was limited by:

- Lack of the number of children that have border line of total cholesterol level (ranged from 170-199 mg/dl).
- Lack of open area for running or jogging for warming up and cooling down of children.

Hypothesis:

- There is no effect of treadmill training program on total cholesterol level for obese children.
- There is no effect of short circuit exercises on total cholesterol level for obese children.
- There is no difference between the effect of treadmill training program and short circuit exercises on borderline total cholesterol level in the obese children.

SUBJECTS, INSTRUMENTATIONS AND PROCEDURES

Forty obese children with borderline total cholesterol level according to their previous laboratory data were examined before study demonstration. Children were selected according to the following criteria:

- Their age ranged from 6-10 years old.
- Obesity was determined by percentile body mass index (Equal to/or greater than the 95th percentile).
- Their total cholesterol level was on the borderline as ranged from 170-199 mg/dl according to the National Cholesterol Education Program (NCEP) **(Conti, 1992).**
- Obesity due to nutritional causes.
- They were able to follow and understand the given orders.

Exclusion criteria:

Children were excluded if they had any of the following:-

- Associated neurological or genetic disorders (e.g. Down's syndrome, diabetes, hypothyroidism … etc).
- Practicing regular sport activities.
- Unstable heart conditions.
- Liver problems.
- Kidney problems.
- Severe musculoskeletal problems (physical injury – atlantoaxial instability).
- Visual problems.
- Severe hearing problems.

Design and Study groups

- **Design:** All Children were assigned randomly into two groups of equal numbers (study group I and study group II)
- **Study group (I):** Twenty obese children who received a balanced diet regimen for weight reduction, and special treadmill training exercise program.
- **Study group (II):** Twenty obese children who received the same diet regimen for weight reduction and a specific short circuit training exercises.
- * Both groups received 3 sessions/week for12 successive weeks.

Instrumentation and tools for evaluation

1- Standard weight and height scale for measuring weight in kilograms (kg) and height in centimeters (cm) to evaluate the body mass index.

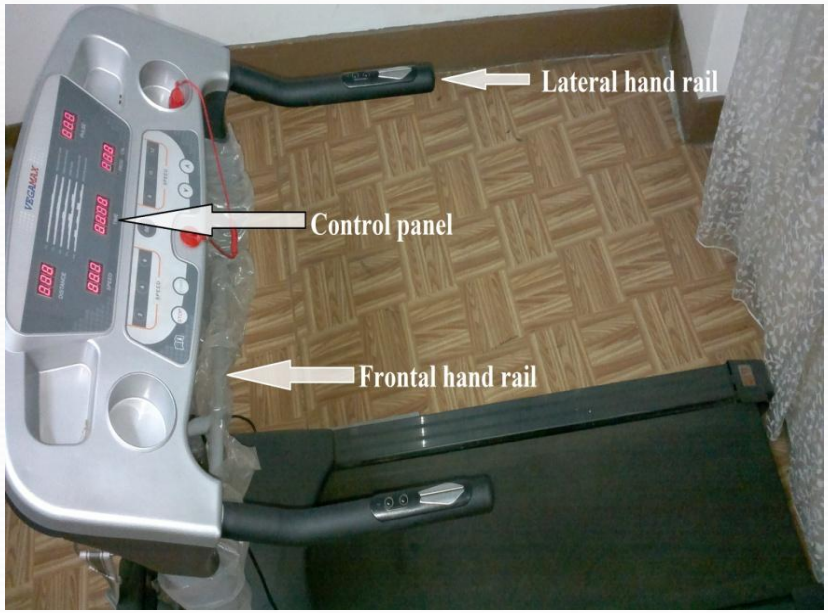
Standard weight and height scale

Tools for treatment:

1- Treadmill electronic device

2-Fitness type mat.

3-Stopwatch.



Treadmill electronic device

III. Procedures:

A. For evaluation:

1. Standard weight and height measurements:

Weight was measured in (Kg)and height was measured in (cm). These measurements were used to calculate BMI; the children were categorized as obese according to percentile body mass index (Equal to or greater than the 95^{th} percentile).

BMI=weight (kg)/height^2 (meter) **(Kopelman et al., 2010).**

2- Laboratory fasting total cholesterol testing:

A selected sample of blood was withdrawn by the laboratorial technique from each child of two study groups as following:

- 5-ml venous blood sample (red-topped tube) was obtained.
- Fasting period ranged from eight to ten hours before sampling.
- Blood serum was analyzed with the Hitachi 704 Analyzer.
- Total cholesterol was measured in mg/dL unit **(Murillo, 2009).**

B. For treatment for both groups:

1. **Balanced diet program:**

Children of both groups (I and II) were subjected to a balanced diet program for weight reduction for twelve weeks. In each visit (every week) the total caloric intake was calculated and 500 kilo calories (kcal) were reduced.

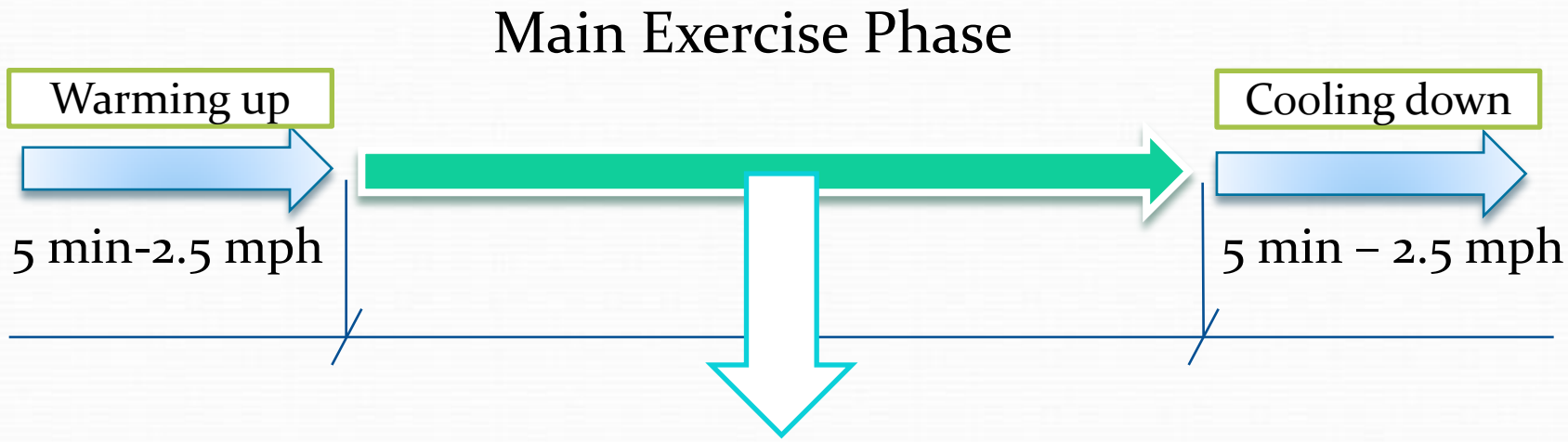
Treadmill Training Program:

- Selected treadmill training protocol was conducted for the children for study Group I according to **(Brown and Levine, 2007)**
- The training program was conducted three times per week, for 12 successive weeks **(Frenhall, 2005)**
- Each child of study Group I was asked to walk on the treadmill by 2.5 for five min as worming up and cooling down.

Treadmill training

Main Exercise Phase

(Brown and Levine, 2007)



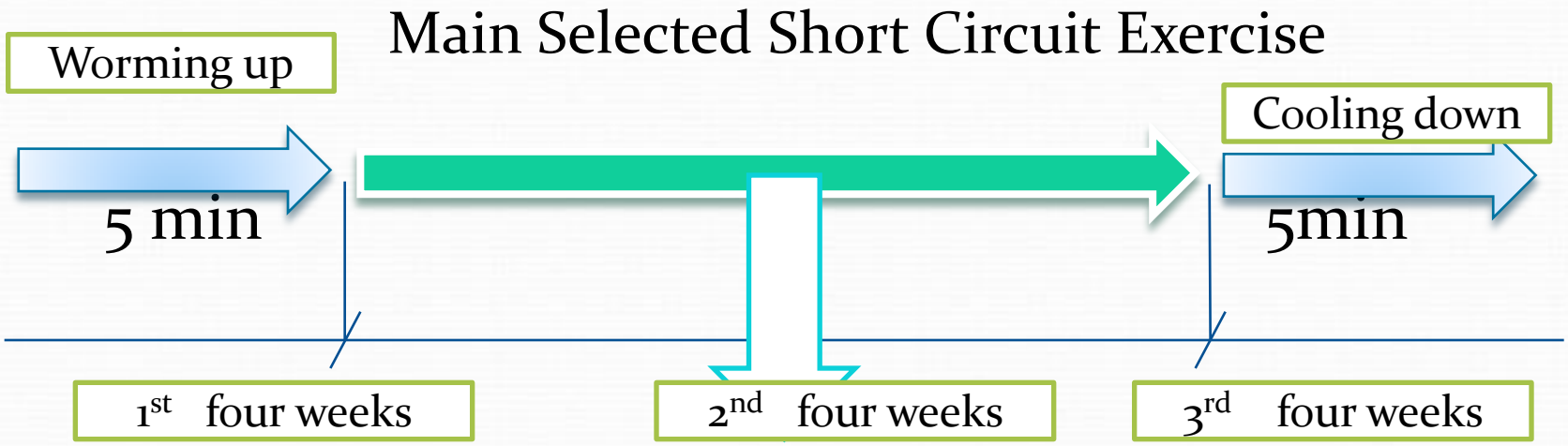
Week	W1	W2	W3	W4	W5	W5	W7	W8	W9	W10	W11	W12
Duration	Constant 10 min				12	14	16	18	20	22	24	26
Speed	4 to 4.5 mph @ 0.2 mph every 2-3 min				4.5 to 5 mph				5 to 6 mph			

Short Circuit Training Exercise

- Children of Study Group II also were subjected to the same warming up and cooling down phases of treadmill before and after the conduction of the protocol of short circuit exercise.
- The training program was conducted three times per week, for 12 successive weeks (**Frenhall, 2005**) as study Group I

- Each child of this group performed three exercises (one short circuit) for totally 10 minutes per time and increased gradually by the third four weeks to perform 2 short circuits training exercises for totally 20 minutes.
- Every exercise was performed for 3sets and every set contained 10 repetitions that increased to 20 by the third four weeks **(Fleck and Kraemer, 2014).** Each station of every exercise (10 repetitions) performed in 45seconds with 15 seconds rest between stations **(Maureen et al., 2008).**

Main Short Circuit Exercise



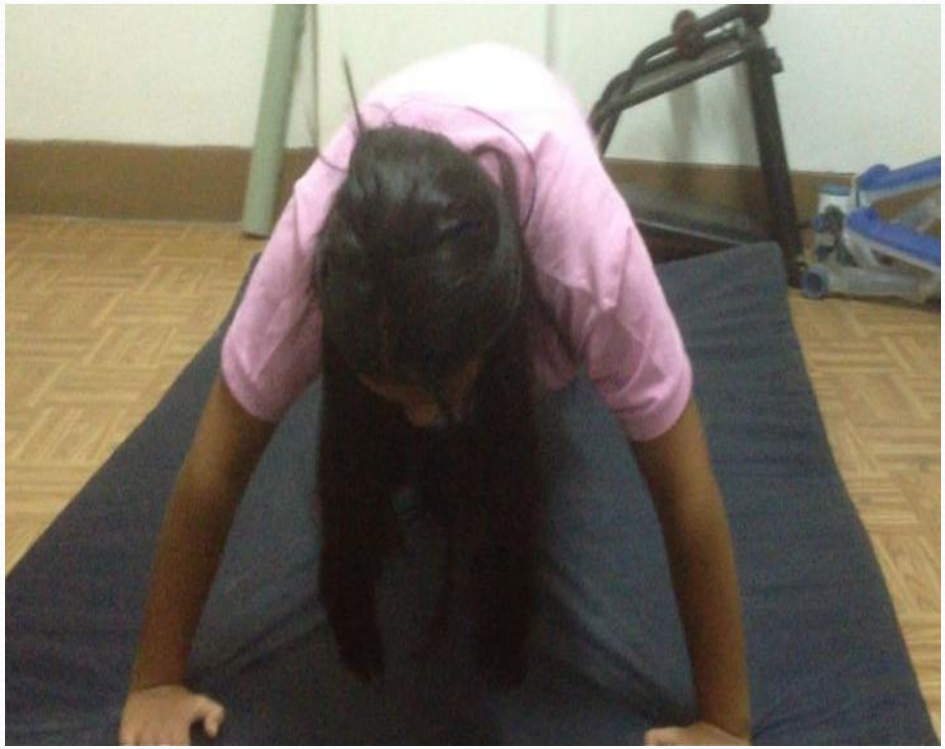
Week	W1	W2	W3	W4	W5	W5	W7	W8	W9	W10	W11	W12
Duration	Constant 10 min				16-18 min				22-24 min			
repetitions	Every set contained 10 times				Every set contained 15 times				Every set contained 20 times			

The main selected short exercise training consisted of three stations for exercises:-

1-Squat Station Exercise

Squat station exercise of short circuit exercises training.

2-Push up station exercise



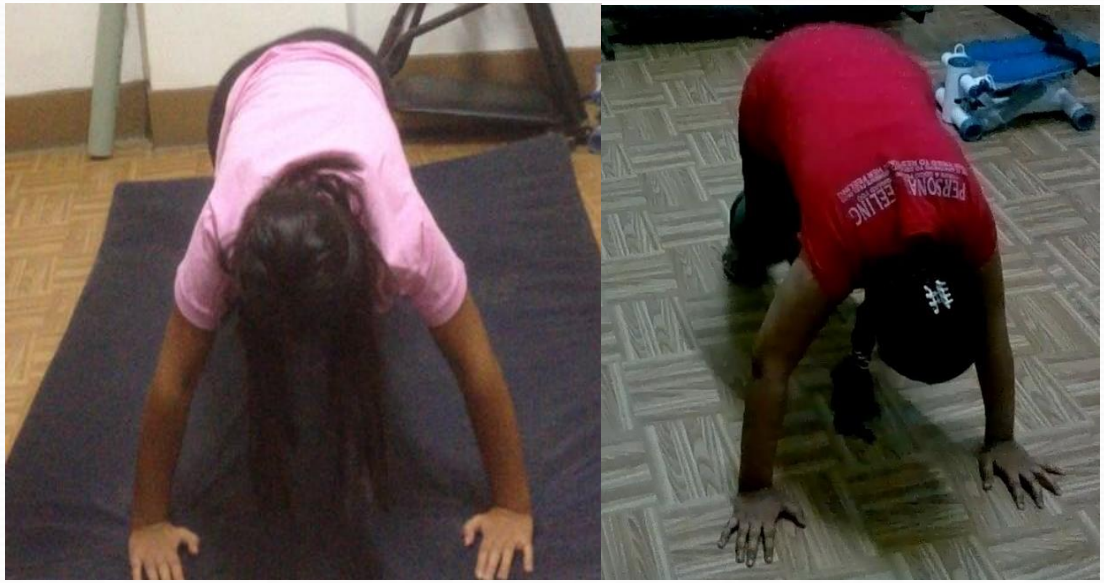
Push up station exercise

Push up station exercise

Push up station exercise with flexed arm.

Push up station exercise with flexed arm.

3-Extension lying up from push up station exercise

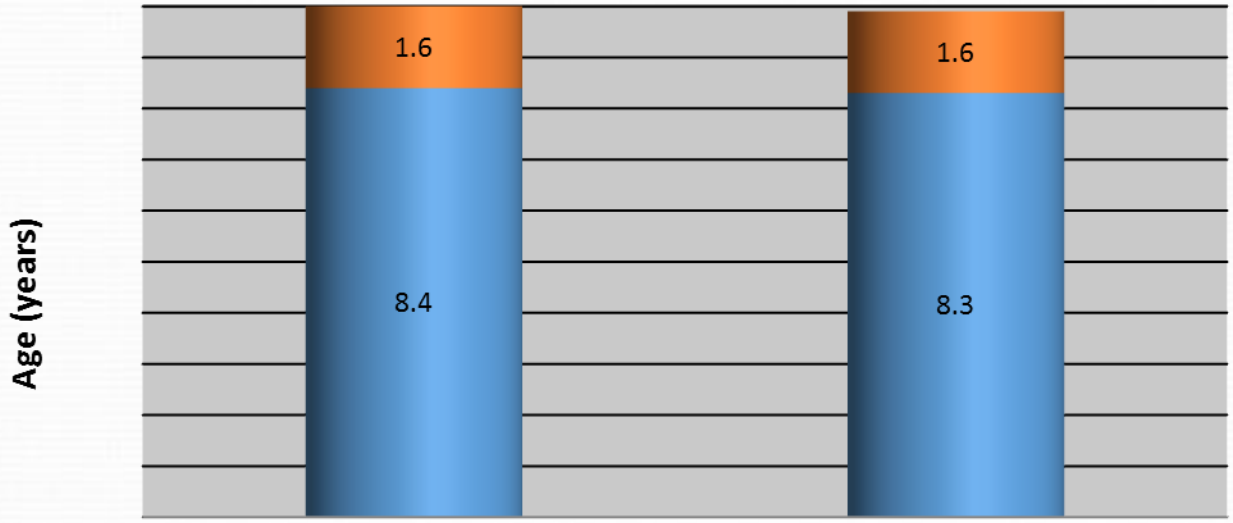


Extension lying up from push up station exercise

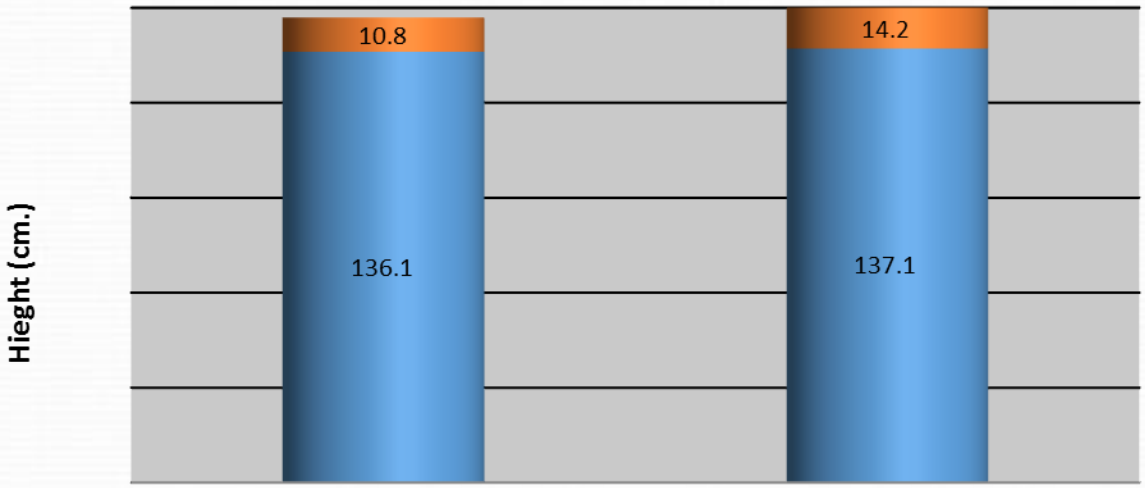
RESULTS

1-General Characteristics of the Subjects:

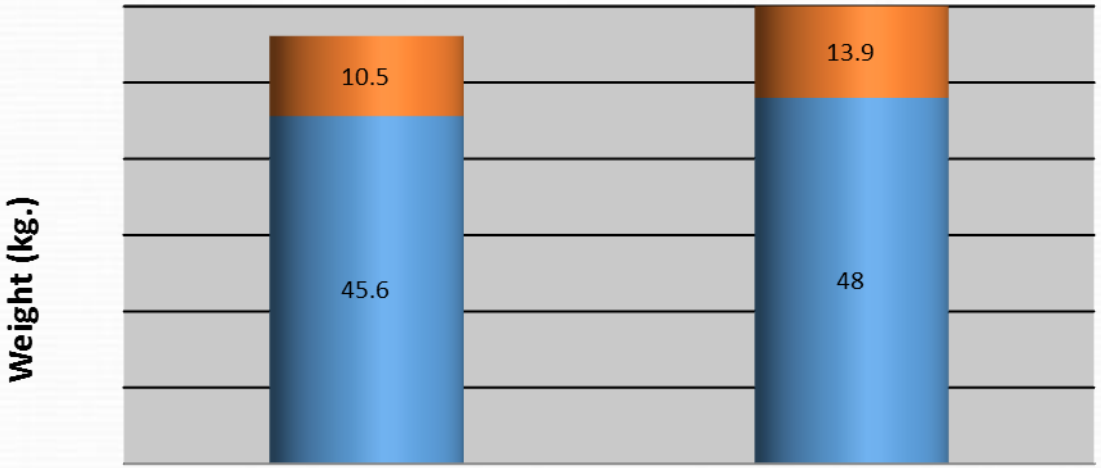
There was no significant difference between two study groups in their age, height and BMI



$\bar{x}$ ± SD of age (years) of children in both groups



$\bar{x}$ ± SD of height (cm.) of children in both groups

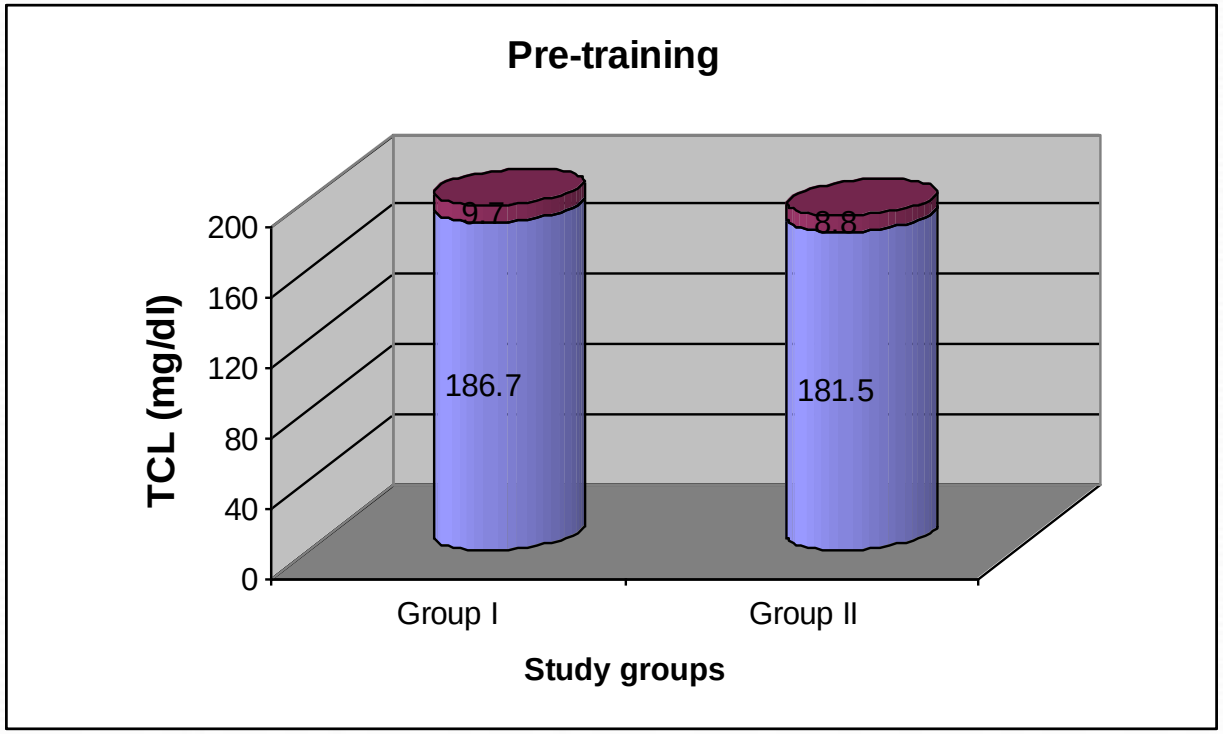


$\bar{x}$ ± SD of weight (kg.) of children in both groups

II. Interrater comparison of measured variable (TCL) within both study groups:

A. Pre training $\bar{x}$ ± SD value of TCL within study groups:

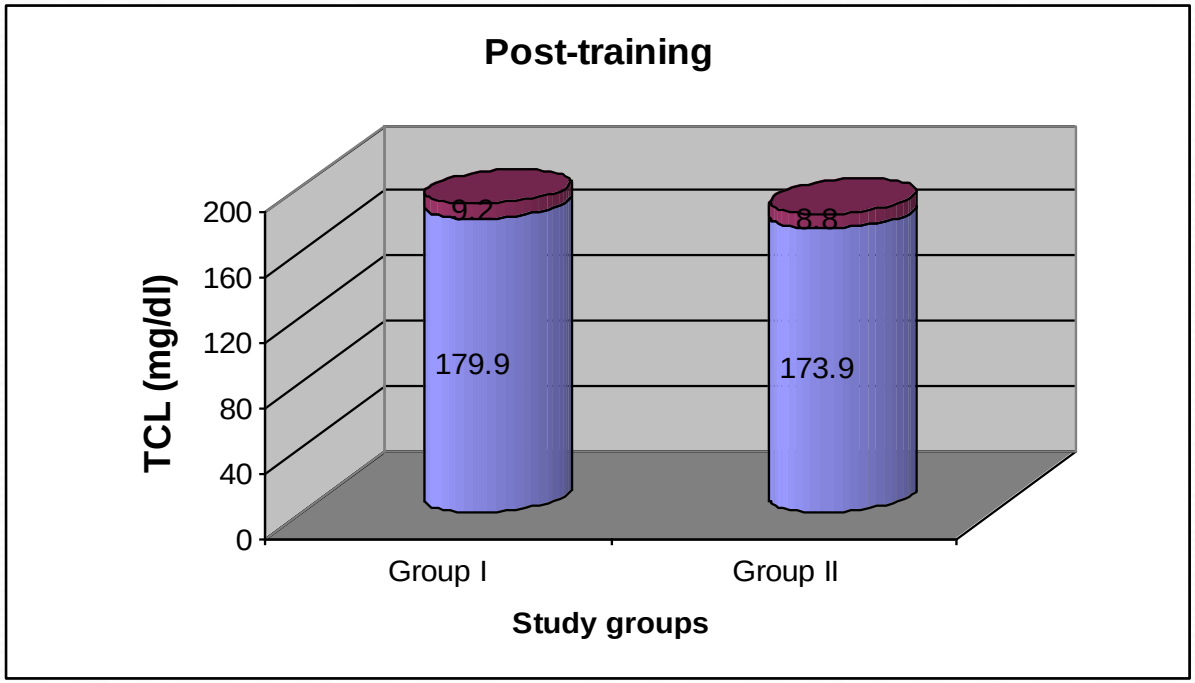
There was no significant difference between two groups.



Pre training $\bar{x}$ ± SD values of TCL for both groups

B. Post training $\bar{x}$ ± SD value of TCL within study groups:

There was significant difference between two groups

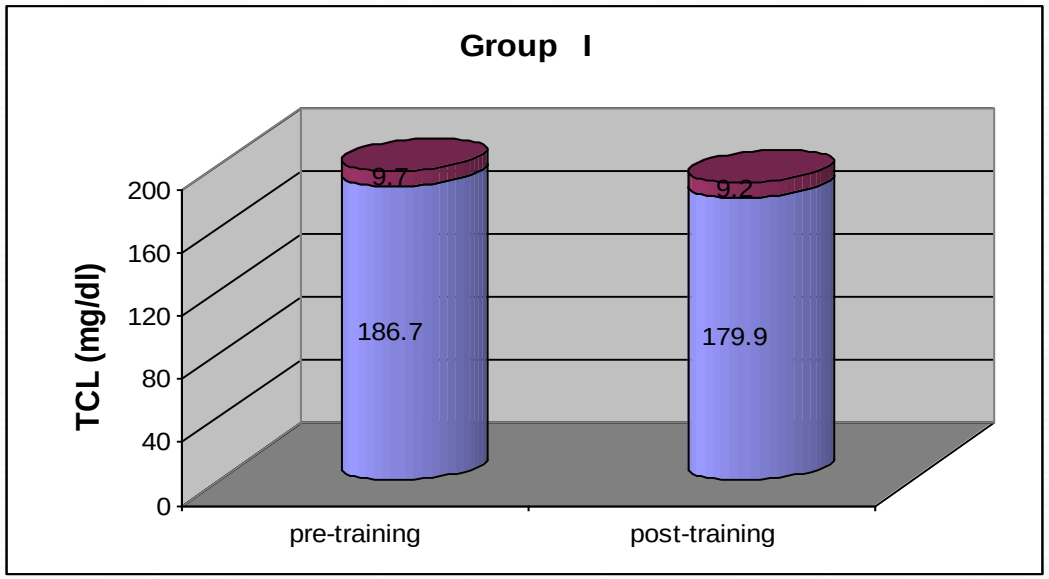


Post training $\bar{x}$ ± SD values of TCL for both groups

III. Interrater comparison of measured variable (TCL) between groups:

A. Comparison of pre and post-training $\bar{x}$ ± SD value of TCL for group (I):

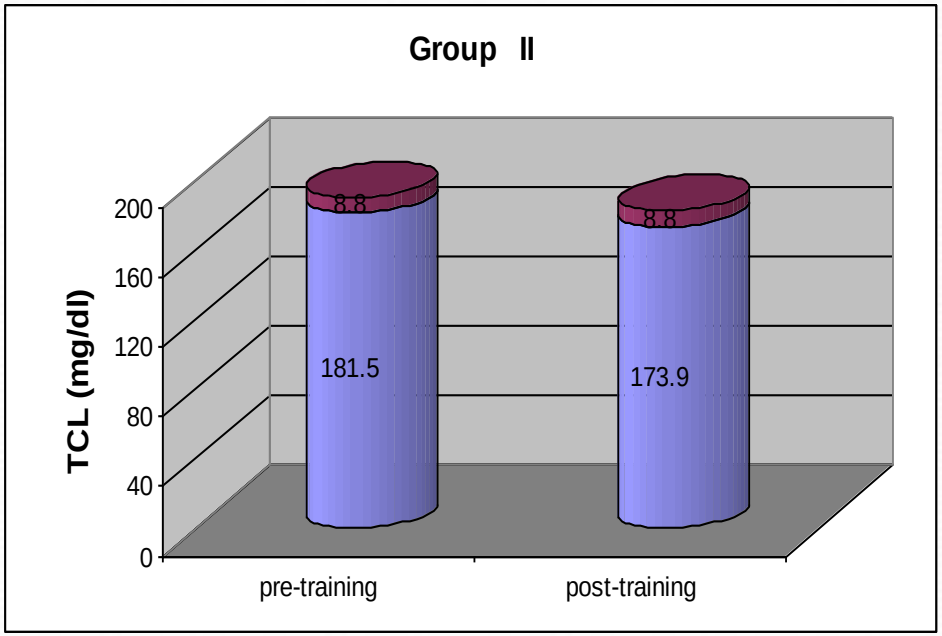
There was significant difference before and after the study. p-value < 0.05.



Pre and post training $\bar{x}$ ± SD values of TCL for group (I).

B. Comparison of pre and post-training $\bar{x}$ ± SD value of TCL for group (II):

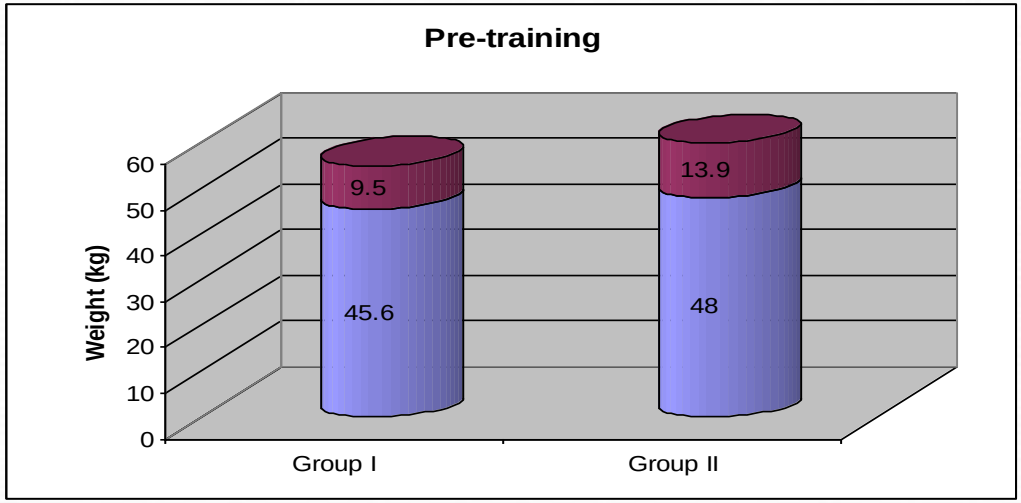
There was significant difference before and after the study . p-value < 0.05.



IV. Interrater comparison of measured variable weight within groups:

A. Pre training $\bar{x}$ ± SD value of weight within study groups:

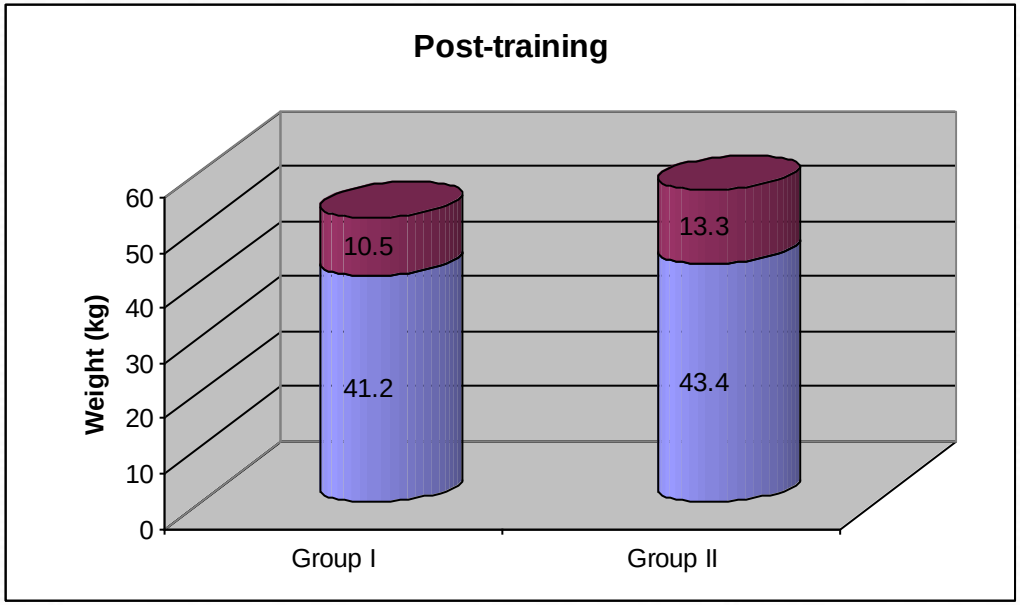
There was no significant difference between two groups



Pre training $\bar{x}$ ± SD values of weight for both groups

B. Post training $\bar{x}$ ± SD value of weight within study groups:

There was no significant difference between two groups

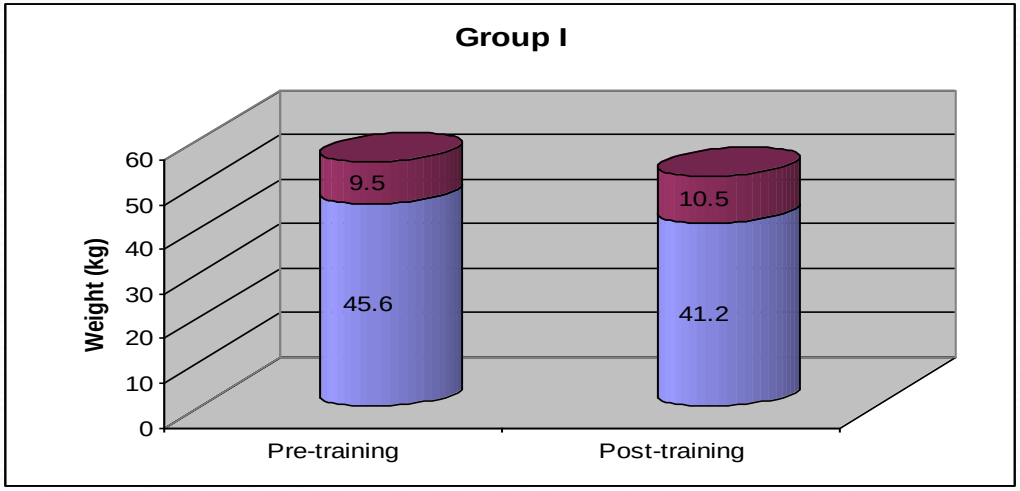


Post training $\bar{x}$ ± SD values of weight for both groups

V. Interrater comparison of measured variable weight between groups:

A. Comparison of pre and post-training $\bar{x}$ ± SD value of weight for group (I):

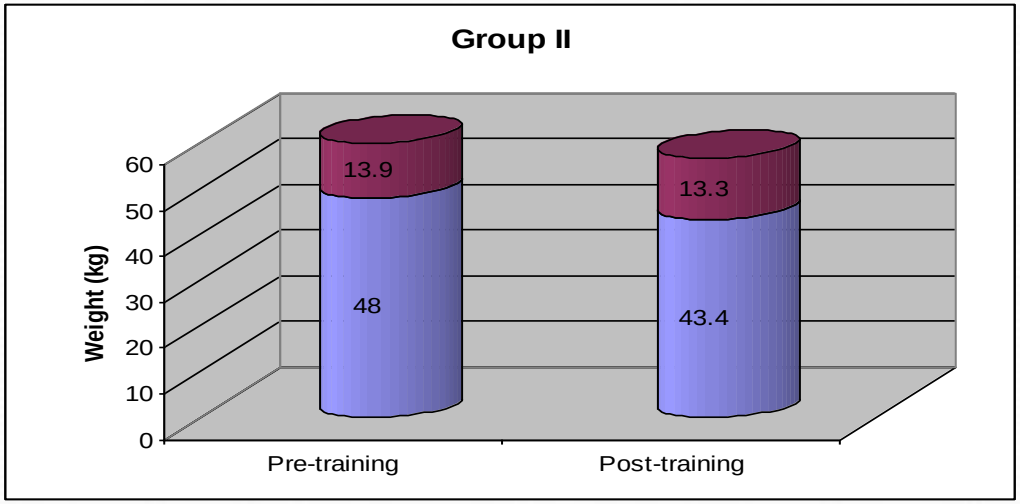
There was significant difference before and after the study



Pre and post training $\bar{x}$ ± SD values of weight for group (I).

B. Comparison of pre and post-training $\bar{x}$ ± SD value of weight for group (II):

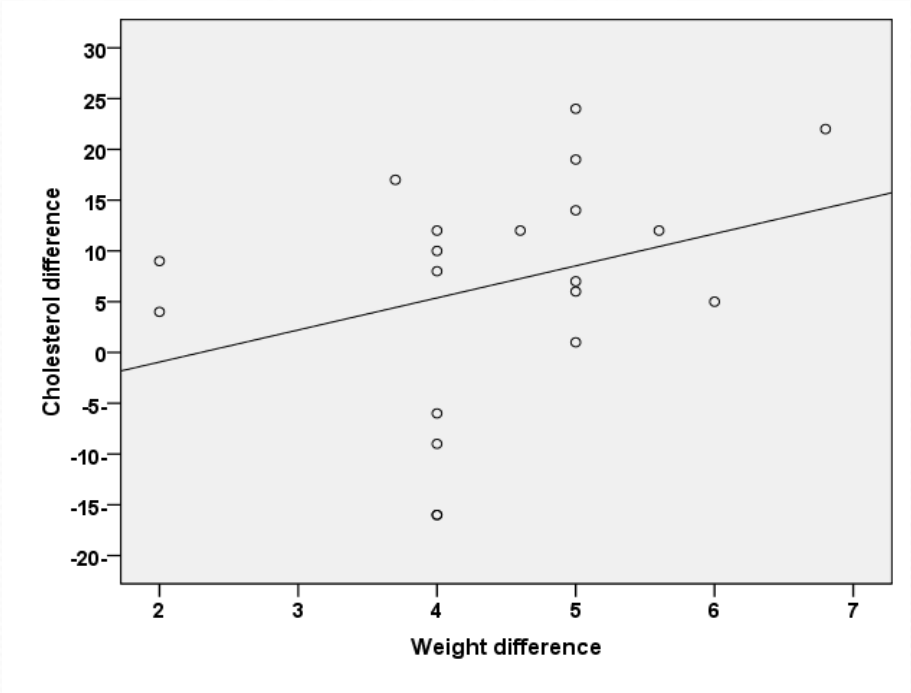
There was significant difference before and after the study



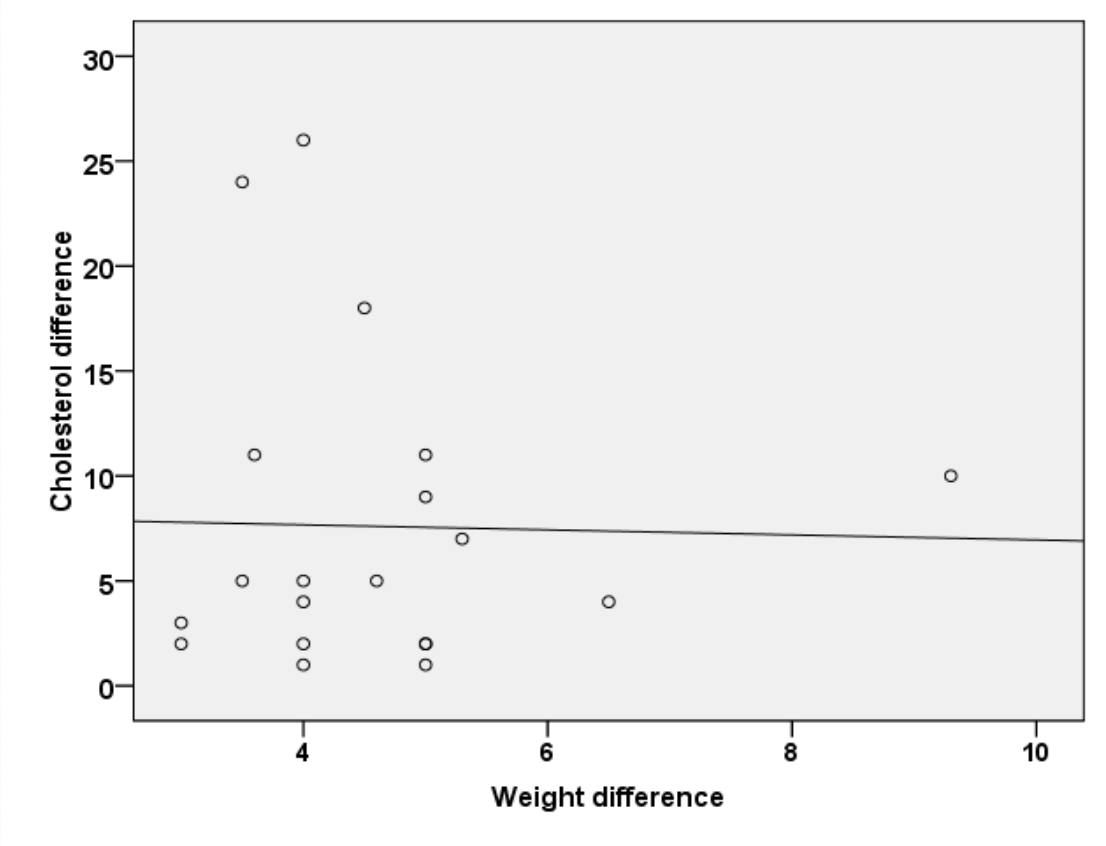
Pre and post training $\bar{x}$ ± SD values of weight for group (II).

Correlation between difference in total cholesterol level and weight in the two study groups (I and II) was performed using Pearson correlation coefficient

There was no statistical significant correlation



Correlation between difference in total cholesterol level and weight in study group(I) (r= 0.321; p=0.168).



Correlation between difference in cholesterol and weight in study group (II) (r= -0.023; p=0.924).

DISCUSSION

The purpose of this study was to provide a comparison between the effect of treadmill training program and short circuit training program on the total cholesterol level of obese children.

Hypercholesterolemia is frequently found in patients with obesity, so that the average serum cholesterol level is significantly higher in overweight subjects than in lean ones, and usually a significant correlation exists between serum cholesterol and obesity (**Miettinen, 2014**).

Studies published recently provided some contrasting evidence suggesting that exercise training may result in 'favourable' alterations in the lipid-lipoprotein profile (**Williford et al., 1996**).

The chosen age of both groups in this study was from 6 to 10 years agreed with **Whitaker et al., (2004)** who reported that it is important to study fat in children which potentially unaffected by sex hormones that may play a role in metabolism during adolescence.

The chosen both sexes of both groups agreed with **Wabitsch et al., (1997)** who demonstrated that there is a close relationship between serum leptin and BMI or percent body fat in overweight adolescents as well as a clear cut gender difference in Adolescents.

There was significant decrease between the pre and post training mean ± SD values of total cholesterol for the study group (I), these results revealed to increase in lean mass which increase oxygen consumption. Treadmill training may also improve motor function and enhance exercise safety. It was, as anticipated, associated with a significant improvement of body composition and total cholesterol.

This is in accordance with the data of **Thompson et al., (2001)** who demonstrated that Treadmill exercise generally produces small reductions in TC and LDL-C. The effect of exercise on TC is the summation of changes in the various lipoprotein sub fractions so that changes in TC alone have little physiological significance.

At the end of the short circuit training program for children of group (II), the post training mean values of the total cholesterol were decreased when compared to those of pre-training.

These results indicated that there is significant decrease in the total cholesterol blood level. This decrease may be due to the increase in the cross-sectional area of type IIA fibers and the increase in lean mass. This is in accordance with the data of **Fett et al., (2009).**

CONCLUSION

According to the results of this present study, it could be concluded that both the treadmill and short circuit training programs provided valid and reliable methods to improve obese children's total cholesterol level .However, there is significantly obtained difference between treadmill and short circuit training indicating that short circuit training program is more effective than the treadmill to improve the total cholesterol level for obese children from 6 to 10 years.

We could conclude that using a selected short circuit training program may be more effective than treadmill training program to improve the total cholesterol level of obese children from border line to a desirable level.

RECOMMENDATIONS

According to the results of this study, the following recommendations are to be considered:

- Using short circuit exercises as an effective and safe methods of reducing level of total cholesterol for obese children (border line).
- Other studies should be conducted to study the effects of both treadmill and short circuit training programs on the total cholesterol level for obese children in different age categories.
- Conducting further researches to study the effect of increasing the intensity and duration of both treadmill and short circuit training program on the border line total cholesterol level for obese children.
- Further studies should be conducted to detect the effects of combined physical training program with both treadmill and short circuit training on the total cholesterol level and HDL for obese children
- Study the effect of administrating total cholesterol medication to the training programs.

Thank You