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Effect of 12 weeks aerobic and anaerobic training on lipid profile of middle distance runners

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Abstract
Aerobic or anaerobic training programme has influence on the blood haematology and lipid profile on human body. There is every possibility to differ in the blood haematology and lipid profile of human due to any kind of training. Some studies indicated such changes.
With this concept the researcher fixed up the purpose to determine the effect of 12 weeks aerobic and anaerobic training on lipid profile of middle distance runners. Six middle distance runners (N=06) were selected as subjects and their age group ranging from eighteen to twenty two years for achieving the objectives. The experimental group was given aerobic and anaerobic exercises as treatment for five days in a week in one session per day for ninety days. In the present study triglyceride, total cholesterol, LDL and HDL were selected as the variable which were tested in SERUM Analysis Centre (P) Ltd. 't'-test was applied as statistical procedure and level of significance was decided at 0.05%. Post test results revealed positive effects due to treatment on lipid profile. The scheduled treatment showed influence positively with a decrease in cholesterol, triglyceride, HDL and LDL.

Keywords: Aerobic exercises, lipid profile, triglycerides, total cholesterol, LDL & HDL

1. Introduction
The 800-meter is a very unique event in Track & Field. It forms the intersection between the sprint and endurance events and in terms of its physiological make up; it's one of the most disputed events in all of Track & Field. Middle distance is defined as runs between 800 and 3000m that require between 2 and 10 minutes to complete, Runs in this range are highly dependent on an integrative contribution from both the aerobic and the anaerobic energy systems. Found that distances requiring up to 10 minutes completing are quite dependent on both aerobic and anaerobic metabolism. The importance of the 2 energy systems changes, not only for different events within the middle distance range but also for runs at the same distance where runners possess different physiological abilities. Middle distance runners with physiological profiles that include a variety of aerobic and anaerobic capabilities are characteristics which separate them from long distance and sprint runners. Aerobic variables make direct and indirect contributions on run performance through their effect on run velocity. Similarly, anaerobic variables also exert a direct and an indirect influence. Run velocity exerts a direct effect on run performance but is limited by contributions from the energy systems. The energy requirements and metabolic support for optimal run performance are functions of the length of the race and the intensity at which it is completed. The velocity that a runner can sustain over the course of a race is important during middle distance running, as the ability to supply the energy necessary to continue a rapid velocity often separates successful elite runners from average and good runners. Owing to the high intensity and duration of middle distance races, runners incur an energy cost that is larger than the capabilities of either aerobic or anaerobic metabolism. Energy contributions from the 2 energy systems are not mutually exclusive, as simultaneous contributions are frequently made by the 2 systems during a running event. The energy requirement for long distance running can, to a great extent, be supplied by the aerobic metabolism, as the rate of energy production necessary to sustain the run velocity is less at longer than at shorter distances.
Endurance exercise training improves plasma lipoprotein and lipid profiles and reduces cardiovascular disease risk.

Lipids have important beneficial biological functions that include the use of triglycerides for energy production or as stored fat in adipose tissue and the use of cholesterol as a component, in conjunction with phospholipids of cellular membranes or in the synthesis of steroid hormones. Elevated plasma cholesterol concentrations have been implicated in the development of coronary artery disease. Carbohydrate is an important source of energy for high-intensity work as well as for prolonged activity. Lipids, on the other hand, cannot be used during high-intensity exercise, although they are an important source of energy in the recovery period between high-intensity bouts and, indeed, during prolonged aerobic exercise. Therefore, lipids cannot be used anaerobically; they require aerobic processes (Mac Laren& Morton, 2011,).

There is a variety of environmental and personal factors that may influence a person's cholesterol composition such as age, gender, level of body fat, dietary intake of fat, cholesterol and carbohydrates, alcohol consumption, cigarette smoking, medication, menopausal status, and exercise. Because of complex interactions among these variables, it is difficult to assess how each of these factors independently affects cholesterol levels and composition.

The lipid profile is a blood test done to assess the status of fat metabolism in the body and is important in heart disease. This includes measuring lipids (fats) and its derivatives known as lipoproteins. Lipoproteins are compounds containing fat and proteins and include free cholesterol, cholesterol esters, triglycerides, phospholipids and apo-proteins. The Lipids are a heterogeneous group of compounds related either actually or potentially to fatty acids. They have a common property of being relatively insoluble in water and soluble in non-polar solvents such as ether, chloroform, benzene and acetone. A lipid includes fats, oils, waxes and related compounds. Lipids are classified as simple, complex and derived lipids.

Cholesterol is a type of fat called a lipid, which the body uses to help build cells and produce certain hormones and bile salts. Cholesterol forms complexes with proteins in the blood to produce lipoproteins. Lipoprotein comes in two forms: (1) High Density Lipoprotein (HDL); the good cholesterol with more protein than fat, and (2) Low Density Lipoprotein (LDL); the bad cholesterol with more fat than protein. Normal range of cholesterol in the blood should be less than 200 milligrams per decilitre or mg/dl. High cholesterol of 240 mg/dl or greater in the blood increases the risk of heart disease, stroke, coronary artery disease etc. Abnormally low levels of cholesterol may indicate hyperthyroidism, or an overactive thyroid gland, liver disease, inadequate absorption of nutrients from the intestines and malnutrition. We all have quite a lot of cholesterol in our blood, and it is there for the excellent reason that it is an essential chemical for the efficient running of the human body. Only a small amount of this cholesterol comes directly from the food we eat: most of it is made by our own body. Nevertheless, it is not a good thing to have too much. Cholesterol is not a life-threatening toxin, but a medium-sized molecule that is really a building block for important parts of the body. In particular it is an essential component of cell membranes. Cholesterol also stabilizes a cell against temperature changes. It is a major part of the membranes of the nervous system, the brain, the spinal cord and the peripheral nerves. In particular it is incorporated into the myelin sheath that insulates the nerves from the surrounding tissue. Cholesterol is also the forerunner of important hormones such as the female sex hormone, oestradiol, and the male sex hormone, testosterone, and of vitamin D, which we need in order to utilize calcium and form bone. Nearly all body tissues are capable of making cholesterol, but the liver and intestines make the most. We require cholesterol to produce the bile we need to digest the fats in our food.

In the present study, the researcher had tried to observe the effects of 12 weeks aerobic and anaerobic training on lipid profile of middle distance runners as we know that exercise plays a very vital role in the all-round development of a person. Therefore, on the basis of this the researcher wants to ascertain the effects, both positively and negatively, of 12 weeks aerobic and anaerobic training on lipid profile of middle distance runners.

2. Methodology

For the purpose of the study 06 male Middle distance runners (800meter and 1500 meter) were selected purposively from Suhid Sango Club Ashoeknagor, North 24 porganas West Bengal.

To compare the lipid profile [Total Cholesterol (TC),Triglyceride (TG), Low Density Lipoprotein Cholesterol(LDL-C),High Density Lipoprotein Cholesterol [HDL-C] before and after completion of 12 weeks-long fitness training programme of male Middle distance runners 5 millilitres of venous blood from right/left upper arm was collected for testing. The study was performed in summer 90 minutes of all 36 training units were administered and supervised by the same instructor. The training programmed was scheduled at 7.00 A.M to 8.30 A.M.

2.1 Experimental Protocol

Week No	Days	Experimental Exercise
1 to 6	Monday	Warm-up:3times Surya Namaskar, Continuous Training (25 minutes run around the oval), warm down: 10min
	Tuesday	Rest
	Wednesday	Warm-up:5 minutes skipping, Circuit Training 3 sets X 6 minutes Work/Rest ratio 1:1 (30sec Exercise:30sec Rest) Hill Runs, Sit Ups, Step Ups, Star Jumps, Shuttle Runs(4X8m), Squats, Bench Press, Leg Extension *800 meters slow jogging after each set warm down: 400 metre slow jog, Static stretching (flexibility) Recreation game 20 minutes
	Thursday	Rest
	Friday	Warm-up:400 metres slow jog,50 metres high knees lifts, kicking heels high, backward running, side steps left and right Fartlek Training :20minutes warm down: 400 metre slow jog, Static stretching (flexibility)
	Saturday	Rest
	Sunday	Rest
7 to 9	Monday	Warm-up:400 metres slow jog,50 metres high knees lifts, kicking heels high, backward running, side steps left

		and right Cross Country Training:25minutes and Recreation game 20 minutes warm down: 400 metre slow jog, Static stretching (flexibility)
	Tuesday	Rest
	Wednesday	Warm-up:400 metres slow jog,50 metres high knees lifts, kicking heels high, backward running, side steps left and right, Interval Training:8x 400metres Long Work/Rest 1:2 warm down: 400 metre slow jog, Static stretching (flexibility)
	Thursday	Rest
	Friday	Warm-up: Mixed warm-up 15 minutes Gym Exercise: Focus on trunk stability and postural improvement (Horse Stance, Deadlift Upright Row, Lawnmower Pull, Cobra Lat Pull Down, Back Extensions, Bent over Lateral Raise, *10Time Repetition of each exercise and 30sec rest after each type of exercise Warm down: 10min
	Saturday	Rest
	Sunday	Rest
10 to 11	Monday	Warm-up: 400 metres slow jog,50 metres high knees lifts, kicking heels high, backward running, side steps left and right Steady-Paced Runs:3 timesX2.5km (10 seconds faster to 25 seconds slower) Warm down: 400 metre slow jog, Static stretching (flexibility)
	Tuesday	Rest
	Wednesday	Warm-up: 400 metres slow jog,50 metres high knees lifts, kicking heels high, backward running, side steps left and right Interval training(one time Repetition): Sprint 25 metres jog 75 metres, Sprint 35 metres jog 65 metres, Sprint 45 metres jog 55 metres, Sprint 55 metres jog 45 metres, Sprint 65 metres jog 35 metres, Sprint 75 metres jog 25 metres, Sprint 100 metres Warm down: 400 metre slow jog, Static stretching and 15minutes easy swimming
	Thursday	Rest
	Friday	Warm-up: 400 metres slow jog,50 metres high knees lifts, kicking heels high, backward running, side steps left and right Plyometric Exercise High Knee, Star jump, Tuck jump, Frog Jump, Burpee push ups, Mogols, Skater jumps, Hopping, Box jump, Stair Jump, Medicine Ball Chest Throes, Hip Extension, Single leg Hurdles jump, Scissor Jumps Warm down: 400 metre slow jog, Static stretching (flexibility)
	Saturday	Rest
	Sunday	Rest
12	Monday	Warm-up: 400 metres slow jog,50 metres high knees lifts, kicking heels high, backward running, side steps left and right, Medium length aerobic intervals Training: 6x600m (2 min recovery after each 600m) Warm down: 400 metre slow jog, Static stretching (flexibility)
	Tuesday	Rest
	Wednesday	Warm-up: 400 metres slow jog,50 metres high knees lifts, kicking heels high, backward running, side steps left and right, Repetition method:3 x 300m(48sec/300m)6min recovery between efforts, 3x400m (68sec/400m)5min recovery between efforts Warm down: 400 metre slow jog, Static stretching (flexibility)
	Thursday	Rest
	Friday	Warm-up: Mixed warm-up 15 minutes 1000m TIME TRIAL (15min recovery), 3X 100m fast strides (jog Back) ➢ Recreation game 20 minutes warm down: 10min
	Saturday	Rest
	Sunday	Rest

2.2 Blood Sampling

Fasting blood samples were obtained in the morning from the elbow vein. Blood samples from each participant were taken into two tubes. For biochemical analyses, a 4.9 mL S-Monovette tube with ethylenedia minetetraacetic acid (K_3EDTA; 1.6 mg EDTA/mL blood) and separating gel (SARSTEDT AG & Co., Nümbrecht, Germany) was used. For complete blood count, a 2.6 mL S-Monovette tube with K_3EDTA (1.6 mg EDTA/mL blood) (SARSTEDT AG & Co., Nümbrecht, Germany) was used. Blood samples for biochemical analyses were centrifuged 300 × *g* for 15 minutes at room temperature in order to receive blood plasma.

2.3 Laboratory Methods

Biochemical analyses were performed before the start of aerobic and anaerobic fitness training programmes and repeated at the 12 weeks of this training programme (after the 36th training unit). The analyses were preformed immediately after the blood collection.

All biochemical analyses were conducted using TOSHO automated glycohemoglobin analyzer g8 for clinical chemistry (vitros 5,1/fs johanson & JOHNSON,U.S.A) Blood plasma was used to determine lipid profile: Tg, Chol, HDL and LDL concentrations Plasma. Triglycerides were determined using Lipase-Glycerol Kinase and Chol concentrations were determined using CHOD-POD method according to the manufacturer's protocol (VITROS 5,1/FS JOHANSON & JOHNSON,U.S.A). HDL plasma concentration was determined using Homogeneous according to the manufacturer's protocol (VITROS 5,1/FS JOHANSON & JOHNSON,U.S.A) Plasma concentrations of LDL were determined using Homogeneous according to the

manufacturer's protocol (VITROS 5,1/FS JOHANSON & JOHNSON,U.S.A). All analysis procedures were verified with the use of multiparameteric control serum (VITROS 5,1/FS JOHANSON & JOHNSON,U.S.A), as well as control serum of normal level (BioNormL) and high level (BioPathL) of lipid profile (VITROS 5,1/FS Johanson & JOHNSON,U.S.A).

3. Results and Discussion

3.1 Table and Figure

Table 1: Significance of Differences of Mean, Standard deviation and "t" test on Total Cholesterol of Middle Distance Runners

Variables	Mean		Standard deviation		t-ratio
Total Cholesterol	Pre-Test	Post-Test	Pre-Test	Post-Test	.254
	141.83	138.33	23.87	19.44	

$Tab_{0.05}$ (11) = 2.201

According to the table number 1 there was no significant difference between pre-test And post-test for total cholesterol of Middle Distance Runners.

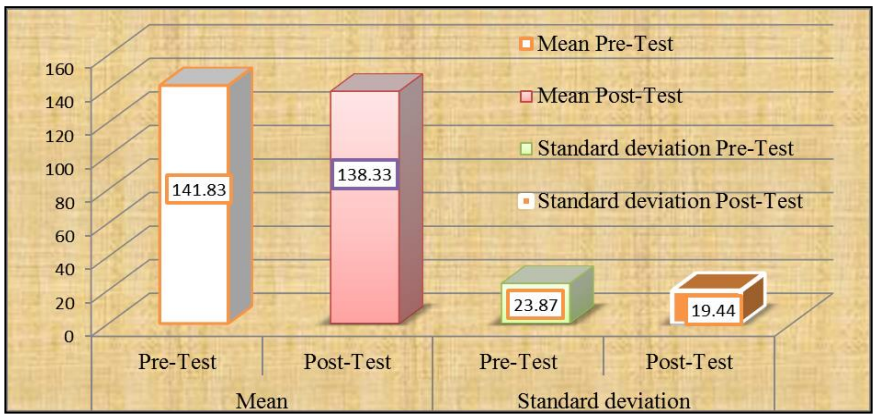

Fig 1: Mean, and Standard deviation on Total Cholesterol of Middle Distance Runners

Table 2: Significance of Differences of Mean, Standard deviation and "t" test on Triglyceride of Middle Distance Runners

Variables	Mean		Standard deviation		t-ratio
Triglyceride	Pre-Test	Post-Test	Pre-Test	Post-Test	.179
	88.67	76.13	31.25	14.37	

$Tab_{0.05}$(11)= 2.201

According to the table number 2 there was no significant difference between pre-test And post-test for Triglyceride of Middle Distance Runners.

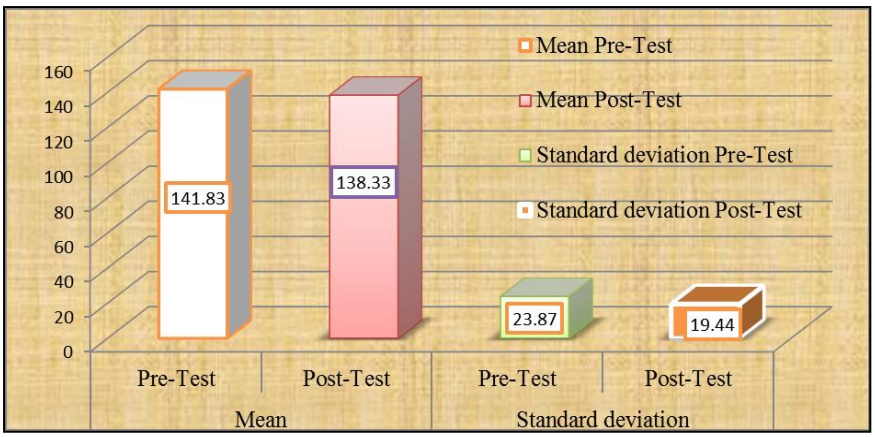

Fig 2: Mean, and Standard deviation on Triglyceride of Middle Distance Runners

Table 3: Significance of Differences of Mean, Standard deviation and "t" test on High Density Lipoprotein Cholesterol of Middle Distance Runners

Variables	Mean		Standard deviation		t-ratio
High Density Lipoprotein Cholesterol	Pre-Test	Post-Test	Pre-Test	Post-Test	.711
	45.66	41.83	10.45	5.84	

$Tab_{0.05}$ (11)= 2.201

According to the table number 3 there was no significant difference between pre-test And post-test for High Density Lipoprotein Cholesterol of Middle Distance Runners

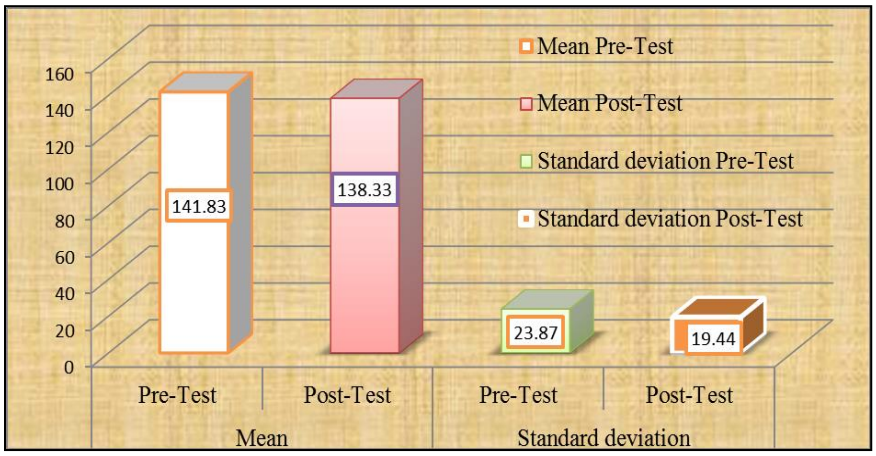

Fig 3: Mean, and Standard deviation on High Density Lipoprotein Cholesterol of Middle Distance Runners

Table 4: Significance of Differences of Mean, Standard deviation and "t" test on Low Density Lipoprotein Cholesterol of Middle Distance Runners

Variables	Mean		Standard deviation		t-ratio
Low Density Lipoprotein Cholesterol	Pre-Test	Post-Test	Pre-Test	Post-Test	.222
	81.00	78.83	16.75	14.05	

$Tab_{0.05}$ (11)=2.201

According to the table number 4 there was no significant difference between pre-test
And post-test for Low Density Lipoprotein Cholesterol of Middle Distance Runners

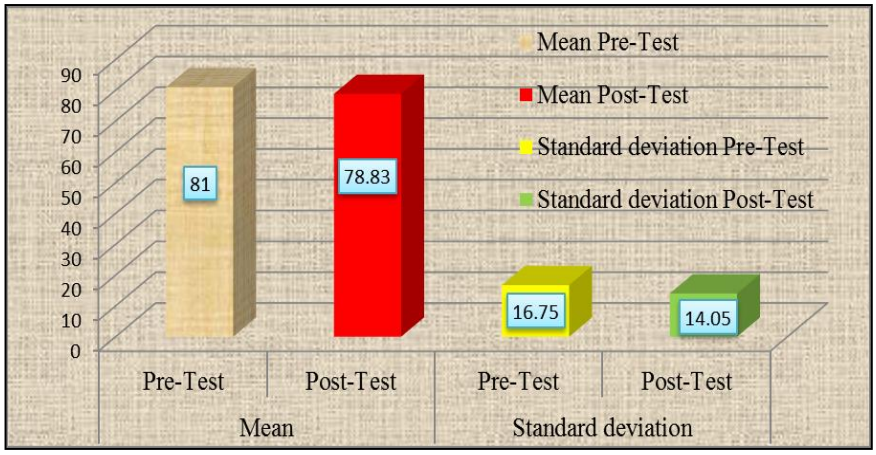

Fig 3: Mean, and Standard deviation on Low Density Lipoprotein Cholesterol of Middle Distance Runners

4. Discussion

The purpose of this study was to find out the effect of 12 weeks of aerobic and anaerobic training program on lipid profile, of Middle Distance Runners. Lipids and lipoprotein profile indicate the cardiovascular and the metabolic status of the athlete. Activity levels have a significant impact on the lipids and lipoprotein levels of the athletes. In the present study Total cholesterol of Middle Distance Runners was decreased but not significantly and Triglyceride also decreased but not significantly. It indicates that as the training load and performance level increases, the level of total cholesterol, and triglyceride level decreased gradually. The possible reason for the reduction in total cholesterol, and triglyceride level is exercise training. However, no significant difference was found in HDL level and LDL level after the post-test. HDL and LDL was decrease from Pre Test to post Test. This may be due to the short duration of the training or improper optimization of the training load. The findings are supported by observations of other researchers in their recent studies. Another research finding showed significant difference in total cholesterol, and triglyceride level after training which was done by in the study, "Training induced changes on physiological and biochemical variables of young Indian field hockey players".

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