CHAPTER II

REVIEW OF LITERATURE

The review of related literature for better understanding of the study and to interpret the results have been presented in this Chapter. A study of relevant literature is an essential step to get a full picture of what has been done and said abroad and in one’s own country with regard to the problem under study.

In this chapter, the available research papers and literature related to this particular study are presented. The reviews were confined to the libraries of YMCA College of Physical Education, Chennai, Annamalai University, Chidambaram, Alagappa University, Karaikudi, Lakshmibai National Institute of Physical Education, Gwalior, Sports Authority of India, Bangalore and Sri Chandrashekara Agashe College of Physical Education, Pune and University of Madras, Chennai. Some literature was also obtained from “MEDLINE (CD ROM)” available at Madras Veterinary College, Vepery, Chennai-7.

STUDIES RELATED TO YOGA ON PHYSICAL, PHYSIOLOGICAL, HAEMATOLOGICAL AND BIO-CHEMICAL VARIABLES

Moorthy (1992) conducted a study on minimum muscular fitness of school children of the age group of six to eleven years and compared the influence of selected yogic exercises and physical exercises on them. In that study, 1000 children (517 boys and 429 girls) from second
and eleventh standard attended at three schools in Pune. 90 boys and 90 girls from the failure group were randomly allotted to control group. Experimental group I (physical exercises) and Experimental group II (Yogic group) underwent the treatment for a period of six weeks. He concluded that both experimental groups showed significant improvement also the improvement in the yogic group was greater than in physical exercise group.

Roy Ramesh Chandra (1984) conducted a comparative study of the effect of Asanas and Ballistic exercise of college student at the Lakshmibai College of Physical Education, Gwalior. The data was collected in a seven weeks experiment in August to September 1964. The subjects were randomly assigned to two groups. While group ‘A’ was put under a training programme consisting of five selected Asanas, group ‘B’ was put under a training programme consisting of five ballistic exercises analogous to the Asanas. The Asanas and exercises were chosen for their alleged contribution to improved performance in running and broad jump. Measurement in running broad jump were taken at the beginning and at the end of experiment.

The mean gains of group ‘A’ and group ‘B’ were tested for significance by ‘t’ test. This difference was not found to be significant even to 5 per cent level of confidence. Performance in running and broad jump can be improved significantly by both Asanas and ballistic exercises.

Gharote, Ganguly and Moorthy (1976) report in a study 430 schoolboys in the age group of 6 to 20 years. Yogic training for three weeks
showed an improvement of 36.8% in comparison to 20% improvement in minimum muscular fitness.

Giri (1966) using a set of yogic exercises studied the effects of the programme for six weeks on the five tests of national physical efficiency. Drive, viz., 80 metre sprint, 400 metre run, Cricket ball throw, pull-ups and running and broad jump. He found a significant improvement among the experimental group in all the five sets as a result of yogic training however, when the group discontinued the practice, the yogic exercises for the same period of six weeks the effect was significantly lost.

Chowdhury Samarendra (1984) in the purpose of this study determines the effect of selected Asanas on stride-length in sprinting. The subjects were twenty three men students of the Lakshmibai National College of Physical Education, Gwalior. The data was collected in a six-week experiment commencing from the third week of August 1969. The subjects were randomly assigned to two groups. Group ‘A’ selected eight Asanas to improve flexibility of hip, knee and ankle joints. The group ‘B’ took control group. The mean gains, in stride-length made by group ‘A’ and group ‘B’ were tested for significance by ‘t’ test. The group ‘A’ revealed one percent level of confidence. The difference in gains made by group ‘A’ over group ‘B’ was found to be significant at one percent level of confidence. The result of the study under conditions of the experiment, indicate that the length of stride in sprinting might improve significantly by selected Asanas.
The author conducted an experiment on strength. There were two groups of 20 subjects each. The yoga training consisted of a 6 week course in 25 asanas. The results reveal a marginal yet beneficial influence on strength index.

Bera and Rajapurkar (1993), forty male high school students, aged 12-15 years participated for a study of yoga in relation to body composition, cardiovascular endurance and anaerobic power. The Ss were placed into two subsets viz. yoga group and control group. Body composition, cardiovascular endurance and anaerobic power were measured using standard method. The duration of the experiment was one year. The result of ANCOVA revealed that a significant improvement in ideal body weight, body density, cardiovascular endurance and anaerobic power was observed as a result of yoga training. This study could not show a significant change in body fat (mid auxiliary), skeletal diameters and most of the body circumferences. However, it was evident that some of the fat folds (triceps, subscapular, supraiaiac, umbilical, thigh and calf) and body circumferences (waist, umbilical and hip) were reduced significantly.

Murugesan, Govindarajan and Bera (2000) conducted a study on the basis of medical officers diagnosis, thirty three (N = 33) hypertensives, aged between 35 and 65 years, from the Govt. General Hospital, Pondicherry, were examined with four variables viz. systolic and diastolic blood pressure, pulse rate and body weight. The subjects were randomly assigned into three groups. The exp. group-I underwent
selected yoga practices. Exp. group-II received medical treatment by the physician of the said hospital and the control group did not participate in any of the treatment stimuli. Yoga training was imparted in the morning and in the evening with 1 hr/session/day for a total period of 11 weeks. Medical treatment comprised drug intake every day for the whole experimental period. The result of pre-post test with ANACOVA revealed that both the treatment stimuli (i.e., yoga and drug) were effective in controlling the variables of hypertension.

Telles, Reddy and Nagendra (2000) evaluated a statement in ancient yoga texts that suggests that a combination of both “calming” and “stimulating” measures may be especially helpful in reaching a state of mental equilibrium. Two yoga practices, one combining “calming and stimulating” measures (cyclic meditation) and the other, a “calming” technique (Shavasan), were compared. The oxygen consumption, breath rate, and breath volume of 40 male volunteers were assessed before and after sessions of cyclic meditation (CM) and before and after sessions of shavasan (SH). The 2 sessions (CM, SH) were 1 day apart. Cyclic meditation includes the practice of yoga postures interspersed with periods of supine relaxation. During SH the subject lay in a supine position throughout the practice. There was a significant decrease in the amount of oxygen consumed and in the breath rate and an increase in breath volume after both types of sessions (2 factor ANOVA, paired t test). However, the magnitude of change on all 3 measures was greater after CM: (1) Oxygen consumption decreased to 32.1% after CM compared with 10.1% after SH; (2) breath rate decreased to 18.0% after CM and 15.2%
after SII; and (3) breath volume increased 28.8% after CM and 15.9% after SII. These results support the idea that a combination of yoga postures interspersed with relaxation reduces arousal more than what relaxation alone does.

Chaarote, Karambelkar and Bhole (1974) stated that vital capacity in ml and breath holding time in seconds are measured respectively in 147 females and 139 males between ages 18 and 50 before and after three weeks of training in 20 Asanas, two breathing practices and three Kriyas at nine yoga camps were held during the year 1959 to 1969. An average increase of 15 seconds in breath holding time was observed after the training period, which was found statistically significant.

Durgalakshmi (1989) conducted a study on “Effect of yogic exercises on selected physiological variables of high school boys”. The group consisted of 60 students. The result of the study showed that systolic pressure was increased and diastolic pressure remain unchanged after a six week training of yoga.

The scores in breath holding time and vital capacity had also improved. It was statistically significant. She also recommended that the athletes could adopt these exercises and thereby increase in the cardio-respiratory function and further she adds, yoga could be included in the regular programme of physical education in schools and colleges.
Dhanraj (1974) studied that the effects of yoga and the 5 Bx fitness plan on selected physiological parameters. The results indicated increase in basal metabolic rate total volume in basal state T-4 thyr oxine, hemoglobin, blood cell PWC 130, vital capacity, chest expansion, breath holding time and flexibility after yoga training. Decrease in heart rate were also observed. When yogic training was discontinued for six weeks following in treatment a significant decline in the values of PWC 130, flexibility and breath holding time were noticed.

Twenty four incubents of Anand Ashram, Pondicherry and 33 persons practicing body building exercise were tested. It was found that there was significant reduction is blood pressure, heart rate and respiration after physiological activity followed by Savasana, even less that the resting value, which is statistically significant (P<0.001).

Raghuraj et al., (1998) studied heart rate variability (HRV) is an indicator of the cardiac autonomic control. Two spectral components are usually recorded, viz. high frequency (0.15-0.50 Hz), which is due to vagal efferent activity and a low frequency component (0.05 to 0.15 Hz), due to sympathetic activity. The present study was conducted to study the HRV in two yoga practices which were previously reported to have opposite effects, viz. sympathetic stimulation (Kapalabhati, breathing at high frequency, ie. 2.0 Hz) and reduced sympathetic activity (nadi shuddhi, alternate nostril breathing. Twelve male volunteers (age range, 21 to 33 years) were assessed before and after each practice on separate days. The electrocardiogram (lead J) was digitized on line and an off-line analysis
was done. The results showed a significant increase in low frequency (LF) power and LF/HF ratio while high frequency (HF) power was significantly lower following kapalabhati. There were no significant changes following nadi-suddhi. The results suggest that kapalabhati modifies the autonomic status by increasing sympathetic activity with reduced vagal activity. The study also suggests that HRV is a more useful psychophysiological measure than heart rate alone.

Telles et al., (1997) studied the heart rate, breathing rate, and skin resistance for 20 community home girls (Home group) and for 20 age-matched girls from a regular school (School group). The former group had a significantly higher rate of breathing and a more irregular breath pattern known to correlate with high fear and anxiety, than the school group. Skin resistance was significantly lower in the school group, which may suggest greater arousal. 28 girls of the Home group formed 14 pairs, matched for age and duration of stay in the home. Subjects of a pair were randomly assigned to either yoga or games groups. For the former emphasis was on relaxation and awareness, whereas for the latter increasing physical activity was emphasized. At the end of an hour daily for six months both groups showed a significant decrease in the resting heart rate relative to initial values (Wilcoxon paired sample rest) and the yoga group showed a significant decrease in breath rate, which appeared more regular but no significant increase in the skin resistance. These results suggest that a yoga program, which includes relaxation, awareness, and graded physical activity, is a useful addition to the routine of community home children.
A group of 25 healthy adults who were performing yoga and age matched controls were compared in this study. The examination included biochemical, haematological and ventilatory function tests. Slowing of pulse rate, corrective improvement in haematological values, significant decrease in blood sugar with increase in plasma protein specially albumin were noted in this study. Mid expiratory flow rate was found to have appreciable improvement in majority of the patients.

Raja et al., (1997) examined the short-term effects of 4 weeks of intensive yoga practice on physiological responses in six healthy adult female volunteers who were measured by using the maximal exercise treadmill test. Yoga practice involved daily morning and evening sessions of 90 minutes each. Pre and post-yoga exercise performance was compared. Maximal work output (Wmax) for the group increased by 21% with a significantly reduced level of oxygen consumption per unit work but without a concomitant significant change in heart rate. After intensive yoga training, at 154 Wmin (-1) (corresponding toWmax of the pre-yoga maximal exercise test) participants could exercise more comfortably, with a significantly lower heart rate (P < 0.05), reduced minute ventilation (P<0.05), reduced oxygen consumption per unit work (P < 0.05), and a significantly lower respiratory quotient (P < 0.05). The implications for the effect of intensive yoga on cardiorespiratory efficiency are discussed, with the suggestion that yoga has some transparently difference quantifiable physiological effects to other exercises.
Scholl and Alloolio and Schonooke (1994) examined the physiological and psychological effects of Hatha-Yoga exercise in healthy women. Hatha-Yoga has become increasingly popular in western countries as a method for coping with stress. However, little is known about the physiological and psychological effects of yoga practice. We measured heart rate, blood pressure, the hormones cortisol, prolactin and growth hormone and certain psychological parameters in a yoga practicing group and a control group of young female volunteers reading in a comfortable position during the experimental period. There were no substantial differences between the groups concerning endocrine parameters and blood pressure. The course of heart rate was significantly different, the yoga group had a decrease during the yoga practice. Significant differences between both groups were found in psychological parameters. In the personality inventory the yoga group showed markedly higher scores in life satisfaction and lower scores in excitability, aggressiveness, openness, emotionally and somatic complaints. Significant differences could also be observed concerning coping with stress and the mood at the end of the experiment. The yoga group had significant higher scores in high spirits and extravertedness.

Chinnasamy (1992) conducted a study on effects of asanas and physical exercise on selected physiological and biochemical variables among school boys. In this study ninety male students were randomly selected from Government Higher Secondary School. The initial score were measured for the selected physiological and biochemical variables namely pulse rate, systolic blood pressure, diastolic blood pressure, haemoglobin
content and blood sugar level. The treatment was given for a period of 6 weeks for the experimental group. The significance of the difference among two kinds of exercise group and asanas group for the pre and post test mean gain were determined by ‘F’ ratio through analysis of covariance. Asanas had significantly improved the haemoglobin content and reduced the blood sugar pulse rate and blood pressure.

Bhargava, Cogate and Mascarenhas (1988) examined the effect of autonomic responses to breath holding and its variations following pranayama. Autonomic responses to breath holding were studied in twenty healthy young men. Breath was held at different phases of respiration and parameters recorded were breath holding time, heart rate, systolic and diastolic blood pressure and galvanic skin resistance (GSR). After taking initial recordings all the subjects practiced Nadi-Shodhana Pranayama for a period of 4 weeks. At the end of 4 weeks the same parameters were again recorded and the results compared. Baseline heart rate and blood pressure (systolic and diastolic) showed a tendency to decrease and both these autonomic parameters were significantly decreased at breaking point after pranayamic breathing. Although the GSR was recorded in all subjects the observations made were not conclusive. Thus pranayama breathing exercises appeared to alter autonomic responses to breath holding probably by increasing muscle tone and decreasing sympathetic discharges.

Sundar et al., (1984) in their study assessed twenty five patients of essential hypertension. Of these, 20 patients were not given
any antihypertensive drug treatment (Group A); other 5 had to be put on antihypertensive drugs before including them in the study (Group B). These patients were demonstrated “Shavasana” and trained to perform it correctly. Shavasana therapy was continued for six months. There was a statistically significant fall in both mean systolic and diastolic pressure of both groups. Further, there was a significant reduction in doses of antihypertensive drugs, being given to patients of group B. In 65 % patients of group A, blood pressure could be controlled with Shavasana only and no drug was needed in them at all. Blood pressure rose significantly to pre-Shavasana levels in patients who left practicing yoga. Thus, with the use of yoga (Shavasana) in therapy of hypertension, requirement of antihypertensive drugs may be significantly decreased and in some cases may be totally dispensed with and it may be an useful adjunct in treatment of hypertension.

Bhole (1982) conducted study on Breath Holding time after complete expiration and different conditions of the Abdominal Muscles. Relaxed, bulged out and contracted condition of the abdominal wall did not influence breath holding time of 22, 28 sec after deep expiration. Kapalbhati for 30 to 45 sec was found to increase breath holding time by 12 and 9 seconds from the average value of 57 sec for males and 41 sec for females, respectively.

Damodaran et al. (2002) studied the effect of yoga on the physiological, psychological well being, psychomotor parameter and modifying cardiovascular risk factors in mild to moderate hypertensive
patients. Twenty patients (16 males, 4 females) in the age group of 35 to 55 years with mild to moderate essential hypertension underwent yogic practices daily for one hour for three months. Biochemical, physiological and psychological parameters were studied prior and following a period of three months of yoga practices, biochemical parameters included, blood glucose, lipid profile, catecholamines, MDA, Vit. C, cholinesterase and urinary VMA. Psychological evaluation was done by using personal orientation inventory and subjective well being. Results showed decrease in blood pressure and drug score modifying risk factors i.e. blood glucose, cholesterol and triglycerides decreased the overall improvement in subjective well being and quality of life. There were decrease in VMA catecholamine, and decrease at the MDA level suggestive of decrease in sympathetic activity and oxidant stress. Yoga can play an important role in risk modification for cardiovascular diseases in mild to moderate hypertension.

Manchanda et al., (2000) evaluated the possible role of lifestyle modification incorporating yoga on retardation of coronary atherosclerotic disease. In this prospective randomized, controlled trial, 42 men with angiographically proven coronary artery disease (CAD) were randomized to control (n = 21) and yoga intervention group (n = 21) and were followed for one year. The active group was treated with a user-friendly programme consisting of yoga, control of risk factors, diet control and moderate aerobic exercise. The control group was managed by conventional methods i.e. risk factor control and American Heart Association Step I diet. After one year, the yoga groups showed significant reduction in number of anginal
episodes per week, improved exercise capacity and decrease in body weight. Serum total cholesterol, LDL cholesterol and triglyceride levels also showed greater reductions as compared with control group.

Mahajan, Reddy and Sachdeva (1999) conducted a study on the effect of yogic lifestyle on the lipid status was studied in angina patients and normal subjects with risk factors of coronary artery disease. The parameters included the body weight, estimation of serum cholesterol, triglycerides, HDL, LDL and the cholesterol - HDL ratio. A baseline evaluation was done and then the angina patients and risk factors subjects were randomly assigned as control (n = 41) and intervention group (n = 52). Lifestyle advice was given to both the groups. An integrated course of yoga training was given for four days followed by practice at home. Serial evaluation of both the groups was done at four, 10 and 14 weeks. Dyslipidemia was a constant feature in all cases. An inconsistent pattern of change was observed in the control group of angina (n = 18) and risk factor subjects (n = 23). The subjects practicing yoga showed a regular decrease in all lipid parameters except HDL. The effect started from four weeks and lasted for 14 weeks. Thus, the effect of yogic lifestyle on some of the modifiable risk factors could probably explain the preventive and therapeutic beneficial effect observed in coronary artery disease.

Schmidt (1997) evaluated participants of a comprehensive residential three month yoga and mediation training programme living on a low fat lacto-vegetarian diet changes in cardiovascular risk factors and hormones were studied Substantial risk factor reduction was found.
Body mass index, total serum and LDL cholesterol, fibrinogen, and blood pressure were significantly reduced especially in those with elevated levels. Urinary excretion of adrenaline, noradrenaline, dopamine, aldosterone, as well as serum testosterone and luteinizing hormone levels were reduced, while cortisol excretion increased significantly.

Pansarc Kulkarni and Pendsc (1989) determined the effect of yogic training on serum LDL levels. LDH is a glycolytic enzyme utilized during exercise to provide energy to contracting muscles. Chronic submaximal exercise for a longer duration shows about two-fold increase in LDH levels. Yogic practices might be bringing similar effects. The present work was designed to study effect of yogic training on LDH levels. Fourteen female and six male students of average age or 18 years were subjected to yogic training for six weeks. Serum LDH levels were found before and after the training course by spectrophotometric method of Henry et al. The serum LDH levels were within normal limits and showed significant increase both in females and males after yogic training. It indicates that Yoga has similar effect on LDL levels like endurance training.

STUDIES RELATED TO AEROBICS ON PHYSICAL, PHYSIOLOGICAL HAEMATOLOGICAL AND BIOCHEMICAL VARIABLES

Welsman, Armstrong and Withers (1997) investigated the physiological effects of two different programmes with three times a week and also an eight week training programmes on the aerobic fitness of nine to ten year old girls. Treadmill determined peak VO\textsubscript{2} submaximal
heart rates, and submaximal blood lactate were the criterion measures. Seventeen girls completed a programme of “aerobics” training, where sessions lasted 20-25 minutes. Eighteen girls followed a cycle ergometer training programme which involved pedaling continuously for 20 minutes with the heart rate maintained between 160 and 170 beats/minute. A control group of 16 girls completed the criterion tests but did not train. In the cycle ergometer group and eight control subjects plasma total cholesterol and high density lipoprotein cholesterol were determined before and after training. Peak VO₂ did not change significantly with training in either training group, neither were there any significant changes in submaximal heart rates. Blood lactate declined significantly at the two lowest submaximal exercise intensities in the cycle ergometer training group (from 2.3 (1.1) to 1.4 (0.06) mmol/l at stage 1 and from 2.1 (1.2) to 1.6 (0.06) mmol/l at stage 2; means (SD): P < 0.01).

Total cholesterol and high density lipoprotein cholesterol remained unchanged with training. These findings suggest that an eight-week structured exercise programme produces minimal changes in either the aerobic fitness or blood lipids of young girls. It may be more beneficial in promoting in long term health to such as enjoyment in activity and positive attitudes to exercise rather than attempting to enhance aerobic fitness through strenuous exercise programmes.

Hopkins et. al., (1990) conducted a study to determine the effect of low-impact aerobic dance on sedentary elderly women (N = 53), functional fitness was measured by items from the proposed American
Alliance of Health, Physical Education, Recreation, and Dance (AAHPERD) fitness test for older adults. After 12 weeks of low-impact aerobic dance, the group improved significantly on all functional fitness components except motor control/coordination, including cardio-respiratory endurance, strength/endurance body agility, flexibility, body fat and balance.

Ghundiyal Santosh (1988) in his study compared the effect of Aerobic and Anaerobic exercises on the physical fitness of the leper School students of Tapowan. A total of 60 students were selected from the 9th and 10th grade of Tapowan School, Amravati (age ranged from 13 to 19 years. The AAHPER youth fitness tests were administered and further were divided in three homogenous groups. Six week training programme of aerobic and anaerobic exercised were given to Group ‘A’ and ‘B’ respectively and final data was collected by the AAHPER test administration. Significance of mean differences among the groups were computed by ‘F’ ratio test. It was concluded that a significant improvement was found in the physical fitness of a leper student because of aerobic and anaerobic exercises.

Cox et al., (2001) evaluated the long-term effects of regular to moderate intensity exercise on blood pressure and blood lipids in previously sedentary older women. Subjects were randomly assigned to either a supervised center-based (CB) or a minimally supervised home-based (HB) exercise program, initially for 6 months. Within each program, subjects were further randomized to exercise either at a moderate (40-
55% heart rate reserve, Hrres) or vigorous intensity (65-80% Hrres). After 6 months, all groups continued a HB moderate or vigorous exercise program for another 12 months. Methods: Healthy, sedentary women (aged 40-65 years) (n= 126) were recruited from the community. The subjects exercised three times per week for 30 min. They were evaluated at baseline, for 6, 12 and 18 months. There was a significant fall of 2.81 mmHg in systolic blood pressure (P = 0.049) and 2.70 mmHg in diastolic blood pressure (P = 0.004) after correction for age and baseline values with moderate exercise, but not with vigorous-intensity exercise. When this analysis was repeated with the change in body mass included, the results were unchanged. After correction for potential confounding factors, there was a significant fall in total cholesterol and low density lipoprotein cholesterol with vigorous but not moderate exercise at 6 months (P < 0.05) but 18 months. In this largely normotensive population of older women, a moderate, but not vigorous exercise program, achieved sustained falls in resting systolic and diastolic blood pressure over 18 months. The study demonstrates that in older women, moderate intensity exercise is well accepted, in a sustainable long-term and has the health benefit of reduced blood pressure.

Rigla et. al., (2000) evaluated the effect of physical exercise on blood pressure, the lipid profile, lipoprotein (a) [Lp(a)] and low-density lipoprotein (LDL) modifications in untrained diabetics, 27 diabetic patients (14 type 1 and 13 type 2) under acceptable and stable glycemic control were studied before and after a supervised 3-month physical exercise program. Anthropometric parameters, insulin requirements, blood
pressure, the lipid profile, Lp(a), LDL composition size and susceptibility to oxidation, and the proportion of electronegative LDL (LDL(-)) were measured. After 3 months of physical exercise, physical fitness improved. The body mass index (BMI) did not change, but the waist circumference decreased significantly. An increase in the subscapular to triceps skinfold ratio and mid arm muscle circumference (MMC), 23.1 +/- 3.4 v 2.44 +/- 3.7 cm, P < 0.01) were observed after exercise. Insulin requirements and diastolic blood pressure decreased in type 2 diabetic patients. High-density lipoprotein cholesterol (HDL-C) increased in type 1 patients while LDL cholesterol (LDL-C) decreased in type 2 patients. Although Lp (a) levels did not vary in the whole group, a significant decrease was noted in patients with baseline (Lp (a) above 300 mg/L (mean decrease, -13%). A relationship between baseline Lp(a) and the change in Lp(a) was also observed. After the exercise program, 3 of 4 patients with LDL phenotype B changed to LDL phenotype A, and the proportion of LDL(-) tended to decrease. No changes were observed for LDL composition or susceptibility to oxidation. In addition to its known beneficial effects on the classic cardiovascular risk factors, regular physical exercise may reduce the risk of cardiovascular disease in diabetic patients by reducing Lp (a) levels in those with elevated Lp(a) and producing favourable qualitative LDL modifications. Woolf-May13 et. al., (1998) conducted a study on forty-nine previously sedentary or low active individuals aged 40-71 years were allocated to three groups. The long walking group participated in an 18-week walking programme which consisted of walks lasting 20-40 min; the repetitive short walking group completed walks of between 10 and 15
min, up to three times a day, with no less than 120 min between each walk; and the control group maintained their low level of activity. Both walking programmes began at a prescribed 60 min x week (-1), which increased steadily up to 200 min x week (-1) by week 12. During the study, the long walking group walked for an estimated 2514 min (139 min x week (-1)), expending an estimated 67.5 MJ (3.72 MJ x week (-1)) at an estimated 73% of their age-predicted maximum heart rate and 68% of their estimated VO2 max. The repetitive short walking group walked for an estimated 2476 min (135 min x week (-1)), expending an estimated 58.5 MJ (3.17 MJ x week (-1)) at an estimated 71% of their age-predicted maximum heart rate and 65% of their estimated VO2 max. The results showed a statistically significant reduction in heart rate during a standardized step test (pre-vs post-intervention) in both walking groups, indicating an improvement in aerobic fitness, although the control group showed a higher average heart rate during the post-intervention test, indicating reduced fitness. When compared with male subjects pre-intervention, the females possessed more favourable levels of high-density lipoprotein (HDL) cholesterol (P < 0.001), apolipoprotein (apo) A1 (P < 0.001) and ratios of total cholesterol: HDL cholesterol (P < 0.02) and low-density lipoprotein (LDL) cholesterol: HDL cholesterol (P < 0.02). Compared with the controls post-intervention, the walking groups showed no statistically significant changes in total cholesterol, LDL cholesterol, HDL cholesterol, apo A1, apo A11, apo B, or the ratios of total cholesterol, HDL cholesterol, LDL, cholesterol; HDL cholesterol, apo A1: apo B or apo A1: apo A11 (P > 0.05). Relative to the walking groups factor XIIa
increased in the control group (P < 0.05). We conclude that although both walking programmes appeared to improve aerobic fitness, there was no evidence of improvements in the blood lipids or associated apolipoproteins of the walking groups. Further analysis indicated that this apparent lack of change may have been related to the subjects' relatively good pre-intervention blood lipid profiles, which restricted the potential for change. The implications of the observed changes in the coagulation/fibrinolytic factors remain unclear.

Dengel et al., (1998) examined the clustering of metabolic abnormalities often associated with hypertension, including insulin resistance, glucose intolerance, and dyslipidemia, in middle-aged men may be the result of a decrease in cardiovascular fitness (VO2 max) and the accumulation of body fat with aging. This study examines the effects of a 6-month program of aerobic exercise training plus weight loss (AEX+WL) on VO2 max, body composition, blood pressure (BP), glucose and insulin responses during an oral glucose tolerance test (OGIT), glucose infusion rates (GIR) during 3-dose hyperinsulinemic-euglycemic clamps at insulin infusion rates of 120, 600, and 3,000 pmol x m (-2) x min (1) and plasma lipoprotein levels. Compared with eight non-obese, hypersensitive, sedentary men studied (age, 56 +/- 1 year, 32% +/- 1% body fat, BP, 147 +/- 3/93+1.2 mm Hg) initially had a larger waist girth and waistto-hip ratio (WHR) and were more hyperinsulinemic and insulin resistant with lower GIR at the two lower insulin infusion rates of the clamp and had a 2.9 fold higher EC50 the insulin concentration producing a half-maximal increase in GIR. They had higher triglyceride (TG) and
lower high-density lipoprotein cholesterol (HDL-C) levels. The IAEX+WL intervention reduced body weight by 9% percent body fat by 21%, waist girth by 9% and WHR by 3% and increased VO2 max by 16% (P < 0.01 for all). This was associated with decreases of 14 + 3 mm Hg in systolic and 10 + 2 mm Hg in diastolic BP, significant changes in GIR at the low (+42%) and responses during OGIT (P < 0.02 for all). AEX+WL also lowered total cholesterol by 14% and TG by 34% and raised HDL2-C levels twofold (P < .01 for all). Thus, a 6 month AEX+WL intervention substantially lower BP and improves glucose and lipid metabolism in obese, sedentary, hypertensive men. This suggests that hypertension and the metabolic risk factors for cardiovascular disease associated with it can be ameliorated by AEX+WL in obese, sedentary, middle-aged men.

Saldanha et al., (1997) conducted a study to examine the maximum heart rate response to intense training. Subjects were 9 male cyclists who trained on average of 20 km per week in the past year. During the active rest phase of their training program, only recreational activities were performed. Prior to and following a 7-week intensive cycling programme on a computerised, graded cycling test to volitional exhaustion. Coaches who use heart rate to prescribe training intensities for endurance athletes need to take cognizance of the rapid changes in maximum heart rate that develop during de-training and with resumption of intense training.

Kelly and Johnson (1994) conducted a study on the effects of aerobic exercise on resting systolic and diastolic blood pressure among
normotensive adults. Four hundred and thirty eight subjects (289 exercise, 149 control) were statistically aggregated using the meta-analytic technique small treatment effect (TE) reductions were noted for both resting systolic and diastolic blood pressure. The results of this study suggest that aerobic exercise resulted in small reductions on resting systolic and diastolic blood pressure among normotensive adults.

Angelopoulos et al. (1993) determined the effect of repeated exercise bouts on High Density Lipoprotein-Cholesterol and its subfraction HDL2-C and HDL3-C. Nine sedentary men [mean age, 22.8 yrs] were studied during and after treadmill exercise at 65% VO2 max to determine the number of repeated exercise bouts required to bring about a sustained elevation in HDL-Cholesterol and its subfraction HDL2-C and HDL3-C. A Latin square counterbalanced design was used. Thirty-minute exercise sessions were undertaken in by 365 ml or 11.8%. The increase in PCV was accompanied by reductions in haematocrit, haemoglobin concentration (g.100 ml01) and RBCs [10 (6) mm-3]

Spodaryk (1993) conducted a study on the effects of long lasting endurance and strength training on the constituents of the blood. The athletes were divided into two groups: endurance – trained subjects and strength – trained subjects. The control group was composed of untrained male subjects. Blood samples were taken at rest for determinations of several haematological and iron related parameters. The mean haemoglobin, packed cell volume and red blood cells measured in the endurance athletes were significantly lower than the control group
but were comparable to those obtained in the strength trained athletes. There were no significant differences in the haematological induce between the groups of athletes and the control group. The results of the investigation showed that some haematological parameters of the endurance athletes differed from the untrained subjects as well as the strength-trained subjects.

Gillett and Elsenman (1987) in their study determined the effect of intensity controlled exercise on the aerobic capacity of overweight, middle-aged women. Thirty-eight moderately overweight women, ages 35-57 participated in a 16-week dance-exercise program. Random assignment was made to an experimental group \((n = 20)\) in which intensity of exercise was controlled and prescribed, and a control group \((n = 18)\) in which exercise was of an intensity typical to commercial aerobic classes. Prior to the onset of training, and at the completion of 16 weeks, the following fitness tests were administered; Aerobic capacity expressed as \(VO_2\) max, body composition analysis, blood chemistry, blood pressure, resting heart rate. it was concluded that a significant improvement was found in the physical fitness.

Park et al., conducted a study of the Effects of Aerobic Dance on Respiratory-Circulatory Function, Blood components Six women college students, chosen for this study did aerobic dance for 4-weeks four times a week. The study aimed at developing a basic data for enhancing physical fitness by revealing the effects of aerobic dance on both the respinro-lisulatory function and blood components. Treadmill was used
for exercise load, while ventilation counting and gas analysis were made possible through the Douglas Bag method and the Respilyzer (BM-10) respectively. Also, the polygraphy system measured heart rate and respiratory rate, and the spectrophometer analysed blood components.

The results obtained from the study after the four-week dance were as follows:

1. Body weight of the subjects decreased by 0.8 kg
2. Maximum oxygen uptake averaged an increase of 0.131/min
3. Oxygen intake in anaerobic threshold recorded a growth of 0.221/min.
4. As for blood components, T-cho showed a significant deduction, whereas HDL-C marked a meaningful enlargement.

The composition and concentration of plasma lipoproteins were studied in five young men [mean BM1 = 27.5 + 2.9 (s.d)] before, during (after 25 and 50 days of training), and after the completion of a 100 day exercise training programme that induced daily 4.2 M] calorie deficit. Along with reductions in body weight (from 86.7 + 20.0 to 78.7 + 17.1 kg, p < 0.01) and in fat mass (from 17.0 + 9.7 to 10.4 + 7.4 kg, p < 0.01), the exercise training program induced numerous changes in plasma lipoprotein levels. Plasma total cholesterol level fell significantly after 25 days of training (p < 0.05) and remained significantly reduced at the end of the training experiment (p < 0.05). This reduction in total plasma cholesterol was accompanied by reductions in plasma apo B, LDL-cholesterol and LDL-apo B levels (p < 0.05). There were trends for
reductions in plasma triglycerides and VLDL components that were significant only VLDL-triglycerides ($P < 0.05$). Plasma HDL-Chol. Levels increased significantly only at the end of the training program ($P < 0.01$). This increase in plasma HDL-cholesterol was not accompanied by an increase in plasma apo A-1 levels suggesting that exercise training produced an increase in HDL-cholesterol was not accompanied by an increase in plasma apo A-1 levels suggesting that exercise training produced an increase in HDL-cholesterol content rather than an increase in HDL, particle number. Ratios of HDL-cholesterol/cholesterol ($P < 0.01$) and apo A-1 apo B ($P < 0.05$) were significantly increased by exercise training, suggesting a decreased risk of cardiovascular disease. These results indicate the reduction in a fat man solely induced by aerobic exercise has substantial beneficial effects on plasma lipoprotein levels (Despres et al., 1990).

Schell and Others (1994) conducted a study on physiological and psychological effects of Hatha-Yoga exercise in healthy women. They measured heart rate, blood pressure, the hormones cortisol, prolactin and growth hormone and certain psychological parameters. There were no substantial differences between the yoga practicing group and a control group concerning endocrine parameters and blood pressure. The course of heart rate was significantly different from the Hatha yoga group that had a decrease during the yoga practice.

Bole et al., (1971) conducted a study on effect of Yoga Training on vital capacity and Breath holding time. An average increase of 157 ml
in vital capacity and of 15 seconds in breath holding time were observed in males after three weeks of training in Yogic Physical culture as recommended by N.F.C. Programme.

Dharmaraj (1974) studied the effect of yoga and the Sbx fitness plan on selected Physiological parameters. The results indicated an increase in basal metabolic rate, tidal volume in basal metabolic rate, T-4 thysoxing haemoglobin; hematocriaed blood cells PWC 130, vital capacity, chest expansion, breath holding and flexibility after yoga training. Decrease in heart rate in basal state was also observed.

Kin Jsier, Kosar and Korkusuz (2001) examined the effect of 8 weeks of step aerobics and aerobic dancing on blood lipids and lipoproteins. Methods: Experimental Design: Comparative training. Setting: Two months of physical fitness program. Participants: Forty-five sedentary female college student volunteers randomly assigned to one of the three groups as step aerobics (n = 15), aerobic dancing (n = 15) and the control group (n = 15). The step aerobics and aerobic dancing groups participated in sessions of 45 min per day, 3 days per week for 8 weeks with 50-70% of their heart rate reserve. Total cholesterol (TC), triglyceride (TG), low-density lipoprotein cholesterol (LDL-C), high density lipoprotein cholesterol levels (HDL-C), the ratio of total cholesterol to high-density lipoprotein cholesterol (TC/HDL-C). RESULTS: At the end of the 8 week period, a significant difference has been found between the step aerobics group and the control group and between the aerobic dancing group and the control group in TC levels (F[2,44]=8.33; p < 0.01). A
significant difference in HDL-C levels ($F_{2,44}=3.65, p < 0.05$) and TC:HDL-C ratio ($F_{2,44}=11.56, p < 0.01$) has been found only between the step aerobics group and the control group. These results indicate that step aerobics training is an effective training mode for modifying lipid and lipoprotein profiles of female college-aged students.

Leon and Sanchez (2001) determined the effects of aerobic exercise training (aET) on blood lipids and assess dose-response relationships and diet interactions. "We reviewed papers published over the past three decades pertaining to intervention trials on the effects of > or = 12 week of AET on blood lipids and lipoprotein outcomes in adult men and women. Included were studies with simultaneous dietary and AET interventions, if they had appropriate comparison groups. Studies were classified by the participants' relative weights expressed as mean BMIs. Information was extracted on baseline characteristics of study subjects, including age, sex, and relative baseline cholesterol levels; details on the training programs; and the responses to training of body weight, VO$_2$(max), and blood total cholesterol (TC) and low-density lipoprotein-cholesterol (LDL-C), high-density lipoprotein-cholesterol (HDL-C) and triglyceride (TG) of the identified 51 studies, 28 were randomized controlled trials and AET was generally performed as a moderate to hard intensity, with weekly energy expenditures ranging from 2090 to > 20,000 kj. A marked inconsistency was observed in the responsiveness of blood lipids. The most commonly observed change was an increase in HDL-C (with reductions in TC, LDL-C, and TG less frequently observed). Insufficient data are failed to establish dose-response relationships
between exercise intensity and volume with lipid changes. The increase in HDL-C with AET was inversely associated with its baseline level ($r = 0.462$, but no significant associations were found with age, sex, weekly volume of exercise, or with exercise-induced changes in body weight or $\text{VO}_2\text{max}$). Conclusions: Moderate to hard-intensity AET inconsistently results in an improvement in the blood lipid profile, with the data insufficient to establish dose-response relationships.

Leaksonen et al. (2000) conducted a study on the potential importance of favourable changes in the lipid profile produced by aerobic exercise, training-induced lipid profile changes in atherosclerosis-prone type 1 diabetes mellitus (DM) have not heretofore been adequately addressed. We assessed the effect of a 12 to 16 week-aerobic (untrained, N = 29) groups after baseline measurements. Training consisted of 30-60 min moderate intensity running 3-5 times a week for 12-16 wk. For the 42 men finishing the study, peak oxygen consumption ($\text{VO}_2\text{peak}$) increased significantly only in the trained group. Total and low-density lipoprotein (LDL)/apo A-1 ratio increased in the trained group. HDL and apo A-1 increased in both groups. The exercise program brought about improvements in the HDL/LDL and apo A-1/apo B ratio and apo B and triglyceride levels when comparing the relative (%) changes in the trained versus control group. In the trained group, men with HDL/LDL ratios below the group median at baseline showed even more favourable changes in their lipid profile than those with higher initial HDL/LDL ratios. Body mass index, % body fat and hemoglobin A1c did not change during the training period in either group. Endurance training improved the lipid
profile in already physically active type 1 diabetic men, independently of effects on body composition or glycemic control. The most favourable changes were in patients with low baseline HDL/LDL ratios, like the group with the greatest benefit to be gained by such changes.

LeMura et al., (2000) evaluated the effects of various modes of training on the time-course of changes in lipoprotein-lipid profiles in the blood, cardiovascular fitness, and body composition after 16 weeks of training and 6 weeks of detraining in young women. A group of 48 sedentary but healthy women (mean age 20.4 (SD1) years) were matched and randomly placed into a control group (CG, n = 12), an aerobic training group (ATG, n = 12), a resistance training group (RTG, n = 12), or a cross-training group that combined both aerobic and resistance training (XTG, n =12). The ATG, RTG and XTG trained for 16 weeks and were monitored for changes in blood concentrations of lipoprotein-lipids, cardiovascular fitness, body composition, and dietary composition throughout a 16 week period of training and 6 weeks of detraining. The ATG significantly reduced blood concentrations of triglycerides (TR1) (P < 0.05) and significantly increased blood concentrations of high-density lipoprotein-cholesterol (HDL-C) after 16 weeks of training. The correlation between percentage fat and HDL-C was 0.63 (P < 0.05), which explained 40% of the variation in HDL-C; while the correlation between maximal oxygen uptake (VO2max) and HDL-C was 0.48 (P < 0.05), which explained 23% of the variation in HDL-C. The ATGA increased VO2max by 25% (P < 0.001) and decreased percentage body fat by 13% (P < 0.05) after 16 weeks. Each of the alterations in the ATG had disappeared after the 6 week
detraining period. The concentration of total cholesterol (TC), TRI, HDL-C and low density lipoprotein-cholesterol in the blood did not change during the study in RTG, XTG and CG. The RTG increased upper and lower body strength by 29% (P < 0.01) and 38% respectively. The 6 week detraining strength values obtained in RTG were significantly greater than those obtained at baseline. The LXTG increased upper and lower body strength by 19% (P < 0.01) and 25% (P < 0.001), respectively. The 6 week detraining strength values obtained in XTG were significantly greater than those obtained at baseline. The RTG, XTG and CG did not demonstrate any significant changes in either VO2max, or body composition during the training and detraining periods. The results of this study suggest that aerobic-type exercise improves lipoprotein-lipid profiles, cardiorespiratory fitness and body composition in healthy, young women, while resistance training significantly improved upper and lower body strength only.

Kayatekin et al., (1998) in their study assessed that total cholesterol TC, triglyceride (TG), high density lipoprotein-cholesterol (HDL-C), low density lipoprotein-cholesterol (LDL-C) and HDL-C/TC levels are important in determining the risk of coronary heart disease. The serum lipids and lipoprotein levels of regularly training sports persons and non-sporting controls were determined and compared with each other to investigate the effects of exercise and sex on these factors. HDL-C levels of male and female training groups were higher than those of corresponding non-sporting groups respectively P < 0.01, P < 0.001). The sportswomen's HDL-C levels were higher (P < 0.05), and TC,TG and
LDL-C levels were lower (P < 0.001). HDL-C/TC ratio of active females was higher than that of control females (P < 0.01). The corresponding difference in males was also significant. We conclude that physical activity and sex have effects on risk factors for cardiovascular disease.

Hardman and Hudson (1998) examined the effectiveness of brisk walking as a means of improving endurance fitness and influencing serum lipid and lipoprotein variables in previously sedentary women. Walkers [n = 10, mean (s.e.m) age 47.3 (2.0 years)] maintained their habitual sedentary lifestyle throughout. Endurance fitness was determined using laboratory measures of responses to treadmill walking. Serum lipid and lipoprotein variables were determined in venous blood (12h fasted). Body fatness was assessed by anthropometry and dietary practice using the 7 day weighed food intake technique functional activity of platelets that included lower levels of cholesterol, thrombin, lower blood oxidative activity and higher contraction of prostaglandin 12 and high density lipoprotein.

Sayed (1996) evaluated the effect of high and low intensity exercise conditioning programs on components pertinent to blood fibrinolysis and selected lipid profile variables in sedentary, but healthy individuals. Eighteen normal subjects were divided into two equal groups: High intensity and low intensity exercise groups. Each subject in the high and low intensity groups exercised on a bicycle ergometer for 20 min, three times a week for 12 weeks at an intensity corresponding to 80% and
30% VO2 max, respectively. One week before and 1 week after the conditioning programs data were collected for body weight, percentage body fat, VO2 max and 12 h fasting blood levels of total tissue-type plasminogen activator (t-PA), tissue type plasminogen activator activity (t-PAa), total plasminogen activator inhibitor (PA 1-T), plasminogen activator inhibitor activity (PA1-1a) cholesterol (CHOL), triglycerides (TG) and high-density lipoprotein cholesterol (HDL-C). In the post-conditioning, maximum oxygen consumption increased significantly (P<0.05 only in the high intensity exercise group while body weight and percentage body fat did not change (P > 0.05) in either of the groups. Physical conditioning induced no statistically significant (P < 0.05) changes in the resting baseline of CHOL, TG or HDL-C. The resting values of t-PA, t-PAa and PA1-1a before conditioning did not vary significantly (P > 0.5) between two groups. Similarly, after training there was no significant change in t-PA, t-PAa or PA1-1. However, PA1-1 decreased significantly (P < 0.05) in the high intensity group, but not in the low intensity (P > 0.05). It is concluded that high, but not low, intensity physical conditioning significantly enhances the cardio respiratory fitness and reduces the resting level of plasminogen activator inhibitor activity which may be linked with the favourable effects of exercise conditioning.

Ades and Poehiman (1996) who studied the effects of numerous intervention trials in young subjects suggest that aerobic exercise training exerts favourable effects on specific lipid subfractions, in particular serum triglycerides and high density lipoprotein (HDL) cholesterol. Cross sectional studies in older individuals suggest that active
individuals have more favorable lipid profiles than inactive individuals. However, it remains controversial as to whether leisure time activity or fitness levels are independent predictors of lipid measures in the elderly versus their intermediate effects on body composition and body fat distribution. That is, a greater deposition of abdominal fat in the least fit individuals is associated with adverse lipid profiles. Short-term (8 weeks) aerobic exercise in elders is not associated with any significant changes in lipid profiles, however, longer term programs, particularly if associated with improvements in body fat distribution and/or weight loss, have been demonstrated to yield significant improvements in lipid subfractions, in particular triglycerides and HDL cholesterol.

Mitsugi Montoyama et al., (1995) examined the effects of long term low intensity aerobic training and determining on serum lipid and lipoprotein concentrations in elderly men and women aged thirty. These subjects were randomly divided into two groups. The training group (n = 15); 7 men and 8 women; mean age 75.5 (SD 5.6) years) agreed to take part in physical training using a treadmill with an exercise intensity at the blood lactate concentration threshold for 30 min 3-6 times a week for 9 months. The other group [(n = 15; 7 men and 8 women, mean age 73.7 (SD4.4) years] did not perform any particular physical training and was followed as the control. Following this training period the high density lipoprotein-cholesterol (HDL-C) had increased significantly (P < 0.01) while the total cholesterol (TC); HDL-C ratio had decreased significantly (P < 0.01) in the training group after 9 months but had not changed in the control group. The TC, triglyceride (TG) and low density lipoprotein-
cholesterol (LDL-C) had not changed significantly in either group. No significant difference was seen between the group throughout the period for TC, LDL-C or TG. These results suggest that long-term low intensity aerobic training improved the profile of serum lipid and lipoproteins in elderly persons.

Bonett et al., (1995) studied plasma levels of lipoprotein (a), total cholesterol, triglycerids, HDL-cholesterol, LDL cholesterol, apoprotein AL and apoprotein B in 10 healthy, untrained volunteers subjected to a bicycle ergometric exercise. Blood samples were taken before the exercise, immediately afterwards and then at 12-hourly intervals for a period of 72 hours. After the exercise, lipoprotein (a) in untrained subjects began to decrease significantly from the 24 h hour and remained lower than baseline levels up till the 72nd hour. This results suggest that exercise induces changes in the lipoprotein (a) in an untrained healthy individual.

Allen et al., (1993) studied the effects of aerobic and anaerobic training on lipoprotein concentrations in 45 healthy untrained men. Thirty three subjects exercised four times per week during nine weeks on a bicycle ergometer. Sixteen trained with an intensity above the anaerobic threshold (blood lactate concentration > 4 mmol. 1-1) and 17 trained with an intensity below the anaerobic threshold. In addition, twelve subjects served as controls. The calculated caloric expenditure of the two training groups was similar. In all three groups, total cholesterol, total high density lipoprotein (HDL), HDL subtractions (HDL2,HDL3), and low density
lipoprotein (LDL) were measured. Training had a significant influence on HDL, HDL2, LDL/HDL, HDL2/HDL3, and chol/HDL with anaerobic training, these variables changed in the opposite direction composed with aerobic training which influenced the lipoprotein profile on the desired direction. Cholesterol, HDL3 and LDL did not alter during the nine weeks of training. After nine weeks of training the higher blood lactate concentration during exercise (representing training intensity), the higher resting LDL/HDL ratio was found. The correlation between these two variables was highly significant. They concluded that training above the anaerobic threshold had no negative effects of blood profile. Therefore, beneficial adaptations in lipoprotein profile must be achieved with moderate training intensities below the anaerobic threshold.

Eckerson and Anderson (1992) conducted a study to determine the heart rate (HR) and oxygen uptake (VO2) measured during water aerobics (WA) and were compared to maximal values obtained during an incremental treadmill test to assess the energy demand and potential cardiorespiratory (CR) training effects of WA. Sixteen college females served as subjects (mean ± SD = 20.4 ± 1.6 years). WA elicited a mean HR of 162 b.min⁻¹ and a mean VO2 of 18.4 ml.kg⁻¹ min⁻¹ which represented 74% of HR reserve, 82% of maximal HR, and 48% of VO2 max. Average caloric expenditure was 5.7 kcal.min⁻¹, HR values for WA were consistent with guidelines established by the American College of Sports Medicine for developing and maintaining CR fitness in healthy adults. However, the VO2 fell just below the recommended minimum threshold level. It was concluded that WA may provide an attractive
alternative to traditional modes of exercise for improving CR fitness, however, IIR measures may over estimate the metabolic intensity of the exercise.

Adiputra et al., (1992) studied to find out the effects of Modern Balinese Baris Dancing Exercise (MBBDE) on serum lipid profiles. Subjects of the study were 30 healthy young males. Balinese as an experimental group and another 30 healthy young Balinese as control group. The MBBDE involved an exercise intensity at 70-80% of targeted heart rate, for 50 min period, 3 times per week for 8 weeks. Pre- and Post-control group design was applied. Total cholesterol and triglyceride were measured enzymatically. Following MBBDE 3 x 50 min/week for 8 weeks duration, serum level of high density lipoprotein cholesterol (HDL-C) concentration increased significantly from 55.3 ± 2.32 mg/dl to 63.2 ± 2.82 mg/dl (p < 0.001). It was also associated with the decrease of total cholesterol concentration from 195 ± 21.10 mg/dl to 161.8 ± 21.29 mg/dl (p < 0.001), triglyceride concentration from 132.2 ± 9.65 mg/dl to 110 ± 9.08 mg/dl (p < 0.001); and low density lipoprotein cholesterol (LDL-C) concentration from 113.8 ± 21.68 mg/dl to 76.9 ± 20.76 mg/dl (p < 0.001). No significant differences were found in the above parameters in the control group. It is concluded that MBBDE is an aerobic endurance exercise and therefore produces beneficial effect on the serum lipid profiles.

Garber, Mckinney and Carleton (1992) evaluated the physiological effects of an 8 weeks aerobic dance programme to those of a walk-jog exercise training programme. Sixty male and female University
employees aged 24-48 years were randomly assigned to an aerobic dance programme (N = 22), a walk-jog programme (N = 24), or a sedentary control group (N = 15). Subjects who had an exercise compliance rate less than or equal to 85% were dropped from the study, as were control subjects who had scheduling conflicts or illnesses precluding post-treatment testing. Thirty-five subjects completed the 8 week period with a compliance rate greater than or equal to 85% leaving 14 in the aerobics group, 11 in the walk-jog group and 10 in the control group. A significant increase (p less than 0.001) in maximal oxygen uptake occurred in both the aerobics (+3.9 ml/kg/min) and walk jog group (+3.4 ml/kg/min) while no significant change was observed in the control group. Peak heart rate decreased significantly (p < 0.05) in the aerobics (-4 h/min) period. Body weight, peak respiratory exchange ratio and peak minute ventilation remained the same in the aerobics walk-jog and control groups throughout the treatment period. It is concluded that aerobic dance programmes can result in similar improvements in aerobic power as a walk-jog programme. Thus, an aerobic dance programme is an effective alternative to a traditional walk-jog training regime.

Mena et al., (1991) studied plasma lipid concentration in professional cyclists after competitive cycle races (800 and 900Km in 6 days). Plasma concentrations of triglyceride, total and low density lipoprotein-cholesterol (LDL-C) and total cholesterol; high density lipoprotein-cholesterol (HDL-C) ratio were significantly lower and HDL-C concentrations were significantly higher in cyclists compared to values in matched sedentary controls. At the end of the races, plasma
concentration of triglyceride and LDL-C were inversely correlated ($R = 0.28; n = 45, P < 0.05$) with triglyceride plasma concentrations. Body fat content, assessed as the sum of skinfold thickness was slightly reduced at the end of the race compared to the starting values. There was no significant correlation between skinfold thickness and plasma concentrations of HDL-C. In conclusion, results presented suggested the physical exercise, performed at the level of professional cyclists in a race, was an independent modifier of plasma lipid concentrations.

Stucchi et al., (1991) studied the effects of exercise on plasma lipids and lipoproteins, high density lipoprotein (HDL) subclass cholesterol levels and low density lipoprotein (LDL), subclass composition and metabolism in Yucatav miniature swim following two years of training. The exercise protocol produced significant training effects. Postheparian lipolytic activity was also significantly increased. Although plasma cholesterol and triglycerides did not differ significantly ($P = 0.08$) between the exercised and control groups, multivariate analysis indicated a strong association between lipoprotein lipase (LPL) and HDL2-C ($P < 0.01$). Although HDL-CL levels rose only slightly ($P < 0.09$) with exercise, a significant shift was noted in the distribution of cholesterol from the HDL3 to the HDL2 fractions, perhaps mediated by the substantial increase in LPL activity. Exercise had little effect on the chemical composition of the major lipoprotein classes, however the triglyceride content of the higher LDL1 subclass was significantly reduced. In the more dense LDL subclass exercise resulted in a significant decrease in triglycerides concomitant with a significant increase in free cholesterol levels. In contrast with the small
reduction in fractional catabolic rates (FCR) in either subclass, production rates of the exercised group were reduced, which accounted for the reduction in LDL subclass pool size. The data indicated that exercise products were subtle but significant changes in lipoprotein metabolism that had been associated with reduced risk of atherosclerosis.

Dangi et al. (1984) studied effect of Yoga therapy on Obesity and Lipid profile. Twenty-five obese individuals were included in this study, majority of them 21, i.e., 84 % were females and four, i.e., 16 % were males. The mean age was 41 years. Control group constituted 10 obese age and sex matched individuals. They observed appreciable improvement in blood lipid levels in the study group. Main fall in serum cholesterol was 26.5mg% (12.43#) and that in serum triglycerides it was 22.82 mg% (14.98%). Similarly, there was a significant fall in low density lipoproteins (LDL) which was 17.73% and that in very low density lipoproteins (VLDL) was 12.83% also a significant fall in fasting blood sugar values was noted in the selected subjects with mean reduction being 38.5 mg% ie. 28%.

Nieman et. al., (1993) studied the relationship between cardiorespiratory exercise and serum lipid and lipoprotein levels that was studied in elderly women. Randomized controlled experimental design with a follow up of 12 weeks: cross-sectional comparison at baseline. Community-living elders in University exercise facilities. Thirty-two apparently healthy, sedentary elderly Caucasian women, 67 to 85 years of age. Ten highly conditioned elderly women, 65 to 84 years of age, who
were active in endurance competitions and had been training for 11.2 + 1.2 years, were recruited at baseline for cross-sectional comparisons. Sedentary subjects were randomized to either a walking or calisthenic group. Intervention groups exercised 30 to 40 minutes, 5 days a week for 12 weeks, with the walking group training at 60% heart rate reserve and the calisthenic group engaging in mild range-of-motion and flexibility movements that kept their heart rates close to resting levels. Serum lipids and lipoproteins, maximal aerobic capacity (VO2 max), four skinfolds, and dietary intake at baseline and after 5 and 12 weeks. RESULTS: When the highly conditioned group and combined group of sedentary subjects were compared at baseline, serum high-density lipoprotein cholesterol (HDL-C; 1.61 + 0.14 vs 1.27 + 0.05 mmol/L respectively; P=0.048) and triglycerides (1.29+/− 0.915 vs 2.00+/− 0.15, respectively; P= 0.002), but not total serum cholesterol (5.72+/− 0.36 vs 5.72+/− 0.19 mmol/L, respectively) and low-density lipoprotein cholesterol (LDL-C; 3.62+/− 0.36 vs 3.72+/− 0.18 mmol/L respectively, were significantly different. Twelve weeks of moderate cardiorespiratory exercise improved the VO2 max of the sedentary subjects 12.6% but did not result in any change in body weight, energy intake, dietary quality, or any of the serum lipids or lipoproteins. Highly conditioned and lean elderly women, when compared with their sedentary counterparts, had higher HDL-C and lower triglycerides, but similar total serum cholesterol and LDL-C values. However, twelve weeks of moderate cardiorespiratory exercise were not associated with an improvement in serum lipid or lipoprotein profiles in previously sedentary elderly women.
Tipton and Wolfe (1998) discovered the exercise has a profound acute effect on protein metabolism. Whereas reports on whole body responses to exercise have varied results, it is generally agreed leucine oxidation is increased during exercise, thus indicating increased net protein breakdown. Following endurance exercise, whole body protein breakdown is generally reduced from resting levels, while following eccentric exercise, both whole body protein breakdown and leucine oxidation are increased. Whole body protein synthesis, on the other hand, is either increased or unchanged. Much of the disagreement in the results of studies on the response of whole body protein metabolism to exercise may be attributed to the limitations of the available methods. Even if the methodology accurately reflects whole body metabolism, this may not reflect changes in the protein metabolism of muscle. Although endurance exercise has not been studied, muscle protein breakdown is increased following resistance exercise. There is a concomitant, and qualitatively greater, increase in muscle protein synthesis following resistance exercise, which may last for as long as 48h. Increased muscle protein synthesis is linked to increased intramuscular availability of amino acids, and thus, to increased blood flow and increased amino acid delivery to the muscle, as well as increased amino acid transport. Administration of exogenous amino acids after exercise increases protein synthesis while ameliorating protein breakdown, thus improving net muscle protein balance. While it is clear that muscle protein synthesis and protein breakdown increase in a qualitatively similar manner following exercise, the mechanisms of stimulation have yet to be determined. However, we propose that the intracellular availability of amino acids is the link between these processes.
Reichsman and Scordilis (1991) examined the characterized changes in the protein composition of human muscle tissue after eccentric exercise. Four subjects performed 70 maximum eccentric, isokinetic actions of the forearm flexors with one arm. The other arm served as control. A biopsy of the biceps muscle of each arm was taken 2 days after exercise when muscles were very sore (mean = 6.0; 1 = normal; 10 = very, very sore), and muscle damage was documented by a mean decrease of 0.2 radians in the relaxed elbow angle. Proteins from the biopsy tissue were solubilized in a high ionic strength buffer containing serveral proteolytic inhibitors. Protein concentrations of the extracts were determined and identical amounts loaded onto sodium dodecy! Sulfate (SDS) polyacrylamide gels (7.5, 12.5, and 17.5%). Densitometric analysis of the Coomassie brilliant blue stained gels revealed alterations in the amounts of three protein bands in the exercised tissue relative to the control. These changes were in the linear portion of the graph of absorbance versus protein amount. Wilcoxon's signed rank test showed the first two of the following bands to increase significantly in amount (P less than 0.062). The average percentage changes [mean (SEM)] for these bands were 63(21), 39(5), and 83(35). The corresponding molecular weights determined from known standards were 76300 (860), 33200 (310), and 12900 (80) daltons, respectively. These changes imply that the increased synthesis, decreased degradation, or some combination thereof, of these three proteins may be necessary for the repair or regeneration response to exercise induced muscle damage.

Bonsheim and Tipton (2002) assessed the study tests the hypothesis that a dose of 6g of orally administered essential amino acids
(EAAs) stimulates net muscle protein balance in healthy volunteers when consumed 1 and 2 h after resistance exercise. Subjects received a primed constant infusion of L-[(2)H(5)] phenylalanine and L-[10(13)C] leucine. Samples from femoral artery and vein and biopsies from vastus lateralis were obtained. Arterial EAA concentrations increased severalfold after drinks. Net muscle protein balance (NB) increased proportionally more than arterial AA concentrations in response to drinks, and it returned rapidly to basal value when AA concentration decreased. Area under the for not phenylalanine uptake above basal value was similar for the first hour after each drink (67+/− 17 vs. 77+/− 20 mg/leg, respectively). Because the NB response was double the response to two doses of a mixture of 3g of EAA + 3g of nonessential AA (NEAA) (14), we conclude that NEAA are not necessary for stimulation of NB and that there is a dose-dependent effect of EAA ingestion on muscle protein synthesis.

Farrell (2001) investigated that the Skeletal muscle proteins are constantly being synthesized and degraded, and the net balance between synthesis and degradation determines the resultant muscle mass. Biochemical pathways that control protein synthesis are complex, and the following must be considered: gene transcription, mRNA splicing, and transport to the cytoplasm; specific amino acyl-tRNA, messenger (mRNA), ribosomal (rRNA) availability; amino acid availability within the cell; the hormonal milieu; rates of mRNA translation; packaging in vesicles for some types of proteins; and post-translational processing such as glycation and phosphorylation/dephosphorylation. Each of these processes is responsive to the need for greater or lesser production of new proteins, and many states
such as sepsis, uncontrolled diabetes, prolonged bed-rest, aging, chronic alcohol treatment, and starvation cause marked reductions in rates of skeletal muscle protein synthesis, in contrast, acute and chronic resistance exercise cause elevations in rates of muscle protein synthesis above rates found in non-diseased rested organisms, which are normally fed. Resistance exercise may be unique in this capacity. This chapter focuses on studies that have used exercise to elucidate mechanisms that explain elevations in rates of protein synthesis. Very few studies have investigated the effects of aging on these mechanisms; however, the literature that is available is reviewed.