Chapter II

REVIEW OF RELATED LITERATURE

The study of the relevant literature was an essential step to get a full picture of what has been done and stated by other researchers. The related literature reviewed for better understanding of the problem and to interpret the results systematically, and they are presented in this chapter. The most relevant literature pertaining to the present study was collected through various sources like books, journal, periodicals and internet and was presented here. The reviews provide background information to the study and help us to understand various concepts of aerobic training and yogic practices on health related fitness, basal metabolic rate (BMR) and blood lipid profile.

The literature in any field forms the foundation upon which all future work will be built. If one builds upon the foundation of knowledge provided by the review of literature, the investigator might not miss some similar work already done on the same topic. The reviews of the literature have been classified under the following headings:

1. Studies on Aerobic Training on Selected Variables.
2. Studies on Yogic Practices on Selected Variables.
1. Studies on Aerobic Training on Selected Variables

*Carl J Lavie, Ross Arena, et al., (2015)* established the value of high levels of physical activity, aerobic exercise training (AET), and overall cardio-respiratory fitness in the prevention and treatment of cardiovascular diseases. This article reviews some basics of exercise physiology and the acute and chronic responses of ET, as well as the effect of physical activity and cardio-respiratory fitness on cardiovascular diseases. This review also surveys data from epidemiological and ET studies in the primary and secondary prevention of cardiovascular diseases, particularly coronary heart disease and heart failure. These data strongly support the routine prescription of ET to all patients and referrals for patients with cardiovascular diseases, especially coronary heart disease and heart failure, to specific cardiac rehabilitation and ET programs.

*Lebon J1, Riesco E, et al., (2014)* stated that isoflavones and exercise have been shown to affect C-reactive protein (CRP) and body composition and to act synergistically on trunk and total fat mass (FM), glucose metabolism, and lean body mass in postmenopausal women with a body mass index higher than 25 kg/m. We hypothesized that exercise and isoflavone supplementation (Ex + ISO) could reduce inflammation in the same subpopulation of women. The objective of this study was to investigate if 6 months of mixed exercise combined with isoflavones could have greater effects on specific inflammatory markers than exercise alone in overweight or obese postmenopausal women. For this study thirty-four postmenopausal women aged 50 to 70 years were
randomly assigned to exercise and placebo (Ex + PLA; n = 15) or Ex + ISO (n = 19). At baseline and after 6 months, waist circumference, hip circumference, total FM, trunk FM, leg FM, and muscle mass index (MMI; = total fat free mass [kg] / height [m]) were assessed (dual-energy x-ray absorptiometry). Inflammatory markers (CRP, tumor necrosis factor-α [TNF-α], and interleukin-6) were obtained by enzyme-linked immunosorbent assay. T tests were used to compare groups at baseline. Despite an increase in TNF-α, the use of isoflavones—when body weight remains stable—seems to enhance the beneficial effects of mixed-exercise training on body composition and CRP in overweight or obese postmenopausal women. Results shown that the Ex + PLA group showed significant changes in MMI (+0.33 kg/m, P ≤ 0.009) and FM compartments (waist circumference, -5.13 cm; % FM, -1.31%; P ≤ 0.001), whereas inflammation remained unchanged. However, the Ex + ISO group showed significant changes in total FM (-1.70 kg, P < 0.0001), FM compartments (hip circumference [-2.51 cm, P = 0.019], leg FM [-1.16 kg, P = 0.037], and trunk FM [-0.72 kg, P = 0.006]), MMI (+0.39 kg, P = 0.011), and inflammation (CRP, -1.14 mg/L, P = 0.029; TNF-α, +0.29 pg/mL, P = 0.010).

Leenders M, Verdijk LB, van der Hoeven L, et al., (2013) investigated and compared the effects of 6 months resistance-type exercise training (three times per week) between healthy elderly women (n = 24; 71±1 years) and men (n = 29; 70±1 years). Muscle mass (dual-energy x-ray absorptiometry - computed tomography), strength (one-repetition maximum), functional capacity (sit-to-stand time), muscle fiber characteristics (muscle biopsies), and
metabolic profile (blood samples) were assessed. Leg lean mass (3% ± 1%) and quadriceps cross-sectional area (9% ± 1%) increased similarly in both groups. One-repetition maximum leg extension strength increased by 42% ± 3% (women) and 43% ± 3% (men). Following training, type II muscle fiber size had increased, and a type II muscle fiber specific increase in myonuclear and satellite cell content was observed with no differences between genders. Sit-to-stand time decreased similarly in both groups. Glycemic control and blood lipid profiles improved to a similar extent in both women and men. A generic resistance-type exercise training program can be applied for both women and men to effectively counteract the loss of muscle mass and strength with aging.

**Ramesh and Subramaniam (2011)** conducted study on the effects of aerobic training at different intensities on Body Mass Index (BMI), Basel metabolic rate (BMR) and body fat percentage (BF%) of obese adolescents. The present study has undertaken the survey method for identifying obese of the school going students. The researcher evaluated the existing data from school survey in Triunelveli town (6,732 boys) to measure the height and weight of the students (BMI). To achieve the purpose of these study thirty nine school boys were selected from St. Johns higher secondary school, and Sri Manthiramoorthy higher secondary school, in Tirunelveli town. Their age ranged from 12 to 18 years. They were divided in to three groups and designed as Experimental group ‘A’ Experimental group ‘B’ and Control group ‘C’ The Experimental group-A was given aerobic and calisthenics exercises, Experimental group-B underwent yogic exercise such as Asanas and
Pranayama (breathing exercises) for a period of three months, both morning and evening for five days in a week, whereas control group-C is not involved any specific exercise programme other than their regular physical activities programme as per their school curriculum. The data were collected before and after the exercises programme and statistically analyzed by using analysis of covariance (ANCOVA). The result of study report that has significantly reduction on body mass index and body fat percentage after three month of aerobic exercise training programme. Basel metabolic rate has significant increased exercise in burning capacity for calories reduce in aerobic exercise for three month period. There was no significant reduction in the performance of selected BMI, BMR and BF% after three months yogic exercise training programme when compared with aerobic exercise as well as control group.

Padmanathan (2011) conducted a study on the effect of low impact aerobic exercises on selected health related physical fitness variables such as muscular endurance, cardio respiratory endurance, flexibility and Bodymass index of male adolescents. Their age ranged from 12 to 15 years. They were divided in to two groups and designed as Experimental group ‘A’ and Control group ‘B’ The Experimental group-A was given aerobic and calisthenics exercises for a period of twelve weeks, both morning and evening for five days in a week, whereas control group-B is not involved any specific exercise programme other than their regular physical activities programme as per their school curriculum. The result of this study indicated that muscular endurance
and cardio respiratory endurance were significantly improved and also it was observed that Body mass Index significantly reduced.

Ramesh and Subramaniam (2011) conducted a study on the effect of aerobic and calisthenics exercise on health related physical fitness variables such as muscular strength, muscular endurance, flexibility, cardio respiratory endurance and body mass index (BMI) of obese adolescents. Their age ranged from 12 to 18 years. They were divided into two groups and designed as the experimental group and control group. The Experimental group was given aerobic and calisthenics exercise for a period of three months, both morning and evening for five days in a week. However, the control group was not allowed to participate in aerobic and calisthenics exercise training programme. The result of this study indicated that muscular strength, muscular endurance, cardio respiratory endurance were significantly improved, and also it was observed that Body mass Index significantly reduced.

Ramesh and Subramaniam (2010) suggested that effect of physical activity and aerobic fitness on health related physical fitness variables of overweight and obese adolescents. The selected variable includes muscular endurance flexibility, cardio-respiratory endurance, and body composition (body mass index). For the purpose of the study thirty obese boys in the age groups of 12 to 15 years and they were selected at random from Tirunelveli district higher secondary schools. They were divided into two equal groups and assigned as experimental group and control group. The experimental groups were given physical activity and aerobic exercise for a period of twelve weeks,
both morning and evening on five days a week. Control group did not participate in physical activity and aerobic exercise training programme. The collected data was statistically analyzed by using analysis of covariance (ANCOVA). The Experiment group had a significant Improvement on the health related physical fitness variables of overweight and obese children than the control group. The authors conclude that the experimental group has achieved significant improvement on muscular endurance, flexibility, cardio-respiratory endurance, and body mass index in significantly on due to the physical activity and aerobic exercise training programme.

Rajkumari, et al., (2010) studied a cross-sectional study among 3356 school children of classes VIII to XII in Imphal West district, Manipur between September, 2005 and August, 2006. The characteristics of the respondents and related variables such as parental build, watching television, eating habits, playing of video/computer games and outdoor games, dietary pattern and knowledge of obesity were assessed using a questionnaire. Height, weight, waist circumference, hip circumference, fat percentage, fat mass and fat-free mass were measured. Body mass index (BMI) and waist–hip ratio for each student were calculated. The BMI of the sampled students was lower than the corresponding WHO and International Obesity Task Force standards. Using the WHO standard, the prevalence of overweight was 4.2% and of obesity 0.8%. Using multivariate logistic regression, mother being reported to be obese (OR 1.9, 95% CI 1.4–2.6), watching television for >2 hours a day (OR 2.052, 95% CI 1.191–3.536), higher family income (OR 5.844, 95% CI 2.135–15.99), not
eating other type of vegetables in the past 1 week (OR 2.338, 95% CI 1.04–5.24) and waist–hip ratio (OR 7.737, 95% CI 4.429–13.51) were found to be independent predictors of a higher BMI. Mother’s literacy below class X (OR 0.6, 95% CI 0.378–0.997) and eating between major meals (OR 0.447, 95% CI 0.293–0.681) were significant predictors of a lower BMI. The prevalence of overweight and obesity among schoolchildren in the Imphal West district of Manipur is low. The possible reasons for this include a more traditional low-fat diet, less exposure to sedentary past-times and a greater time spent playing outdoors.

Saremil, et al., (2010) examined the effects of 12 weeks of aerobic training on serum chemerin levels in association with cardiovascular risk factors in overweight and obese males. Twenty-one overweight and obese subjects [44.3 (±4.1 yrs, body mass index (BMI) 25 kg/m2) were assigned to exercise training (obese EX, n= 11) and control (obese CON, n= 10) groups. The obese EX group participated in 12 weeks of progressive aerobic training 5 days a week. Serum chemerin, insulin resistance, lipid profiles, blood pressure, and body composition were all measured before and after the training. After the aerobic training, waist circumference (P=0.009), fat percent (P=0.03), visceral fat (P=0.03), subcutaneous fat (P=0.01), fasting glucose (P=0.01), insulin resistance (P=0.03), triglyceride (P=0.05), total cholesterol (P=0.04), low-density lipoprotein cholesterol (P=0.05) and systolic blood pressure (P=0.04) of participates were significantly decreased. Concurrently, serum chemerin concentrations were significantly decreased after aerobic program (P=0.02).
Aerobic training caused an improvement in cardiometabolic risk factors in obese subjects, and this improvement was accompanied by decreased chemerin levels.  

**Chaudhary, et al., (2010)** evaluated the effects of aerobic and strength training on cardiac variables such as blood pressure, heart rate (HR), and metabolic parameters like cholesterol, high density lipoprotein (HDL), triglycerides and anthropometric parameters of obese women of Punjab. This study was performed as an experimental study, in which subjects were randomly selected. There were thirty obese women, aged between 35-45yrs with body mass index (BMI) of above 30. Subjects were grouped into control (n=10), aerobic training (n=10) and resistance training (n=10). Aerobic training was given for three days a week at 60-70% of maximum HR for 6 weeks. Resistance training (Delorme and Watkins Technique) was given for alternate days for 6 weeks. HR and blood pressure were measured before and after the exercise. Recovery HR was also measured. The findings of the study indicate statistically significant differences in recovery heart rate [Pre-exercise: 97.40±5.378 (mean ± standard deviation (SD)), post-exercise: 90.70±4.599, t=8.066, P<0.001] and in post-diastolic blood pressure [Pre-exercise: 85±3.265, post-exercise: 86.20±2.820, P<0.001] in aerobic training and in systolic blood pressure [Pre- and post-exercise] in both training groups (P<0.001). Significant differences were observed in very low-density lipoprotein [pre-exercise: 28.10±1.415, post exercise: 26.86±0.760, t=5.378] and HDL [pre-exercise: 45.40±3.533, post-exercise: 53.60±3.134, t=6.318] levels in aerobic training
group with P<0.001. BMI and body fat percentage showed significant improvements in both training groups. Aerobic training is more beneficial and can be used as a preventive measure in patients who are at risk of developing cardiovascular diseases due to obesity.

**Habibzadeh, et al., (2010)** examined the obesity has been identified as a risk factor for the development of bulimia nervosa (BN) in those who try to lose weight. The purpose of the present study was to examine the effect of walking exercise in order to provide a method for overcoming bulimia nervosa in obese young women suffering from bulimia nervosa. Twenty obese women with bulimia nervosa (body mass index [BMI]>30) and a mean age of 22.00 ± 1.50 years volunteered to participate in this study. They were randomly assigned to exercise (n=10) and control (n=10) groups. Both groups underwent anthropometric measurements and blood analysis before and after the training program. Exercise program included 30-minute walking sessions at 50-75% of maximal heart rate, 3 days per week and for 2 months. After 2 months significant changes were observed in all anthropometric variables (P<0.001). Percent body fat, fat mass, BMI, body weight and lean mass changes in response to training were significant in the exercise group (P<0.001). This study demonstrated that moderate aerobic exercises such as moderate walking are suitable behavior therapies for overcoming bulimia nervosa in obese young women.

**Urdiales, et al., (2010)** analysed the association of objectively assessed physical activity (PA) with muscular strength and fat-free mass in adolescents,
and to determine whether meeting the current PA recommendations is associated with higher levels of muscular strength and fat-free mass. The present cross-sectional study comprised 363 Spanish adolescents (180 females) aged 12.5–17.5 years. PA was assessed by accelerometer and expressed as average PA (counts/min), and min/day of inactive, light, moderate, vigorous and moderate to vigorous PA (MVPA). MVPA was dichotomized into <60 min/day and ≥60. Upper body muscular strength was measured with the handgrip strength test, and lower body muscular strength was measured with the standing broad jump, squat jump, counter movement jump and Abalakov tests. Fat-free mass was measured by DXA. We observed positive associations between vigorous PA and all the lower body muscular strength tests except for the counter movement jump in males. PA was not associated with fat-free mass in both males and females. Male adolescents engaged in at least 60 min/day MVPA performed better in the standing broad jump test. In conclusion, the findings of the present study suggest that only vigorous PA is associated with muscular strength, particularly lower-body muscular strength in male adolescents.

Leite, et al., (2009) examined the effects of physical exercise and nutritional guidance on body composition, physical fitness, lipid profile and insulin resistance among obese adolescents with and without metabolic syndrome. Sixty-four obese adolescents (26 boys), 10-16 years of age, were divided into two groups: with metabolic syndrome (n=29) and without metabolic syndrome (n=35). They were classified as having metabolic syndrome
if they met three or more criteria for age and sex according to the Adult Treatment Panel III (ATP III). Blood pressure, waist circumference, maximum oxygen uptake (VO2peak), blood glucose, blood insulin, homeostatic model assessment (HOMA-IR), quantitative insulin sensitivity check index (QUICKI) and lipid profile were assessed at baseline and after 12 weeks of intervention. Both groups participated in 12 weeks of physical education and two nutritional guidance sessions. Each physical education session consisted of 50 min indoor cycling, 50 min of walking/running and 20 min of stretching, three times a week. Results: Fifty-five participants (with metabolic syndrome=25; without metabolic syndrome=30) completed the treatment. After 12 weeks, both groups showed reductions in body weight, BMI z-score, waist circumference, fat mass and triglycerides; and increases in height, HDL-C and VO2peak (p<0.05). In addition, the group with metabolic syndrome presented reduced systolic blood pressure and increased insulin sensitivity (p<0.05). The risk factors for metabolic syndrome decreased by 72% Following the multidisciplinary intervention, the risk factors decreased, with improvements in physical fitness and metabolic profile. The multidisciplinary intervention was effective in reducing metabolic syndrome.

Sulayma, et al., (2009) studied the effects of overweight and leisure-time activities on maximal aerobic capacity (VO2max) in urban and rural Omani adolescents. A total of 529 (245 males, 284 females) adolescents, aged 15–16 years were randomly selected from segregated urban and rural schools. Maximal aerobic capacity was estimated using the multistage 20-meter
shuttle-run test. The body mass index (BMI) of urban boys and girls was significantly higher than that of rural boys and girls. Urban boys and girls spent significantly less weekly hours on sports activities and significantly more weekly hours on TV/computer games than their rural counterpart. Urban boys and girls achieved significantly less VO2max than rural boys and girls (44.2 and 33.0 vs. 48.3 and 38.6 mL/kg/min, respectively). Maximal aerobic capacity was negatively correlated with BMI in urban boys. Overweight and inactivity had significant negative effects on cardiorespiratory fitness in urban boys and girls as compared to their rural counterparts. Weight gain in adolescence requires early intervention.

Leite, et al., (2009) studied on the effects of physical exercise and nutritional guidance on metabolic syndrome in obese adolescents. For the purpose the lipid profile test and the height and weight were measure the calculated BMI, body weight, but mass and blood pressure were analysed. It was concluded that metabolic syndrome had a reduce the factor through the development of physical fitness and lipid profiles after twelve weeks training programme the effects of multidisciplinary involvement are important as blocking measures and remedial procedures for obese adolescents in order to improve their physical fitness and metabolic profiles regular physical activity need to be promoted in obese paediatric populations. Volpe et al. (2008)investigated the effect of diet alone (D), exercise alone (E), and a combination of diet and exercise (DE) on body weight, body composition, energy intake, blood pressure, serum lipid and leptin levels, and fitness levels
in mildly obese sedentary women and men. The three interventions were compared in a randomized longitudinal study design. The exercise programs were supervised for six months, after which participants in E and DE were provided with exercise equipment to take home. 90 adult overweight women and men (age: 44.2 +/- 7.2 years; BMI = 30.5 +/- 2.7 kg/m^2). Body weight, body composition, waist and hip circumferences, blood pressure, serum lipid levels, and fitness levels were evaluated at 0, 3, 6, 9, and 12 months. Serum leptin concentrations were measured at 0 and 6 months only. A combination of diet and exercise resulted in a significant decrease in body weight in women and men; but this decrease was not maintained at one year follow-up. Serum leptin concentrations showed significant within-group decreases, but were not different among groups. A supervised diet and exercise program is effective for weight loss; however, once intensive participant-investigator and participant-participant contact is discontinued, weight regain ensures.

**Benounis, et al., (2008)** studied effects of two month physical – endurance and diet – restriction programmes on lipid profiles and insulin resistance in obese adolescent boys. A sample of 24 obese adolescent boys participated in an eight week physical endurance and diet-restriction programme. The authors concluded that moderate physical endurance, combination of and dietary restriction training programmed significant decrease, in body mass index, plasma triglycerides, LDL and total cholesterol and cardiovascular risk factors in obese adolescent bodies. However, HDL
cholesterol to triglycerides was significantly increased in obese adolescent boys.

**Bhutkar, et al., (2008)** conducted on 78 subjects, (48 males and 30 females). It was observed that 6 months of suryanamaskar practice decreases resting pulse rate and blood pressure. At the same time it increases cardio-respiratory efficiency and respiratory capacity as evaluated by bicycle ergometry and various lung functions tests, in both male and female subjects. From this study we conclude that suryanamaskar practice can be advocated to improve cardio-respiratory efficiency for patients as well as healthy individuals.

**Wong, et al., (2008)** studied the effects of a 12-week twice weekly additional exercise training, which comprised a combination of circuit-based resistance training and aerobic exercises, in additional to typical physical education sessions, on aerobic fitness, body composition and serum C-reactive protein (CRP) and lipids were analysed in 13- to 14-year-old obese boys contrasted with a control group. Both the exercise group (EG, n = 12) and control group (CG, n = 12) participated in the typical 2 sessions of 40-minute physical education (PE) per week in schools, but only EG participated in additional 2 sessions per week of 45 to 60 minutes per session of exercise training, which comprised a combination of circuit-based resistance training and aerobic exercises maintained at 65% to 85% maximum heart rate (HRmax = 220 - age). Body composition was measured using dual energy X-ray absorptiometry (DEXA). Fasting serum CRP and blood lipids was analysed pre- and postexercise programme. Aerobic fitness was measured by an objective
laboratory submaximal exercise test, PWC170 (Predicted Work Capacity at HR 170 bpm). Exercise training significantly improved lean muscle mass, body mass index, fitness, resting HR, systolic blood pressure and triglycerides in EG. Serum CRP concentrations were elevated at baseline in both groups, but training did not result in a change in CRP levels. In the CG, body weight increased significantly at the end of the 12-week period. This study supports the value of an additional exercise training programme, beyond the typical twice weekly physical education classes, to produce physiological benefits in the management of obesity in adolescents, including prevention of weight gain.

Huang, et al., (2007) investigated the effect of a twelve-week heart health education and physical activity program on body weight and risk factors for type 2 diabetes and cardiovascular disease. Subjects were 120 obese fifth graders (65 boys and 55 girls, aged 10-13 years (mean 10.6 yrs), body mass index (BMI) at the 95th percentile or more) and were randomly assigned to an intervention group (n=60) or control group (n=60). The intervention group received a twelve-week heart health education and physical activity program, while the control group did not. In both groups, a series of examinations were done at baseline and post-test, including height, weight, BMI, body fat, blood pressure (BP), physical fitness (800-meter running test), heart health knowledge, and serum biochemistry. Differences for baseline and post-test data were compared between both groups. Mean changes in the intervention group versus control group were significant for weight (P = 0.024), BMI (P = 0.047), percentage body fat (P = 0.008), physical fitness (800-meter running
test) \((P = 0.025)\), heart health knowledge \((P = 0.006)\), total cholesterol \((P = 0.027)\), triglycerides \((P = 0.018)\), high-density lipoprotein cholesterol \((HDL-C) \ (P = 0.009)\), low-density lipoprotein cholesterol \((LDL-C) \ (P = 0.041)\), sugar \((P = 0.035)\), insulin \((P = 0.007)\), and insulin resistance \((HOMA-IR) \ (P = 0.028)\). At post-test, weight, BMI, body fat, total cholesterol, triglycerides, LDL-C, sugar, insulin and HOMA-IR had decreased, but HDL-C had increased in the intervention group. A classroom-based weight-control intervention provides educational programs to promote cardiovascular health in children. This intervention is simple, practical, and beneficial for elementary school children.

**Hansen, et al., (2007)** studied the dietary restriction combined with endurance exercise training represents an effective strategy to promote weight loss and reduce fat mass in obese patients. Exercise programmes without dietary restriction are less efficient. However, addition of exercise to a dietary restriction programme does not induce a greater fat-mass loss than dietary restriction alone. The latter is likely attributed to a compensatory reduction in daily physical activity following the implementation of exercise training. Nonetheless, inclusion of an exercise training programme is important to prevent a decrease in fat-free mass, increase relative visceral fat-mass loss, improve dietary compliance and eventually maintain long-term weight control. Obese male patients with the highest fat mass are most likely to lose the largest amount of fat mass in such lifestyle intervention programmes. Influences of training modalities during energy intake restriction on fat-mass loss are reviewed. The relationship between total energy expenditure during
exercise training and overall fat-mass loss has been firmly established. The amount of training forms a more important predictor of fat-mass loss than training intensity. The sort of exercise (e.g. walking, cycling, swimming) plays another important predictor of fat-mass loss in intervention programmes. The implementation of resistance training in such programmes does not augment fat-mass loss but improves body composition by increasing fat-free mass. Further studies are needed to define the optimal interventional programme for obese patients.

McTiernan, et al., (2007) studied the effect of national exercise recommendations on adiposity is unknown and may differ by sex. We examined long-term effects of aerobic exercise on adiposity in women and men. This was a 12-month randomized, controlled clinical trial testing exercise effect on weight and body composition in men (N = 102) and women (N = 100). Sedentary/unfit persons, 40 to 75 years old, were recruited through physician practices and media. The intervention was facility- and home-based moderate-to-vigorous intensity aerobic activity, 60 min/d, 6 days/wk vs. controls (no intervention). Exercisers exercised a mean 370 min/wk (men) and 295 min/wk (women), and seven dropped the intervention. Exercisers lost weight (women, -1.4 vs. +0.7 kg in controls, p = 0.008; men, -1.8 vs. -0.1 kg in controls, p = 0.03), BMI (women, -0.6 vs. +0.3 kg/m(2) in controls, p = 0.006; men, -0.5 kg/m(2) vs. no change in controls, p = 0.03), waist circumference (women, -1.4 vs. +2.2 cm in controls, p < 0.001; men, -3.3 vs. -0.4 cm in controls, p = 0.003), and total fat mass (women, -1.9 vs. +0.2 kg in controls, p = 0.001; men,
-3.0 vs. +0.2 kg in controls, p < 0.001). Exercisers with greater increases in pedometer-measured steps per day had greater decreases in weight, BMI, body fat, and intra-abdominal fat (all p trend < 0.05 in both men and women). Similar trends were observed for increased minutes per day of exercise and for increases in maximal oxygen consumption.

Stiegler and Cunliffe (2006) studied the fat-free mass (FFM) represents a key determinant of the magnitude of resting metabolic rate (RMR), it follows that a decrease in lean tissue could hinder the progress of weight loss. Therefore, with respect to long-term effectiveness of weight-loss programmes, the loss of fat mass while maintaining FFM and RMR seems desirable. Diet intervention studies suggest spontaneous losses in bodyweight following low-fat diets, and current data on a reduction of the carbohydrate-to-protein ratio of the diet show promising outcomes. Exercise training is associated with an increase in energy expenditure, thus promoting changes in body composition and bodyweight while keeping dietary intake constant. The advantages of strength training may have greater implications than initially proposed with respect to decreasing percentage body fat and sustaining FFM. Research to date suggests that the addition of exercise programmes to dietary restriction can promote more favourable changes in body composition than diet or physical activity on its own. Moreover, recent research indicates that the macronutrient content of the energy-restricted diet may influence body compositional alterations following exercise regimens. Protein emerges as an important factor for the maintenance of or increase in FFM induced by exercise.
training. Changes in RMR can only partly be accounted for by alterations in respiring tissues, and other yet-undefined mechanisms have to be explored. These outcomes provide the scientific rationale to justify further randomised intervention trials on the synergies between diet and exercise approaches to yield favourable modifications in body composition.

**Carrel, et al., (2006)** determined whether a school-based fitness program can improve body composition, cardiovascular fitness level, and insulin sensitivity in overweight children. Fifty overweight middle school children with a body mass index (BMI) above the 95th percentile for age were randomized to lifestyle-focused, fitness-oriented gym classes (treatment group) or standard gym classes (control group) for 9 months. Children underwent evaluation of fasting insulin and glucose levels, body composition by means of dual energy absorptiometry, and maximum oxygen consumption (V0(2)max) treadmill testing at baseline (before the school year) and at end of the school year. Rural middle school and an academic children's hospital. Baseline test results for cardiovascular fitness, body composition, and fasting insulin and glucose levels. At baseline, there were no differences between groups before intervention (values for age, 12 +/- 0.5 years [all results, mean +/- SD]; BMI [calculated as weight in kilograms divided by the square of height in meters], 31.0 +/- 3.7; percentage of body fat, 36.5% +/- 4.6%; lean body mass, 41.4 +/- 8.6 kg; and V0(2)max, 31.5 +/- 5.1 mL/kg per minute). Compared with the control group, the treatment group demonstrated a significantly greater loss of body fat (loss, -4.1% +/-3.4% vs -1.9% +/- 2.3%; P = .04), greater increase in
cardiovascular fitness (V0(2)max, 2.7 +/- 2.6 vs 0.4 +/- 3.3 mL/kg per minute; P<.001), and greater improvement in fasting insulin level (insulin level, -5.1 +/- 5.2 vs 3.0 +/- 14.3 microIU/mL [-35.4 +/- 36.1 vs 20.8 +/- 99.3 pmol/L]; P = .02). Children enrolled in fitness-oriented gym classes showed greater loss of body fat, increase in cardiovascular fitness, and improvement in fasting insulin levels than control subjects. The modification to the school physical education curriculum demonstrates that small but consistent changes in the amount of physical activity has beneficial effects on body composition, fitness, and insulin levels in children. Partnering with school districts should be a part of a public health approach to improving the health of overweight children.

**Langer and Houlay (2005)** determined if RMR of overweight and sedentary subjects consuming $\beta$-blockers can be increased following an aerobic exercise training program. Twenty-four subjects participated in the study; 11 (6 women, 5 men) were treated with $\beta$-blockers for hypertension and 13 (9 women, 4 men) were non medicated (control group). Body composition, RMR, and peak oxygen uptake (VI O2peak) were assessed for all subjects before and after a 12-week aerobic exercise training program. Weekly exercise energy expenditure equaled 83.68 kJ (20 kcal) per kg of body weight while exercise intensity was maintained between 60% and 70% of the V I O2 reserve. Body composition, RMR, and V I O2peak did not differ among groups at the beginning of the study. Body weight (1.4 kg for $\beta$-blockers, P G .05; j2.5 kg for control, P G .05) and V I O2peak (+2.2 mL/kg/min for $\beta$-blockers, P G .05; +4.1 mL/kg/min for control, P G .001) were significantly improved in both
groups, whereas RMR ($272$ kJ/day for $\beta$-blockers, NS; $+573$ kJ/day for control, $P \leq 0.05$) was increased only in the control group after the aerobic exercise training program. These results suggest that $\beta$-blockers limit the increase in RMR normally observed following an aerobic exercise training program. Consequently, obtaining a negative energy balance in an attempt to lose weight may be more difficult.

Monyeki, et al., (2005) determined the relationships between the body composition characteristics, body mass index (BMI), sum of skinfolds (SSF), % body fat (%BF), fat-free mass (FFM) and waist-to-hip ratio (WHR), and nine physical fitness items in undernourished rural primary school children in Ellisras, South Africa. A cross-sectional study. The study consisted of 462 boys and 393 girls who were aged 7-14 y. Five body composition measures were assessed: BMI, SSF, %BF, FFM and WHR. Nine physical fitness test items were assessed: standing long jump, bent arm hang, sit-ups, $10 \times 5$ m shuttle run, $50$ m sprint, $1600$ m run, flamingo balance, sit and reach, plate tapping. BMI was highly correlated with FFM ($r = 0.7$, $P < 0.001$). In line with findings from Western countries, regression coefficients ($B$) showed that children with higher BMI or SSF performed worse in bent arm hang (girls, $B = -0.84$, $P < 0.001$, and $B = -0.06$, $P = 0.02$, respectively) and in $1600$m run ($B = 6.68$, $P < 0.001$). BMI was significantly associated with flamingo balance ($B = 0.26$, $P = 0.04$). WHR was positively associated with bent arm hang ($B = 9.37$, $P = 0.03$), and inversely with sit and reach ($B = -7.48$, $P = 0.01$). In contrast, significant relationships were found between BMI and standing long jump ($B = 0.74$, $P =$
0.04), sit and reach (B = 0.51, P < 0.001), flamingo balance (B = 0.26, P = 0.04) and plate tapping (B = -19, P = 0.01). SSF was significantly associated with sit and reach (B = 0.04, P = 0.03). Significant inverse associations were found between FFM and bent arm hang (girls, B = -0.06, P = 0.05), 1600 m run (girls, B = -2.33, P = 0.003) and 50 m run (boys, B = -0.11, P = 0.006). FFM was significantly associated with standing long jump (boys, B = 0.99, P < 0.001; girls, B = 0.73, P < 0.001), flamingo balance (B = 0.17, P < 0.001), and with sit and reach (boys, B = 0.59, P = 0.03). In the present study in undernourished children, body composition was significantly related to physical fitness, but not always in the expected direction. It is therefore important to note that in this population, BMI should not be interpreted as a measure of fatness/overweight, but rather as an indicator of muscle mass.

**Nassis, et al., (2005)** examined the influence of cardiorespiratory fitness on total and truncal fatness in children. It was hypothesised that high cardiorespiratory fitness would result in lower total and central obesity. Observational cohort study. Primary and secondary schools in Athens, Greece. A total of 1362 healthy children aged 6-13 y (742 boys and 620 girls). Anthropometric data (height, body mass, four skin folds thickness) were collected and per cent body fat was calculated. Body mass index (BMI) sex- and age-specific cutoff points were used for overweight and obesity definition and children were placed in two groups: overweight/obese and non overweight. Cardiorespiratory fitness (CRF) was assessed with the endurance shuttle-run test. Participants were grouped into high (upper two quintiles) and low (lower
two quintiles) CRF based on age and sex distributions. T-test and Mann-Whitney test were used for comparisons between fit and unfit children within each BMI category. Sum of skinfolds, subscapular and truncal skinfold thickness, BMI and per cent body fat were lower in overweight and obese youths with high CRF in comparison with youths at the same BMI category with low CRF (P<0.01). The beneficial effect of high CRF was also presented in non overweight children (P<0.01). The influence of CRF on body composition remained even after correcting body fatness for BMI. Central and total obesity were lower in overweight and obese children with high CRF. This is the first study to show that a high CRF may reduce the hazards of obesity in children.

Heelan, et al., (2005) examined the increase the level of physical activity among children. However, the impact of walking, bicycling or skating (active commuting) to and from school on the prevalence of overweight is unknown. Body mass index (BMI) was measured for 320 children (age 10.2 +/- 0.7 years) in September. Over 5 months, an active commuting index (SI) and daily physical activity were estimated via questionnaire. In April, BMI and body fat were measured. A significant positive association was found between April BMI and SI adjusting for September BMI (partial r=0.03, P<0.05). Positive associations were found between SI and physical activity before school (r=0.17, P<0.05) and daily moderate intensity physical activity (r=0.13, P<0.05). There were no significant association between SI and BF (P>0.05). This preliminary data suggests that active commuting does not appear to provide sufficient amounts of physical activity to attenuate BMI; however, it may contribute to
the attainment of physical activity recommendations. Future research is needed to objectively measure the impact of active commuting on the prevalence of overweight.

Sabia, et al., (2004) compared the effect of continuous aerobic and intermittent anaerobic physical exercise associated with nutritional orientation on weight reduction, body composition, biochemical measures and physical capacity of obese adolescents. 28 adolescents between 12 and 14 years old were studied, whose body mass index (BMI) is above percentile 95 for age and gender. The volunteers were randomly distributed into 2 groups: continuous walking exercise (GEC; n = 13) and running intermittent exercise (GEI; n = 15) and underwent a physical training program 3 times a week during 16 weeks, with duration from 20 to 40 minutes. Nutritional orientation occurred once a week, in 60-minute group sessions, throughout the entire experiment. In the initial and final periods, weight and height were measured so as to calculate the BMI, as well as subcutaneous fold, arm (AC) and arm muscle circumferences (AMC), body composition by means of electric bioimpedance, biochemical serum analyses (glycemia and lipids), and direct determination of maximum oxygen intake (VO2max) and anaerobic threshold (LAn). In both groups (GEC and GEI), anthropometric findings, BMI and subcutaneous folds, were significant decreased. In biochemical evaluation, a significant decrease occurred in GEC with respect to HDL, LDL and total cholesterol serum levels, although still within normal values. Values of HDL and triglycerides presented significant decrease in GEI. VO2max values increased significantly in both
groups. We concluded that the physical activity proposed for both GEC and GEI was sufficient and satisfactory, promoting weight loss, better body composition and lipid levels, as well as an increase in the adolescents’ aerobic capacity.

Adkins, et al., (2004) examined the measurements of girls' physical activity and associations with BMI, parent's reported self-efficacy and support for helping daughters be active, girl's perceived support from parents for physical activity, parent's and girl's perceived neighborhood safety and access to facilities, and family environment. Fifty-two 8- to 10-year-old African-American girls and their primary caregiver in the Minneapolis/St. Paul area participated in the Girls Health Enrichment Multisite Studies pilot intervention to prevent weight gain by promoting healthy eating and physical activity. Data collected included height, weight, physical activity level, and physical activity-related psychosocial measures from girl and parent. Girls wore an activity monitor for three days to assess an activity level. Correlations were computed among the average minutes per day of moderate to vigorous activity between 12 pm and 6 pm and BMI and psychosocial measures. BMI was inversely correlated with moderate to vigorous activity \((r = -0.35, p < 0.01)\), whereas parent's self-efficacy for supporting daughter to be active was positively correlated with activity \((r = 0.45, p < 0.001)\). There was a trend for parent's reported support of daughter's activity level to be associated with activity \((r = 0.26, p < 0.06)\). Girl's perception of parent's support for physical activity, perceived neighborhood safety and access to facilities, and family environment
was not associated with girl's activity levels. Interventions to increase physical activity among preadolescent African-American girls may benefit from a parental component to encourage support and self-efficacy for daughters' physical activity.

Molnar, et al., (2004) examined the lack of physical activity is associated with increased risk of overweight and cardiovascular disease, conditions associated with lower socioeconomic status (SES). Associations between activity levels of urban youth and limited access to safe recreation areas in their neighborhoods of residence were investigated. Analyses of data from the Project on Human Development in Chicago Neighborhoods, a multilevel longitudinal study of families and communities, are reported. Individual-level data were obtained from 1378 youth 11 to 16 years old and caregivers living in 80 neighborhood clusters. Neighborhood-level data were collected from 8782 community residents and videotapes of 15,141 block faces. Parental estimates of hours youth spent in recreational programming were used to estimate physical activity. A scale of residents' assessment of neighborhood safety for children's play was created; disorder measures came from videotaped observations. Physical activity averaged 2.7 hours/week (SD = 5.0), varying significantly across neighborhoods. Using hierarchical linear regression, SES, age, and male gender, but not body mass index, were independently associated with physical activity. Lower neighborhood safety and social disorder were significantly associated with less activity, controlling for demographics. One mechanism for reduced physical activity among youth may
be the influence of unsafe neighborhoods. Neighborhood interventions to increase safety and reduce disorder may be efficacious in increasing physical activity, thereby reducing risk of overweight and cardiovascular disease.

**Deforche, et al., (2003)** assessed different aspects of physical fitness and physical activity in obese and non-obese Flemish youth. A random sample of 3214 Flemish schoolchildren was selected and divided into an "obese" and "non-obese" group based on body mass index and sum of skinfolds. Physical fitness was assessed by the European physical fitness test battery. Physical activity was estimated by a modified version of the Baecke Questionnaire. Obese subjects had inferior performances on all tests requiring propulsion or lifting of the body mass (standing-broad jump, sit-ups, bent-arm hang, speed shuttle run, and endurance shuttle run) compared with their non-obese counterparts ($p < 0.001$). In contrast, the obese subjects showed greater strength on handgrip ($p < 0.001$). Both groups had similar levels of leisure-time physical activity; however, non-obese boys had a higher sport index than their obese counterparts ($p < 0.05$). Results of this study show that obese subjects had poorer performances on weight-bearing tasks, but did not have lower scores on all fitness components. To encourage adherence to physical activity in obese youth, it is important that activities are tailored to their capabilities. Results suggest that weight-bearing activities should be limited at the start of an intervention with obese participants and alternative activities that rely more on static strength used.
Van, et al., (2002) investigated the effect of exercise training at different intensities on fat oxidation in obese men. Twenty-four healthy male obese subjects were randomly divided in either a low- [40% maximal oxygen consumption (V O2 max)] or high-intensity exercise training program (70%V O2 max) for 12 wk, or a non-exercising control group. Before and after the intervention, measurements of fat metabolism at rest and during exercise were performed by using indirect calorimetry, [U-13C] palmitate, and [1,2-13C]acetate. Furthermore, body composition and maximal aerobic capacity were measured. Total fat oxidation did not change at rest in any group. During exercise, after low-intensity exercise training, fat oxidation was increased by 40% (P < 0.05) because of an increased non-plasma fatty acid oxidation (P < 0.05). High intensity exercise training did not affect total fat oxidation during exercise. Changes in fat oxidation were not significantly different among groups. It was concluded that low intensity exercise training in obese subjects seemed to increase fat oxidation during exercise but not at rest. No effect of high-intensity exercise training on fat oxidation could be shown.

Dorien, et al., (2002) examined the relationship we reviewed studies of BMR in children, adolescents, adults, semistarved non-obese, anorexics, and weight-reducing obese. The relationship between BMR and fat-free mass (FFM) of children, lean adolescents, and lean and obese adults consuming sufficient energy could be described by a single line, BMR (MJ/d) = 2.44 + 0.084 FFM (SEE = 0.63, R2 = .80). Obese adolescents demonstrated BMRs greater than predicted and semistarved lean individuals demonstrated BMRs less than
predicted by this relationship. Obese individuals demonstrated a reduced BMR during underfeeding, but less so than semistarved lean individuals. The reduction in BMR relative to FFM in semistarved lean individuals could not be explained by disproportionate reductions in body cell mass (BCM).

Gutin, et al., (2002) determined the effects of physical training intensity on the cardiovascular fitness, percentage of body fat (%BF), and visceral adipose tissue (VAT) of obese adolescents. Obese 13–16-y-olds (n = 80) were assigned to 1) biweekly lifestyle education (LSE), 2) LSE + moderate-intensity physical training, or 3) LSE + high-intensity physical training. The intervention lasted 8 mo. Physical training was offered 5 d/wk, and the target energy expenditure for all subjects in physical training groups was 1047 kJ (250 kcal)/session. Cardiovascular fitness was measured with a multistage treadmill test, %BF with dual-energy X-ray absorptiometry, and VAT with magnetic resonance imaging. The increase in cardiovascular fitness in the high intensity physical training group, but not in the moderate-intensity group, was significantly greater than that in the LSE alone group (P = 0.009); no other comparisons of the 3 groups were significant. Compared with the LSE alone group, a group composed of subjects in both physical training groups combined who attended training sessions 2 d/wk showed favorable changes in cardiovascular fitness (P < 0.001), %BF (P = 0.001), and VAT (P = 0.029). We found no evidence that the high-intensity physical training was more effective than the moderate-intensity physical training in enhancing body composition. The cardiovascular fitness of obese adolescents was significantly improved by
physical training, especially high intensity physical training. The physical training also reduced both visceral and total-body adiposity, but there was no clear effect of the intensity of physical training.

**De Stefano, et al., (2000)** studied the fifteen obese boys (aged 9–12 yr, body mass index (BMI) 31.8±6.5, average percent body fat (%BF) 41±4.2) underwent a supervised aerobic and resistance training program (12 wk, 2 days/wk for 30 min/session), to investigate the effects on weight and body composition. After the 3-month training period, weight loss averaged only 1.5±1.0 kg (not significant), but total body fat decreased by 4.1±1.8 kg (p<0.05) and fat-free mass (FFM) increased by 2.6±1.1 kg (p<0.05) based on hydrostatic weighing. As a result, %BF fell by 10% (p<0.01). There was a 5.8±2.8 mL/kg/min (p<0.05) increase in peak volume of oxygen uptake (VO2), along with a 248±120 kcal/d (p<0.05) increase in resting energy expenditure (REE). Activity questionnaires showed a significant increase in high intensity recreational activities (6.5±1.5 vs 3.5±0.5 h physical activity/wk; p<0.01) in the home and a significant decrease in low intensity activities (7±2.0 vs 12±3.5 h TV viewing/wk; p<0.01). Vigorous supervised aerobic training in obese boys has beneficial effects on body composition, fitness and leisure time activities that are not apparent by measurement of changes in body weight alone.

probability sample of 16,007 men and women aged 18 to 74 years was selected using health insurance registration files in each province. Anthropometry was performed on 10,054 (63%) of these adults. The power of height in the body mass index (BMI, kg/m2) and of hip circumference in the ratio of waist to hip circumference (WC/HC) was varied from 0 to 3. Simple linear regression analysis for each age-sex group was used to examine the relation of each index to systolic and diastolic blood pressure (SEP and DBP), levels of total cholesterol (TC), low-density lipoprotein cholesterol (LDL) and high-density lipoprotein cholesterol (HDL), triglycerides (TRIG) and the ratio of TC to HDL. Values for the coefficient of determination (r²) were used to compare the fits of the models. The r² values were generally low (< 0.27), but were greatest in the younger age groups (18-24 and 35-54 years) and in women. Waist circumference alone (WC/HC0) showed the best fit with SEP and DBP, whereas WC/HC0.5 was most closely related to HDL, TC/HDL and TRIG. None of the indices was closely associated with TC or LDL. Whatever the power of height used, the weight-height ratios showed weaker associations with the risk factors than the waist-hip ratios. WC and BMI correlate most closely with blood pressure and plasma lipid and may be the best simple anthropometric indices to include in the routine clinical examination of adults.

Katzel, et al., (1995) compared the effects of weight loss vs aerobic exercise training on coronary artery disease risk factors in healthy sedentary, obese, middle-aged and older men. A total of 170 obese (body mass index, 30 +/- 1 kg/m2 [mean +/- SEM]), middle-aged and older (61 +/- 1 years) men. A
9-month diet-induced weight loss intervention, 9-month aerobic exercise training program, and a weight-maintenance control group. Change in body composition, maximal aerobic capacity (V02 max), blood pressure, lipoprotein concentrations, and glucose tolerance. Forty-four of 73 men randomized to weight loss completed the intervention and had a 10% mean reduction in weight (-9.5 +/- 0.7 kg; P < .001), with no change in VO2 max. Forty-nine of 71 men randomized to aerobic exercise completed the intervention, increased their VO2 max by a mean of 17% (P < .001), and did not change their weight, whereas the 18 men who completed in the control group had no significant changes in body composition or VO2 max. Weight loss decreased fasting glucose concentrations by 2%, insulin by 18%, and glucose and insulin areas during the oral glucose tolerance test (OGTT) by 8% and 26%, respectively (P < .01). By contrast, aerobic exercise did not improve fasting glucose or insulin concentrations or glucose responses during the OGTT but decreased insulin areas by 17% (P < .001). In analysis of variance, the decrement in fasting glucose and insulin levels and glucose areas with intervention differed between weight loss and aerobic exercise when compared with the control group (P < .05). Similarly, weight loss but not aerobic exercise increased high-density lipoprotein cholesterol levels (+ 13%) and decreased blood pressure compared with the control group. In multiple regression analyses, the improvement in lipoprotein and glucose metabolism was related primarily to the reduction in obesity. These results suggest that weight loss is the preferred treatment to
improve coronary artery disease risk factors in overweight, middle-aged and older men.

**Broeder, et al., (1992)** investigated the effect of aerobic fitness on resting metabolic rate. The objective of this study was to find the relationship between resting metabolic rate and aerobic fitness. Body composition, resting metabolic rate, and a three-day dietary recall were collected from the subjects. The subjects were placed in low, moderate, or high fitness levels aerobic exercise of their tests. The results of the significantly different among the groups were fat free mass normally positively associated with resting metabolic rate. If the groups were graded on their level of strength, then there could possibly prove to be significant differences between groups.

**Dattilo and Kris-Etherton, (1992)** examined the effects of weight loss by dieting on lipids and lipoproteins through the review method of meta-analysis. Results from the 70 studies analyzed indicated that weight reduction was associated with significant decreases \((P \lt 0.001)\) and correlations \((P \lt 0.05)\) for TC \((r = 0.32)\), LDL-C \((r = 0.29)\), VLDL-C \((r = 0.38)\), and TG \((r = 0.32)\). For every kilogram decrease in body weight, a 0.009-mmol/L increase \((P \lt 0.01)\) in HDL-C occurred for subjects at a stabilized, reduced weight and a 0.007-mmol/L decrease \((P \lt 0.05)\) for subjects actively losing weight. Our results indicate that weight reduction through dieting can be a viable approach to help normalize plasma lipids and lipoproteins in overweight individuals.

**Luke and schoeller (1992)** examined the relationship between BMR and fat-free mass (FFM) of adolescents, and weight-reducing
obese. Obese adolescents demonstrated BMRs greater than predicted and semi-starved lean individuals demonstrated BMRs less than predicted by this relationship. Obese individuals demonstrated a reduced BMR during underfeeding, but less so than semi-starved lean individuals. The reduction in BMR relative to FFM in semi-starved lean individuals could not be explained by disproportionate reductions in body cell mass.

2. **Studies on Yogic Practices on Selected Variables**

*Ashwini Sham Tikhe, Subramanya Pailoor, et al., (2015)* assessed the effect of intensive integrated approach of yoga therapy (IAYT) on body fat and body mass index (BMI) and resting metabolism in mid-life overweight patients with T2DM (BMI, Mean ± SD, 27.05 ± 4.51). For this study investigators had taken Twenty-four mid-life patients (6 females) with T2DM (Age, Mean ± SD, 55.38 ± 7.96 years) participated in the study and practiced IAYT for 7 days. The IAYT works at five layers of human existence (physical, vital, mental, intellectual and bliss) to bring positive health. The body fat and BMI and resting metabolism were recorded before and after IAYT using Karada Scan body composition monitor HBF-375 from Omron Healthcare Singapore PTE LTD. SPSS-16 was used to analyze the data. Shapiro-Wilk test showed that the data was not normally distributed. Further, the Wilcoxon signed-ranks test was used to analyze the change in means of pre- and post-measurements. Data analysis showed that there was a significant decrease in body fat and BMI and resting metabolism (in all assessments, P < 0.001). The present study
suggested that 7 days practice of IAYT has a great promise for the management of overweight in mid-life patients with T2DM. Additional well-designed studies are needed before a strong recommendation can be made.

**Dr. B Chittibabu (2014)** assessed the combined effect of strength, endurance training and yogic practices on physiological variables of obese adolescent children. A total of forty five (45) male obese subjects having BMI 30.0-39.9 were selected for the study. Their age ranged between 10 to 14 years. These subjects were randomly distributed in each group namely strength, endurance training and yogic practice group (SEYPG: 15) and control group (CONG: 15). The criterion variables selected in the study were body mass, percent body fat, lean body mass, systolic blood pressure, diastolic blood pressure, resting heart rate and VO2max. The result of paired t test revealed a significant decrease in body mass, percent body fat, systolic blood pressure, diastolic blood pressure and resting heart rate. In contrast lean body mass and VO2max increased. It is concluded that 8 weeks of combined strength, endurance training and yogic practices significantly alter the physiological variables and thereby it improves the health status of the obese adolescent school children.

**John C Sieverdes, Martina Mueller, et al., (2014)** stated that yoga improves blood pressure (BP) control, with down regulation of the hypothalamic–pituitary–adrenal (HPA) axis and the sympathetic nervous system (SNS) projected as underlying mechanisms. This pilot study assessed whether hatha yoga has the potential to reduce BP among youth and whether
dampening of the SNS and/or HPA activity is a likely pathway of change. For this study Thirty-one seventh graders were randomly assigned to a Hatha yoga program (HYP) or attention control (AC) music or art class. Baseline and 3-month evaluations included resting BP; overnight urine samples; and saliva collected at bedtime, upon awakening, and at 30 and 60 minutes after awakening for α-amylase and cortisol assays. Results shown Twenty-eight (14 in the HYP group and 14 in the AC group) students were assessed both before and after the intervention. BP changes from pre to post intervention were 3.0/-2.0mmHg for HYP group and -0.07/-0.79mmHg for the AC group (p=0.30 and 0.57, respectively). Changes in systolic BP (SBP)/diastolic BP (DBP) for the prehypertensive (75th–94th percentiles for SBP) subgroup analyses were -10.75/-8.25mmHg for HYP group (n=4) versus 1.8/1.0mmHg for the AC group SBP=0.02; p for DBP=0.09). Although no statistically significant group differences were observed with changes in SNS or HPA awakening curves (area under curve for α-amylase and cortisol, respectively), a small to moderate effect size was seen favoring a reduction of α-amylase activation for the HYP group (Cohen d=0.34; prehypertensive d=0.20). A school-based Hatha yoga program demonstrated potential to decrease resting BP, particularly among prehypertensive youth. Reduced SNS drive may be an underlying neurohormonal pathway beneficially affected by the program. A large-scale efficacy/effectiveness randomized clinical trial is warranted.

Dr. P. Leela, Dr. C.R. Mallikarjun, et al., (2013) stated that coronary heart disease is one of the major causes of death and having a prevalence of
10% in Indian population. Dyslipidemia is one of the important modifiable risk factor. It initiates atherosclerotic plaque formation, finally resulting in degeneration of endothelial cell function, which enhances the coagulability of blood by activation of various factors for which apolipoproteins have been implicated. Various attempts such as physical exercises and dietary modifications have been performed to control the lipid content of blood. The aim of present study was to know the effects of Pranayama and Yoga on Apolipoproteins, lipid profile and atherogenic index in healthy subjects. In this study a group of 30 healthy age and sex matched subjects were selected from whom blood was drawn before and after Pranayama and yoga for assay of Apolipoproteins and lipid profile by immunoturbidimetric and enzymatic methods, respectively. There is a significant reduction in the levels of Total cholesterol, LDL-C, Apolipoprotein B and ratio of ApoB/ApoA1, also significant increase in the levels of HDL-C and ratio of HDLC/T.Cholesterol after Yoga and pranayama.

**Dr. Maninder Bindra, Dr. Shema Nair, et al., (2013)** conducted a study on Type II diabetic mellitus is a highly prevalent chronic disease strongly associated with obesity and fat distribution. A number of behavioral interventions’ have been suggested for preventing and controlling type II diabetic mellitus including increased physical activity, diet modification and cessation of smoking. In order to regulate the stress psychology which is associated with insulin resistance, obesity and hypertension; mind body interventions have been suggested. The purpose of this investigation was to
systematically analyze and synthesize yoga interventions designed to prevent and control type II diabetic mellitus. The study of conducted in the department of Biochemistry Gandhi Medical College in association with yoga Kendras Bhopal and Department of Pathology Gandhi Medical College. The study design was two groups of 50 subjects each. One group is taking only conventional medicines (group-I) and the other practicing yoga along with conventional medicines (group-II). Participants were type-II diabetics not taking insulin, recruited opportunistically by general practice staff with diabetic duration not more than 10 years. Patients with rheumatoid arthritis, cancer, pulmonary TB, myocardial infarction and those who were not willing to perform yoga were excluded. First, (Primary) outcome measure was HbA1C. Secondary outcome measures included lipid levels, blood glucose levels, quality of life related to diabetes. the lipid profile and other diabetic markers in type-II diabetes who were on conventional antidiabetic therapy and observed no statistical difference in mean values of lipid profile, fasting blood sugar and HbA1C, P>0.05 between two groups the group who were on yoga with conventional medicine shows greater control on diabetic markers than the group who was on conventional therapy alone. P > 0.01 except triglycerides (P> 0.05).

Lee JA, Kim JW, and Kim DY, (2012) stated that regular and continuous yoga exercise is one of the most important non pharmacological methods of improving serum lipid concentrations, adipose tissue, and metabolic syndrome factors. The purpose of this study was to analyze the effects of yoga exercise on serum adiponectin and metabolic syndrome factors.
in obese postmenopausal Korean women. For this study sixteen healthy
postmenopausal women aged 54.50 ± 2.75 years with more than 36% body fat
were randomly assigned to either a yoga exercise group (n = 8) or to a "no
exercise" control group (n = 8). The variables of body composition, visceral fat,
serum adiponectin, and metabolic syndrome factors were measured in all the
participants before and after the 16-week study. Body weight, percentage of
body fat, lean body mass, body mass index, waist circumference, and visceral
fat area had significantly decreased. High-density lipoprotein cholesterol and
adiponectin had significantly increased, but total cholesterol, triglyceride, low-
density lipoprotein cholesterol, blood pressure, insulin, glucose, and
homoeostasis model assessment-insulin resistance had significantly decreased.
Serum adiponectin concentrations were significantly correlated with waist
circumference, high-density lipoprotein cholesterol, diastolic blood pressure,
and homoeostasis model assessment-insulin resistance in the postyoga
exercise group. Our findings indicate that yoga exercise improves adiponectin
level, serum lipids, and metabolic syndrome risk factors in obese
postmenopausal women. Consequently, yoga exercise will be effective in
preventing cardiovascular disease caused by obesity in obese postmenopausal
Korean women.

Hatha Yoga (HY) is an alternative exercise system for improving health in
adults and older people with low physical capacity. Although the HY benefits
on cardiovascular health have been demonstrated, its physical determinants
haven’t been demonstrated. Therefore, this study evaluates the effect of an HY intervention on cardiovascular risk factors, in physically active adult women. For this study sixteen healthy and physically active adult women (56.31±10.47 years) were enrolled into an 11-week HY program (55 sessions/ 90 min each session). The program adherence, asana performance and work intensity were assessed along the intervention. Anthropometry and biochemical analysis were evaluated before, and after HY intervention. Cardiovascular fitness and dietary parameters were evaluated before and after HY intervention. After the completion of study we can find A decreased of ~1.5 kg of body fat and ~17 mm of skinfold thickness (p<0.05) was detected in women. Total serum cholesterol, HDL-C, LDL-C, glucose and lactate increased 27 mg/dl, 11 mg/dl, 19 mg/dl, 11 mg/dl and 5 mM, respectively (p<0.05). The maximum oxygen uptake (VO2 peak) increased ~3 ml/kg/min. Systolic and diastolic blood pressure decreased 6 mmHg and 3 mmHg respectively (p<0.05). Heart rate (56 ± 8 beats/min) during HY determined changes in the Σ skin folds and systolic blood pressure (78 and 58% of the variance, respectively). Likewise Asana performance skills determined changes in HDL-C, glucose and maximal lactate (79, 42 and 89% of the variance, respectively). Finally, the program adherence, measured as % session attendance”, determined changes in diastolic blood pressure (55% of the variance). Hence the proposed HY intervention improves physical fitness and reduces CVD risk factors in physically active adult women. In addition, heart rate during HY exercise, asana performance skills and percentage
assistance to the intervention program, determined about 42-89% of the changes in cardiovascular health in senior physically active women.

**Asai and Rane (2011)** conducted an experiment study on asanas and lezium programme on selected physical fitness variables of school boys. The objectives to measure over all physical fitness level of the school boy of age 14 to 16 years. Selected subjects were divided into two equal groups one control group and a experimental group. Seventy male students (n=70) from the secondary section of our lady of Nazareth high school. Bhayandar, Mumbai in India. The health related physical fitness test was considered as dependent variable. The subjects of the experimental group were then put under six weeks of lezium and yogic exercises training programme. The collected data were statistically analyzed by using analysis of variance (ANOVA). The authors conclude that there was significantly changes in health related physical fitness such as, cardio-respiratory endurance, abdominal strength and endurance and flexibility increase the performance. However, the body fat percentage significantly reduces performance for due the asana and lezium training programme.

**Elangovan and Babu (2011)** suggested that the effect of yogic practices on selected bio-chemical variables of obese college men with age between 19 to 25 years. The selected subjects were randomly assigned into two equal groups namely experimental group (N: 15) which underwent yogic practices for 12 weeks with 4 sessions per week and control (N:15) which did not undergo any special training. The subjects were tested for Laboratory test prior to and after
training on selected variable HDL, and LDL and BMI, the obtained data were statistically assessed for any significant difference using ANCOVA. The author concluded that the significantly increased due to HDL. However LDL cholesterol was significantly decreasing in obese college men.

Ramesh (2011) conducted a study on the effect of physical and breathing exercise on fat free mass index (FFM) and basal metabolic rate (BMR) variable of obese adolescence. The present study has undertaken the survey method for identifying obese of the school going students. The researcher evaluated the existing data from school survey in Triunelveli town (4,732 boys) to measure the height and weight of the students (BMI) after which the effect study was conducted. To achieve the purpose of these study forty five school boys were selected from St.Johns higher secondary school, and Sri Manthiramoorthy higher secondary school, in Tirunelveli town. Their age ranged from 13 to 18 years. They were divided in to three equal groups and designed as Experimental group ‘A’, Experimental group ‘B’ and Control group ‘C’ The Experimental group-A was given aerobic and calisthenics exercises, Experimental group-B underwent yogic exercise such as Asanas and Pranayama (breathing exercises) for a period of three months, both morning and evening for five days in a week, whereas control group-C is not involved any specific exercise programme other than their regular physical activities programme as per their school curriculum. The result of this study indicated that fat free mass reduced significantly and also it was observed that basal metabolic (burning capacity) significantly increased.
Mody (2010) assessed the cardio-respiratory and metabolic responses of four rounds of Suryanamaskar, a typical amount performed by practitioners, to determine its potential as a training and weight loss tool. Six healthy Asian Indian men and women (18–22 years) who had trained in Surya Namaskar for over two years participated in the study. Testing was completed in a single session lasting about 30 min. To measure heart rate and oxygen consumption while performing the four rounds, participants were connected to a heart rate monitor and the Oxycon Mobile Metabolic System. Participants exercised at 80% of age-predicted maximal heart rate (HRmax) during Round 2, 84% during Round 3, and 90% during Round 4. Average intensity during the four rounds was 80% HRmax, sufficient to elicit a cardio-respiratory training effect. Oxygen consumption averaged 26 ml/kg/min during each round, resulting in an energy expenditure of 230 kcals during a 30 min session for a 60 kg individual. Regular practice of Suryanamaskar may maintain or improve cardio-respiratory fitness, as well as promote weight management.

Telles, et al., (2010) studied the effects of yoga and diet change program, emphasizing breathing techniques practiced while seated, was assessed in obese persons. A single group of 47 persons were assessed on the first and last day of a yoga and diet change program, with 6 days of the intervention between assessments. The assessments were: body mass index (BMI), waist and hip circumferences, mid-arm circumference, body composition, hand grip strength, postural stability, serum lipid profile and fasting serum leptin levels. Participants practiced yoga for 5 hours every day
and had a low fat, high fiber, vegetarian diet. Last and first day data were compared using a t-test for paired data. Following the 6-day residential program, participants showed a decrease in BMI (1.6 percent), waist and hip circumferences, fat-free mass, total cholesterol (7.7 percent decrease), high density lipoprotein (HDL) cholesterol (8.7 percent decrease), fasting serum leptin levels (44.2 percent decrease) and an increase in postural stability and hand grip strength (p<0.05, all comparisons). A 6-day yoga and diet change program decreased the BMI and the fat-free mass. Total cholesterol also decreased due to reduced HDL levels. This suggests that a brief, intensive yoga program with a change in diet can pose certain risks. Benefits seen were better postural stability, grip strength (though a 'practice effect' was not ruled out), reduced waist and hip circumferences and a decrease in serum leptin levels.

**Dhananjai, et al., (2010)** studied the effect of a yoga practice for 12 weeks on lipid profiles of 56 obese subjects (32 females and 24 males) age ranged from 20 to 45 yrs were evaluated. Results revealed a significant (p<0.01) decrease in anthropometric variables (weight, body mass index, waist circumference and hip circumference). Further, total cholesterol, triglyceride, very low density lipoprotein, low density lipoprotein and fasting plasma glucose decreased significantly (p<0.01) while high density lipoprotein increase significantly when compare to the basal variables before intervention given (p<0.01). A significant and positive correlation was evident among pretreatment anthropometric variables (p<0.01) while most of the lipid profiles parameters also showed a significant (p<0.05 or p<0.01) positive or negative correlation
with each other. The pretreatment weight ($r=0.49; p<0.01$), waist circumference ($r=0.39; p<0.01$) and hip circumference ($r=0.26; p<0.05$) showed significant and positive correlation with pretreatment Triglyceride. The change (improvement) in weight and TG were significantly ($r=0.49, p<0.01$) associated with each other. However, the improvement in all anthropometric variables and lipid profiles parameters of females and males were found to be similar ($p>0.05$). This pilot study found yoga practices effective in reducing weight. Further, this weight loss is also found to be associated well with the improvements in lipid profiles. Investigations with large sample size, different covariates and follow up of outcomes are needed to validate the effect of other yoga exposures.

Ramesh and Subramaniam (2010) conducted a study on the cardiorespiratory fitness and body mass index between rural and urban school boys. For the purpose of this study two hundred six (206) boys studying in schools located in Urban area and three hundred ninety seven (397) boys studying in school located in urban and Rural area of Tirunelveli (Tamilnadu) age ranged from 11 to 16 years, were selected as subjects for the study. The cardiorespiratory fitness of the subjects was evaluated by conducting six minute run and walk tests and body mass index was determined by dividing weight in kilogram by the square of body height in meters. T-test was applied to determine the significance of mean differences between Urban and Rural school boys on body mass index and cardio-respiratory fitness. It was found that rural boys were better in cardio-respiratory fitness was well as BMI. Urban school boys were heavier than Rural School boys of Tirunelveli. Urban school
boys were having grater body mass index (BMI) as compared to Urban School boys. Rural school boys were better in cardio-respiratory fitness than urban school boys of Tirunelveli. The findings of this study suggest that children who have higher body mass index and lower cardio respiratory fitness are likely to have grater BMI gain over time.

**Ramesh and Subramaniam (2010)** carried out a study on the effect of yogic pranayama and meditation on selected physical and physiological variables in adolescents with age group of 12 to 15 years were selected from Jawaharlal Navodaya Vidyalaya higher Secondary School Pondicherry. The subjects were divided into two groups namely control group and experimental group. The experimental group was given yogic pranayama and meditation for a period of twelve weeks, both morning and evening an alternative days in a week. The control group did not participate in yogic pranayama and meditation training programme. The collected data were statistically analyzed by using ANCOVA. The author concluded that there was a significant change in flexibility increase performance in adolescents.

**Bezerra, et al., (2010)** conducted a study on the effects of yoga on bone biochemical markers (BBM) of formation (osteocalcin) and absorption (carboxy-terminal collagen crosslinks, CTX), and estradiol hormone. Forty eight post-menopausal women (63.9 ± 5.6 years old) were divided into two groups: Yoga Group (YG, n = 24) and Control Group (CG, n = 24). The YG performed yoga three times per week (one hour each session) for six months, while the CG was instructed to do not alter their habitual daily routine. Bone mineral density
(BMD), BBM and estradiol hormone were analyzed before and after Yoga program by standard procedures. A mixed factorial ANOVA was performed to verify intra and inter group differences. A significant decrease in spinal lumbar and total hip BMD for the CG was observed while only spinal lumbar BMD decreased in the YG. Osteocalcin values increased in YG and decreased in CG, while CTX values decreased in both groups. No significant differences were observed for the estradiol hormone. It was concluded that the yoga intervention failed to induce significant improvements in post-menopausal women BMD, however, it was capable of enhancing biochemical marker of bone formation as measured by serum osteocalcin, thus suggesting an increased bone turnover.

Jimenez (2010) evaluated the effect of an intensive HY intervention (IHY) on cardiovascular risk factors in middle-aged and older women from Northern Mexico. In this prospective quasi experimental design, four middle-aged and nine older CHY practicing females (yoginis) were enrolled into an 11-week IHY program consisting of 5 sessions/week for 90 min (55 sessions). The program adherence, asana performance, and work intensity were assessed along the intervention. Anthropometric [body mass index (BMI), % body fat and \( \Sigma \) skin folds], cardiovascular fitness [maximal expired air volume (VE max ), maximal O 2 consumption (VO 2max ), maximal heart rate (HR max), systolic (BPs) and diastolic blood pressure (BPd)], biochemical [glucose, triacylglycerols (TAG), total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), and low-density lipoprotein cholesterol (LDL-C)], and dietary parameters were evaluated before and after IHY.
caloric intake (~1,916 kcal/day), program adherence (~85%), and exercising skills (asanaperformance) were similar in both middle-aged and older women. The IHY program did not modify any anthropometric measurements. However, it increased VO2max and VE max and HDL-C while TAG and LDL-C remained stable in both middle-aged and older groups (P< 0.01). The proposed IHY program improves different cardiovascular risk factors (namely VO2max and HDL-C) in middle-aged and older women.

Fillmore, et al., (2010) documented the effects of yoga interventions on balance, flexibility, and strength in adolescent girls 14 to 18 years. Quasi-experimental, non-randomized. A convenience sample of 33 female adolescents participated in yoga training 2 times per week and a walking program 3 times per week, for 7 weeks. The instructor-led group received instruction from a registered yoga therapist in person, while the video-led group watched a tape of the instructor-led session. Pre- and post-measurements of weight, hamstring flexibility, body fat, strength, and balance were collected. Means were computed for all variables. Levene's tests for equality of variances were run to determine baseline homogeneity. Histograms with a normal curve superimposed were drawn to check for normal distribution. Repeated-measures general linear model tests were run to test for both within- and between-subjects factors, as well as interactions between the two. Yoga may be a useful adjunct to therapy programs and provide a method to keep this age group interested in exercise.
Ruhal, et al., (2010) studied the 30 male students of BPE first year of LNIPE (Deemed University), Gwalior were randomly selected as subjects. Subjects were divided into two groups that is, one experimental group and one control group. The quantitative measurements of each subject were taken with the help of standard equipment, before and after the treatment period of 12 weeks. The selected body composition variables were body fat (%), lean body mass (kg), body water content (%) and basal metabolic rate (KCl) were administered in the Yoga Laboratory of the Institute. Paired ‘t’ test was applied to determine the effect of kapalbhati on selected body composition variables. The paired ‘t’ test revealed that practice of kapalbhati pranayama had significant effect on body fat % (t = 5.47, against required value of 1.761), lean body mass (t = 9.65, against required value of 1.761), body water content (t = 17.24, against required value of 1.761) and basal metabolic rate (t = 9.410, against required value of 1.761) which showed significant effect of practice of kapalbhati pranayama. On the basis of results following conclusions were drawn:

(1) significant effect was found on body fat % and no change was found in control group. (2) Significant effect was found on lean body mass and no change was found in control group. (3) Significant effect was found on body water content and no change was found in control group. (4) Significant effect was found on basal metabolic rate and no change was found in control group.

Acharya, et al., (2010) studied the effect of pranayama (voluntary regulated breathing) and yogasana (yoga postures) on lipid profile in normal
healthy junior footballers. Twenty male junior footballers younger than 15 years of age, belonging to the Mohun Bagan Athletic Club, Kolkata, were selected for the study at Haridwar. They had to play in a Football Cup organized in UK and they were here to practice yoga sequences taught by Swami Ramdevji. They were of age 14.65±0.58 years and none of them had a history of lipid metabolism disorders. There was a significant reduction in the levels of serum cholesterol, Low-density lipoprotein (LDL) cholesterol, serum triglycerides, and very-low-density lipoprotein (VLDL)-cholesterol at the end of the yogasession. The results indicated that the fasting blood sugar (FBS) level was positively elevated in junior footballers. This demonstrated that Pranayama and Yogasana were helpful in regulating sugar level also. Study demonstrates the efficacy of SRY (Swami Ramdev Yoga)-Pranayama and Yogasana sequences on blood lipid profiles in normal healthy footballers. Pranayama and Yogasana can be used as supportive therapy in patients with lipid disorders, heart diseases, hypoglycemia, and so on. There is a need for conducting the experiments on a larger number of participants, to explore the results and mode of action.

Chen, et al., (2009) investigated the effect of yoga exercise on the health-related physical fitness of school-age children with asthma. The study employed a quasi-experimental research design in which 31 voluntary children (exercise group 16; control group 15) aged 7 to 12 years were purposively sampled from one public elementary school in Taipei County. The yoga exercise program was practiced by the exercise group three times per week for a
consecutive 7 week period. Each 60-minute yoga session included 10 minutes of warm-up and breathing exercises, 40 minutes of yoga postures, and 10 minutes of cool down exercises. Fitness scores were assessed at pre-exercise (baseline) and at the seventh and ninth week after intervention completion. A total of 30 subjects (exercise group 16; control group 14) completed follow-up. Results included: 1. Compared with children in the general population, the study subjects (n = 30) all fell below the 50th percentile in all five physical fitness items of interest. There was no significant difference in scores between the two groups at baseline (i.e., pre-exercise) for all five fitness items. 2. Research found a positive association between exercise habit after school and muscular strength and endurance among asthmatic children. 3. Compared to the control group, the exercise group showed favorable outcomes in terms of flexibility and muscular endurance. Such favorable outcomes remained evident even after adjusting for age, duration of disease and steroid use, values for which were unequally distributed between the two groups at baseline. 4. There was a tendency for all item-specific fitness scores to increase over time in the exercise group. The GEE analysis showed that yoga exercise indeed improved BMI, flexibility, and muscular endurance. After 2 weeks of self-practice at home, yoga exercise continued to improve BMI, flexibility, muscular strength, and cardiopulmonary fitness.

Karunakaran and Ramesh (2009) conducted study on effect of raja yoga and pranayama on selected physical and physiological variable of adults. The objectives of this study were to find out the physical and physiological
variable. The selected variables of Flexibility in measure the sit and reach box. For this study thirty boys in the age group of 23 to 27 years were selected from Pondicherry University, Pondicherry. The subjects were divided into two groups namely control group and experimental group. The experimental group was yogic pranayama and meditation for a period of twelve weeks, both morning and evening on five days a week. The control group did not participate in yogic pranayama and meditation training programme. The collected data were statistically analyzed by using analysis of covariance (ANCOVA). The Experiment group had a significant improvement on the selected physical and physiological variables except systolic and diastolic blood pressure than control group.

Farias, et al., (2009) studied the influence of programmed physical activity on body composition among adolescent students during 1 school year. The sample included 383 students (age range: 10 to 15 years) separated into two groups: 186 cases (96 male and 90 female) and 197 controls (108 male and 89 female). This was an intervention study with pre- and post-test assessments in which interventions consisted of programmed physical activity; the control group had conventional school physical education. Body composition was assessed by anthropometric measurements, body mass index (BMI), body fat percentage and fat and lean body mass. In the case group, subscapular skinfold thickness, BMI, body fat percentage and fat body mass remained stable; there were significant reductions in tricipital skinfold thickness and in abdominal perimeter among girls and significant increases in
arm, waist and calf perimeters and in lean body mass. In the control group, there were significant increases in BMI, tricipital skin fold thickness, abdominal perimeter and fat body mass among girls. At post-test, overweight and obesity significantly decreased among case group subjects, but not among controls. Programmed physical activity resulted in improvement or maintenance of body composition parameters and in reduction of overweight and obesity in the intervention group.

Sukhee Lee and Kim (2006) identified the effects of aerobic exercise and yoga on body composition and lipid metabolism in abdominal obese women. Using one-group pretest-posttest design, a convenience sample of 23 women who had abdominal obesity (greater than 32 inches of waist circumference) was recruited in a local area of P city and participated in 1 hour of aerobic exercise and yoga program twice a week for 12 weeks. Body composition was measured by body mass index, body fat ratio, waist and hip circumference, and waist-hip ratio; and lipid metabolism was measured with blood pressure, total cholesterol and triglycerides. At pretest, mean age of the subjects was 48.7(SD=9.5) and body fat ratio was 33%, and waist-hip ratio was .85. By paired t-tests, waist circumference and waist-hip ratio were significantly decreased before and after the program but body mass index, blood pressure, and the level of lipid metabolism did not change.

Chaya, et al., (2006) investigated the net change in the basal metabolic rate (BMR) of individuals actively engaging in a combination of yoga practices (asana or yogic postures, meditation and pranayama or breathing exercises) for
a minimum period of six months, at a residential yoga education and research center at Bangalore. The measured BMR of individuals practicing yoga through a combination of practices was compared with that of control subjects who did not practice yoga but led similar lifestyles. The BMR of the yoga practitioners was significantly lower than that of the non-yoga group, and was lower by about 13 % when adjusted for body weight (P < 0.001). This difference persisted when the groups were stratified by gender; however, the difference in BMR adjusted for body weight was greater in women than men (about 8 and 18% respectively). In addition, the mean BMR of the yoga group was significantly lower than their predicted values, while the mean BMR of non-yoga group was comparable with their predicted values derived from 1985 WHO/FAO/UNU predictive equations. This study shows that there is a significantly reduced BMR, probably linked to reduced arousal, with the long term practice of yoga using a combination of stimulatory and inhibitory yogic practices.

Blank (2006) evaluated acute physiological responses to Hatha yoga asanas (poses) practiced in the Iyengar tradition. Preliminary data were collected on the impact of postural alignment on physiological responses. Intermediate/advanced level yoga practitioners (n=15 females) were monitored for heart rate (HR), oxygen uptake (VO2), and brachial arterial blood pressure (n = 9) during a 90 min practice. The subjects, aged 43.5 ± 6.9 yr (average ± SD), had current weekly practice of 6.2 ± 2.4 hr/week and practice history 9.2 ± 7.2 yr. Physical characteristics of the subjects included: height (167.3 ± 4.1
cm), body mass (59.3 ± 7.2 kg), and percent body fat (23.1 ± 3.6 %). The practice included supine, seated, standing, inversions, and push up to back arch asanas maintained for 1-5 min. Physiological responses were significantly (p<0.05) greater in standing asanas, inversions, and push up to back arch versus supine and seated asanas. The average metabolic equivalent (MET) of each pose did not exceed 5 METs. The practice expended 149.4 ± 50.7 Kcal. The cumulative time spent within a HR zone of 55-85% HRmax was 29.7 ± 15.9 min (range = 10.8 – 59.9 min). Asana practice was classified as mild to moderate intensity exercise without evidence of a sustained cardiopulmonary stimulus. Intermediate and advanced practitioners maintained poses for up to 5 min without stimulating an undesirable pressure response. However, postural alignment significantly influenced blood pressure responses indicating that adherence to precise alignment has relevant physiological consequences for the yoga practitioner.

Petrofsky, et al., (2005) studied the yoga and yoga-related training have often been touted as providing good muscle stretching and relaxation, as well as being beneficial for overall stress management. During forceful muscle contractions of yoga, substantial muscle activity can be demonstrated. In the present investigation, the muscle activity of the right and left rectus abdomen’s and of the right and left external oblique muscles was examined to assess the level of muscle activity during one type of yoga maneuver: a breathing exercise performed in the seated position. The results showed that while muscle activity during this yoga breathing exercise was comparable to that seen during the
performance of abdominal crunches, the longer duration of the breathing exercises increased the total work on the abdominal muscles up to 5 times greater than the work during crunches. Because of the high muscle activity, this form of exercise would be good for people who cannot easily exercise on the floor such as people with disabilities or obese people.

Sinha, et al., (2004) observed critically the energy cost and different cardio-respiratory changes during the practice of SN. Twenty one male volunteers from the Indian Army practiced selected Yogic exercises for six days in a week for three months duration. The Yogic practice schedule consisted of Hatha Yogic Asanas (28 min), Pranayama (10.5 min) and Meditation (5 min). In the Yogic practice schedule 1st they practiced Kapal Bhathi (breathing maneuvers) for 2 min then Yogamudra (yogic postural exercise) for 2 min, after that they took rest until oxygen consumption and heart rate (HR) came to resting value. Subsequently subjects performed SN for 3 min 40 seconds on an average. After three months of training at the beginning of the fourth month subjects performed entire Yogic practice schedule in the laboratory as they practiced during their training session and experiments were carried out. Their pulmonary ventilation, carbondioxide output, Oxygen consumption, HR and other cardiorespiratory parameters were measured during the actual practice of SN. Oxygen consumption was highest in the eighth posture (1.22 ± 0.073 l min⁻¹) and lowest in the first posture (0.35 ± 0.02 l min⁻¹). Total energy cost throughout the practice of SN was 13.91 kcal and at an average of 3.79 kcal/min. During its practice highest HR was 101 ± 13.5 b.p.m. As an aerobic
exercise SN seemed to be ideal as it involves both static stretching and slow dynamic component of exercise with optimal stress on the cardiorespiratory system.

Tran, et al., (2001) studied the ten healthy, untrained volunteers (nine females and one male), ranging in age from 18-27 years, were studied to determine the effects of hatha yoga practice on the health-related aspects of physical fitness, including muscular strength and endurance, flexibility, cardiorespiratory fitness, body composition, and pulmonary function. Subjects were required to attend a minimum of two yoga classes per week for a total of 8 weeks. Each yoga session consisted of 10 minutes of pranayamas (breath-control exercises), 15 minutes of dynamic warm-up exercises, 50 minutes of asanas (yoga postures), and 10 minutes of supine relaxation in savasana (corpse pose). The subjects were evaluated before and after the 8-week training program. Ankle flexibility, shoulder elevation, trunk extension, and trunk flexion increased by 13% (p<0.01), 155% (p<0.001), 188% (p<0.001), and 14% (p<0.05), respectively. Absolute and relative maximal oxygen uptake increased by 7% and 6%, respectively (p<0.01). These findings indicate that regular hatha yoga practice can elicit improvements in the health-related aspects of physical fitness.

Shankardayalan (1996) suggested that a study on effect of yogic exercise on muscular performance and body composition in adult male. He selected fifty male students and divided into two groups of equal number of twenty five subjects each. One group was utilized as control group and the
other group as experimental. The experimental period was eight weeks. The data on aerobic capacity, sit-ups, flexibility and percentage body fat were obtained before pre test and after post test the experimental period. The obtained ‘F’ ratio was tested for significance at 05 level of confidence. The found out measure all the variables such as aerobic capacity, muscular endurance, flexibility and percent body fat in favour of experimental group. He concluded that the aerobic capacity was increased, and the muscular endurance was improved. Flexibility was developed. The significant difference was found in percent body fat of yogasana practice programme.

Bera and Rajapurkar (1993) studied the forty male high school students, age 12-15 yrs, 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 anaerobic powers were measured using standard method. The duration of 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 significant change in body fat (midaxillary), skeletal diameters and most of the body circumferences. It was evident that some of the fat-folds (tricep, subscapular, suprailiac, umbilical, thigh and calf) and body circumferences (waist, umbilical and hip) were reduced significantly.

3. Summary of the Literature
The reviews are presented under the two sections namely studies on aerobic training (n=41) and yogic practices (n=31). All the research studies that are presented in this section prove that aerobic training and yogic practice methods contribute significantly for better improvement in health related and lipid profile variables. Research studies using yogic practice revealed compatible results (Aswini Sham Tikhe, et al., 2015, Dr. P. Leela, et al., 2013, Lee JA, et al., 2012, Elangovan and Babu, 2011, Mody, 2010, Telles, et al., 2010, Tran, et al., 2001, Chen, et al., 2009, Prasad, et al., 2006 and Bernardi, et al., 2007). There was clear evidence that the use of yogic practice was one of the effective training methods to improve the selected criterion variables.

The independent and dependent variable for the current study are aerobic training and the change of level of selected variables. Aerobic training has been found to elicit greater change in selected variables than the yogic practices on selected variables (Dr. B. Chitti Babu, 2014, Ramesh and Subramanyam, 2011, Urdiales, 2010, Volpeet, et al., 2008, Wong, et al., 2008, Saremil, et al., 2010, Chaudhary, et al., 2010, Sabia, et al., 2004, and Leite, et al., 2009)

The review of literature helped the researcher from the methodological point of view too. It was learnt that most of the research studies cited in this chapter on analysis and experimental design as the appropriate methods for find out the training. The present study may serve as a foundation and main ingredient for future research and investigate the proper in training methods
for changing the health related physical fitness, basal metabolic rate and blood lipid profile variables of obese college men.