CHAPTER II

Review of Related Literature
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This chapter describes the source of review of related literature. The researcher finds out some of the review of literature which could be very supportive and strengthen this study. After going through the available literature, the investigator presented some of the observations and findings of the experts in this area. The essential aspect of a research is the review of the related literature. In the word of Good, “The key to the vast store house of published literature may open the doors to sources of significant problems and explanatory hypothesis, and provide helpful orientation for definition of the problem, background for selection of procedure, and comparative data for interpretation of results. In order to be truly creative and original, one must read extensively and critically as stimulus thinking.

For any research project to occupy a place in the development of a discipline, the researcher must be thoroughly familiar with both previous theory and research. The literature related to any problems helps the scholar to discover already known, which would enable the investigator to have a deep insight, clear prospective and a better understanding of a chosen problem. And various factors connected to the study. So a number of books, journals, and websites were referred. In the following pages, an attempt has been made to present briefly a few of the important researchers and studies conducted abroad and in India, as they have significant bearing on the present study. The reviews of literature were confined to the Internet Websites.
The purpose of the study was to find out the influence of floor aerobics, step aerobics and combined training on selected motor fitness, physiological and bio-chemical variables among the women students. The reviews of the literature related to the statement of the problem have been classified under the following headings:

1. Studies on motor fitness variables
2. Studies on physiological variables
3. Studies on bio-chemical variables

2.1 STUDIES ON MOTOR FITNESS VARIABLES

Annette et al. (2014) systematically reviewed was to summarize current cross-sectional and longitudinal studies on physical activity, fitness and overweight in adolescents and to identify mediator and moderator effects by evaluating the interaction between these three parameters. The electronic academic databases PubMed, SportDiscus, WEB OF KNOWLEDGE and Ovid were searched for studies on physical activity, fitness and overweight in adolescents aged 11 to 19 years (cross-sectional studies) and in adolescents up to 23 years old (longitudinal studies) published in English in or after 2000. Twelve cross-sectional and two longitudinal studies were included. Only four studies analyzed the interaction among physical activity, fitness and overweight in adolescents and reported inconsistent results. All other studies analyzed the relationship between either physical activity and overweight, or between fitness and overweight. Overweight—here including obesity—was inversely related to physical activity. Similarly, all studies reported inverse relations between
physical fitness and overweight. Mediator and moderator effects were detected in the interrelationship of BMI, fitness and physical activity. Overall, a distinction of excessive body weight as cause or effect of low levels of physical activity and fitness is lacking. The small number of studies on the interrelationship of BMI, fitness and physical activity emphasizes the need for longitudinal studies that would reveal 1) the causality between physical activity and overweight / fitness and overweight and 2) the causal interrelationships among overweight, physical activity and fitness. These results must be carefully interpreted given the lack of distinction between self-reported and objective physical activity and that studies analyzing the metabolic syndrome or cardiovascular disease were not considered. The importance of physical activity or fitness in predicting overweight remains unknown.

Manjit et al. (2014) determined the comparative analysis of motor fitness components of sprinters. To obtain data, the investigators had selected sixty (N=60), Male Inter-College and Inter-University Level Sprinters between the age group of 18-25 years (Mean ± SD: age 20.683±2.02 years, height 5.7449±26.3 m, body mass 76.400±14.3 kg) were selected. The subjects were purposively assigned into three groups: Group-A: Sprinters (n1=60) Inter-College (n1a=30) and Inter-University (n1b=30). To determine the significant differences of motor fitness components between Inter-College and Inter-University Sprinters, unpaired t-test was employed for data analyses. To test the hypothesis, the level of significance was set at 0.05. To conclude, it is significant to mention in relation to motor fitness components that insignificant
differences occur between Inter-College and Inter-University Sprinters on the sub variable agility, balance and flexibility. However, the significant differences occur between Inter-College and Inter-University Sprinters on the sub variable speed and explosive strength.

Sankarson et al. (2014) difference between male and female in physical, physiological, motor, psychological, social and emotional dimensions have been confirmed by many researchers time to time (Tanner: 1978; Overman & Williams, 2004; Linda, 2005). The causes have been identified as genetic, social and cultural. But, it has also been reported that sex difference does not become prominent before puberty (Gustafsson & Lindenfors, 2008). The purpose of the study was to compare motor fitness status of boys and girls belonging to primary school at a rural setting. 118 boys and girls (9-10 years) were selected as subjects from Bardhaman district, West Bengal. Speed, Cardio-respiratory Endurance, Muscular Strength-Endurance, Flexibility, Agility, Coordination and Anaerobic Power were chosen motor fitness variables for the study. Results of the present study revealed that in speed, coordination, power and agility no significant difference exists (p<0.05) between the boy and girl students of 9-10 year age. However, in flexibility, cardio- respiratory endurance & muscular strength-endurance significant difference exist (p>0.05) between the groups. In cardio-respiratory endurance, boys were better than the girls while girls had higher scores than boys in flexibility and abdominal muscular strength-endurance.
**Claudia et al. (2010)** the benefits of fitness for cognitive performance in healthy older adults have repeatedly been demonstrated. Animal studies, however, have revealed differential relationships between physical and motor fitness and brain metabolism. We therefore investigated whether for older humans different dimensions of fitness are differentially associated with cognitive performance and brain activation patterns. Seventy-two participants (mean age 68.99 years, SD = 3.66; 52 females) completed four psychometric tests reflecting two primary abilities of higher cognitive functioning (executive control, perceptual speed) and a battery of fitness tests comprising two fitness dimensions (physical and motor fitness). We found that not only physical fitness indexed by cardiovascular fitness and muscular strength, but also motor fitness including movement speed, balance, motor coordination and flexibility showed a strong association with cognitive functioning. Additionally, functional brain imaging data revealed that physical and motor fitness were differentially related to cognitive processes. Results are discussed with regard to the compensation hypothesis and potential consequences for intervention work.

**Voelcker et al. (2010)** the benefits of fitness for cognitive performance in healthy older adults have repeatedly been demonstrated. Animal studies, however, have revealed differential relationships between physical and motor fitness and brain metabolism. We therefore investigated whether for older humans different dimensions of fitness are differentially associated with cognitive performance and brain activation patterns. Seventy-two participants
(mean age 68.99 years, SD = 3.66; 52 females) completed four psychometric tests reflecting two primary abilities of higher cognitive functioning (executive control, perceptual speed) and a battery of fitness tests comprising two fitness dimensions (physical and motor fitness). We found that not only physical fitness indexed by cardiovascular fitness and muscular strength, but also motor fitness including movement speed, balance, motor coordination and flexibility showed a strong association with cognitive functioning. Additionally, functional brain imaging data revealed that physical and motor fitness were differentially related to cognitive processes. Results are discussed with regard to the compensation hypothesis and potential consequences for intervention work.

Kingwell et al. (2002) was conducted a study on effects of walking and other exercise programs upon blood pressure in normal subjects. Rational use of non-pharmacological therapy for elevated blood pressure requires some knowledge of dose-effect relationships to optimize regimens. We investigated the effects on blood pressure of: one hour of walking at 50% of predetermined maximal work capacity (Wmax); 15 minutes of cycling at 80%-90% of Wmax (high-intensity cycling; HIC)--each performed five days per week; and three 30-minute cycling sessions per week at 65%-70% of Wmax (moderate-intensity cycling; MIC) which we have previously found lowers blood pressure in both normotensive and hypertensive people. The three exercise interventions and a period of normal sedentary activity were performed for four weeks each, by 14 normotensive volunteers (seven male, seven female) in a randomized 4 x
Latin-square design. MIC produced the greatest blood pressure reduction relative to the period of normal sedentary activity—mean 5/3 mmHg; standard error of the difference (SE-diff) 2/1 mmHg; P < 0.05 in the supine position, and 4/5 mmHg; SE-diff 2/2 mmHg; P < 0.05 standing. Walking induced smaller blood pressure reductions 3/2 mmHg; SE-diff, 2/1 mmHg (P < 0.05 for systolic pressure), and 2/1 mmHg; SE-diff, 2/2 mmHg for the supine and standing positions respectively. The HIC did not change blood pressure. Heart rate reduction with training was proportional to exercise intensity. Cardiac output, body weight, 24-hour urinary sodium excretion, cholesterol and triglyceride levels did not alter with any of the interventions. Effects of exercise on blood pressure vary according to the intensity and duration of training bouts. Moderate exercise levels may be optimal, but walking is also effective.

Baker (2001) examined the effect of an in-season of concurrent training on the maintenance of maximum strength and power in professional and college-aged rugby league football players. Fourteen professional (NRI) and 15 college aged (SRL) rugby league players were observed during a lengthy in-season period to monitor the possible interfering effects of concurrent resistance and energy-system conditioning on maximum strength and power levels. All subjects were performed concurrent training aimed at increasing strength, power, speed and energy-system fitness, as well as skill and team practice sessions, before and during in-season period. The SLR group significantly improved to 1 repetition maximum bench press (1 RMBP) strength, but not bench throw (BT Pmax) or jump squat maximum power
(JSPmax) over their 19-week in-season. The fact that no reduction in any test for either group occurred may be due to prioritization, sequencing and timing of training session, as well as the overall periodization of the total training volume. Having athletes better conditioned to perform concurrent training may also aid in reduction the possible interfering effects of concurrent training. Correlations between changes in 1 RM BP and BT Pmax suggest differences in the mechanisms to increase power between stronger, more experienced and less strong and experienced athletes. Dr. J.A Myers stated that the vital capacity of the lungs may be affected by several factors such as extensive physical training. It may result in over development of the vital capacity which certain sedentary occupations may decrease it.

Newton et al. (1999) conducted a study on the effects of ballistic training on preseason preparation of the elite volleyball players. The purpose of this study was to determine whether ballistic resistance training would increase the vertical jump (VJ) performance of already highly trained jump athletes sixteen male volleyball players from a NCAA Division I team participated in the study. A vertex was used to measure standing vertical jump and reach (SJR) and jump and reach from a three-step approach (AJR). Several types of vertical jump tests were also performed on a plyometric Power System and a force plate to measure force, velocity, and power production during vertical jumping. The subjects completed the tests and were then randomly divided into two groups, control and treatment. All subjects completed the usual preseason volleyball on-court training combined with a resistance
training program. In addition, the treatment group completed 8 wk of squat jump training while the control group completed squat and leg press exercises at a 6RM load. Both groups were retested at the completion of the training period. The treatment group produced a significant increase in both SJR and AJR of 5.9+/−3.1% and 6.3+/−5.1% respectively. These increases were significantly greater than the pre- to post changes produced by the control group, which were not significant for either jump. Analysis of the data from the various other jump tests suggested increased overall force output during jumping, and in particular increased rate of force development were the main contributors to the increased jump height. These results lend support to the effectiveness of ballistic resistance training for improving vertical jump performance in elite jump athletes.

Wilson et al. (1993) compared the effects of 10 weeks of training with traditional back squats or one of two forms of plyometric training loaded jump squats or drop jumps on vertical jump performance. The subjects involved in the study had a minimum of 1 y of weight training experience and could perform half squats with at least 100% of their body weights. During the loaded jump squats, subjects used a load that produced the greatest mechanical power output, i.e., about 30% of the 1 RM for the concentric (upward) phase of an ordinary squat lift. Two types of vertical jump tests were performed: 1) a counter-movement jump in which the subjects started from a standing position, performed a rapid crouch, and then jumped for maximal height, and 2) a jump from a static crouching position, i.e., with no counter movement. All training
groups except the drop-jump group produced significant increases in vertical jump performance. For the counter-movement jump, the group that trained with loaded jump squats produced the greatest improvement (18%), which was significantly greater than that for the drop-jump group (10%) or for the weight-trained group (5%). For the static crouch jump, the group trained with loaded jump squats increased jump height by 15%, which was significantly greater than the increase for the drop-jump group (7.2%) and for the weight training group (6.8%). These results were similar to those obtained by Berger (1963), who also found that training with jump squats loaded at 30% of maximum resulted in greater increases in vertical jump than did training programs consisting of traditional weight training, drop-jump training, or isometric training.

Hooper (1990) has recommended for exercise training and physical activity for older adults include cardiovascular and resistance training components (CVT and RT, respectively). The purpose of the present investigation was to compare the fitness benefits of concurrent CVT and RT with those attained through an equivalent duration of CVT or RT alone. Thirty-six participants (ages 60-84) were assigned to a control group or to one of three exercise treatment groups. The treatment groups exercised three times per week for 12 wk using RT (N = 11), CVT (N = 10), or CVT and RT (BOTH, N = 9). Pre- and post-training, participants performed a sub maximal exercise test (GXT), five repetition-maximum strength tests (5RM), and the AAHPERD functional fitness test for older adults. All exercise treatment groups revealed
lower resting heart rate and rate-pressure product; lower exercise diastolic blood pressure and rating of perceived exertion; increased GXT duration; increased leg, back, and shoulder 5RM scores; and improved AAHPERD flexibility, coordination, and cardiovascular endurance scores. The exercise treatment groups responded differently on the following: RT and BOTH enhanced arm and chest strength more than CVT; and both enhanced AAHPERD strength and agility scores more than CVT or RT. Concurrent CVT and RT is as effective in eliciting improvements in cardiovascular fitness and 5RM performance as CVT or RT, respectively. Moreover, incorporating both CVT and RT in exercise programs for older adults may be more effective in optimizing aspects of functional fitness than programs that involve only one component.

Baker (1987) has done a research of fourteen professional (NRI) and 15 college aged (SRL) rugby league players were observed during a lengthy in-season period to monitor the possible interfering effects of concurrent resistance and energy-system conditioning on maximum strength and power levels. All subjects were performed concurrent training aimed at increasing strength, power, speed and energy-system fitness, as well as skill and team practice sessions, before and during in-season period. The SLR group significantly improved to 1 repetition maximum bench press (1 RMBP) strength, but not bench throw (BT Pmax) or jump squat maximum power (JSPmax) over their 19-week in-season. The fact that no reduction in any test for either group occurred may be due to prioritization, sequencing and timing
of training session, as well as the overall periodization of the total training volume. Having athletes better conditioned to perform concurrent training may also aid in reduction the possible interfering effects of concurrent training. Correlations between changes in 1 RM BP and BT Pmax suggest differences in the mechanisms to increase power between stronger, more experienced and less strong and experienced athletes.

2.2 STUDIES ON PHYSIOLOGICAL VARIABLES

Nascimento et al. (2014) conducted a research on Sustained effect of resistance training on blood pressure and hand grip strength following a detraining period in elderly hypertensive women: a pilot study. Introduction: Hypertension is the most prevalent modifiable risk factor with a high prevalence among older adults. Exercise is a no pharmacological treatment shown to benefit all patients with hypertension. Objective: This study examined the effects of a 14-week moderate intensity resistance training program (RT) on the maintenance of blood pressure and hand grip strength during an extended detraining period in elderly hypertensive women. Methods: Twelve hypertensive sedentary elderly women completed 14 weeks of whole body RT at a moderate perceived exertion following a detraining period of 14 weeks. Results: Following the training period, participants demonstrated an increase in absolute hand grip strength (P=0.001), relative hand grip strength (P=0.032) and a decrease of systolic (P=0.001), diastolic (P=0.008), and mean blood pressure (P=0.002) when compared to pre-exercise values. In addition, these effects were sustained after 14 weeks of detraining. Conclusion:
Resistance training may be a valuable method to improve muscular strength and blood pressure in elderly people with benefits being maintained up to 14 weeks following training cessation.

Carrick-Ranson et al. (2014) reveals the documentation that the effect of Lifelong Exercise Dose on Cardiovascular Function during Exercise. An increased "dose" of endurance exercise training is associated with a greater maximal oxygen uptake (VO2max), a larger left ventricular (LV) mass, and improved heart rate and blood pressure control. However, the effect of lifelong exercise dose on metabolic and hemodynamic response during exercise has not been previously examined. Methods and Results: We performed a cross-sectional study on 101 (69 men) seniors (60 yr and older) focusing on lifelong exercise frequency as an index of exercise dose. These included 27 who had performed ≤2 exercise sessions/wk (sedentary), 25 who performed 2-3 sessions/wk (casual), 24 who performed 4-5 sessions/wk (committed) and 25 who performed ≥6 sessions/wk plus regular competitions (Masters athletes) over at least the last 25 yr. Oxygen uptake and hemodynamics (cardiac output [Qc], stroke volume [SV]) were collected at rest, two levels of steady-state submaximal exercise and maximal exercise. Doppler ultrasound measures of LV diastolic filling were assessed at rest and during LV loading (saline infusion) to simulate increased LV filling. Body composition, total blood volume, and heart-rate recovery after maximal exercise were also examined. VO2max increased in a dose-dependent manner (P<0.05). At maximal exercise, Qc and SV were largest in committed exercisers and Masters athletes.
(P<0.05), while arteriovenous oxygen difference was greater in all trained groups (P<0.05). At maximal exercise, effective arterial elastance, an index of ventricular-arterial coupling, was lower in committed exercisers and Masters Athletes (P<0.05). Doppler measures of LV filling were not enhanced at any condition irrespective of lifelong exercise frequency. Conclusion: These data suggest that performing 4 or more weekly endurance exercise sessions over a lifetime results in significant gains in VO2max, SV and heart rate regulation during exercise; however, improved SV regulation during exercise is not coupled with favorable effects on LV filling, even when the heart is fully loaded.

**Best et al. (2014)** conducted a research on Age and sex differences in muscle sympathetic nerve activity in relation to haemodynamics, blood volume and left ventricular size. We compared the effect of age- and sex-related differences in haemodynamics, blood volume (BV) and left ventricular (LV) size and mass on resting muscle sympathetic nerve activity (MSNA) in healthy, normotensive adults. Twenty young men (19-47yrs) and 20 young women (21-46yrs) as well as 15 older men (62-80yrs) and 15 older women (60-82yrs) were studied. Cardiac output (acetylene rebreathing), total peripheral resistance (TPR), forearm vascular resistance (FVR, venous occlusion plethysmography) and MSNA were measured during supine rest. BV was calculated (CO rebreathing) and LV mass, end diastolic (LVEDV) and end systolic volume (LVESV) were measured using magnetic resonance imaging. Cardiac index (P<0.001, P=0.016), BV (both P<0.001), LV mass (P<0.001, P=0.002),
LVEDV (P<0.001, P=0.002) and LVESV (both P<0.001) were lower in the older and female groups respectively. TPR was significantly higher in the older (P<0.001) and female (P=0.014) groups but FVR was increased in the female (P=0.048) groups only (age, P=0.089). MSNA was greater in the older (P<0.001) groups only (sex, P=0.228). Increased MSNA was shown to correlate with a decrease in BV (P=0.004) in men only when adjusted for age (women, P=0.133). There was a positive relationship between MSNA and FVR (P=0.020) in men but not women (P=0.422). There were no significant relationships between MSNA and LV mass, LVEDV or LVESV. The findings suggest the increase in resting MSNA with age may be related to the decline in BV in men only but it is unknown if sex differences in sympathetic adrenergic vasoconstriction occur independently of these changes.

Chaudhary et al. (2010) documented that the effects of aerobic versus resistance training on cardiovascular fitness in obese sedentary females. Purpose: The present study was designed to evaluate 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. Methods: 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. Results: 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. Conclusion: 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.

Strasser, et al, (2010) documented that resistance training in the treatment of the metabolic syndrome: a systematic review and meta-analysis of the effect of resistance training on metabolic clustering in patients with abnormal glucose metabolism. Over the last decade, investigators have given increased attention to the effects of resistance training (RT) on several metabolic syndrome variables. The metabolic consequences of reduced muscle mass, as a result of normal aging or decreased physical activity, lead to a high
prevalence of metabolic disorders. The purpose of this review is: (i) to perform a meta-analysis of randomized controlled trials (RCTs) regarding the effect of RT on obesity-related impaired glucose tolerance and type 2 diabetes mellitus; and (ii) to investigate the existence of a dose-response relationship between intensity, duration and frequency of RT and the metabolic clustering. Thirteen RCTs were identified through a systematic literature search in Medline ranging from January 1990 to September 2007. We included all RCTs comparing RT with a control group in patients with abnormal glucose regulation. For data analysis, we performed random effects meta-analyses to determine weighted mean differences (WMD) with 95% confidence intervals (CIs) for each endpoint. All data were analysed with the software package Review Manager 4.2.10 of the Cochrane Collaboration. In the 13 RCTs included in our analysis, RT reduced glycosylated hemoglobin (HbA(1c)) by 0.48% (95% CI -0.76, -0.21; p = 0.0005), fat mass by 2.33 kg (95% CI -4.71, 0.04; p = 0.05) and systolic blood pressure by 6.19 mmHg (95% CI 1.00, 11.38; p = 0.02). There was no statistically significant effect of RT on total cholesterol, high-density lipoprotein cholesterol, low-density lipoprotein cholesterol, triglyceride and diastolic blood pressure. Based on our meta-analysis, RT has a clinically and statistically significant effect on metabolic syndrome risk factors such as obesity, HbA(1c) levels and systolic blood pressure, and therefore should be recommended in the management of type 2 diabetes and metabolic disorders.
**Farpour-Lambert et al, (2009)** organized a research on physical activity reduces systemic blood pressure and improves early markers of atherosclerosis in pre-pubertal obese children. Objectives: The aim of this study was to determine the effects of physical activity on systemic blood pressure (BP) and early markers of atherosclerosis in pre-pubertal obese children. Background: Hypertension and endothelial dysfunction are premature complications of obesity. Methods: We performed a 3-month randomized controlled trial with a modified crossover design: 44 pre-pubertal obese children (age 8.9 + or - 1.5 years) were randomly assigned (1:1) to an exercise (n = 22) or a control group (n = 22). We recruited 22 lean children (age 8.5 + or - 1.5 years) for baseline comparison. The exercise group trained 60 min 3times/week during 3 months whereas control subjects remained relatively inactive. Then, both groups trained twice/week during 3 months. We assessed changes at 3 and 6 months in office and 24-h BP, arterial intima-media thickness (IMT) and stiffness, endothelial function (flow-mediated dilation), body mass index (BMI), body fat, cardiorespiratory fitness (maximal oxygen consumption [VO(2)max]), physical activity, and biological markers. Results: Obese children had higher BP, arterial stiffness, body weight, BMI, abdominal fat, insulin resistance indexes, and C-reactive protein levels, and lower flow-mediated dilation, VO(2)max, physical activity, and high-density lipoprotein cholesterol levels than lean subjects. At 3 months, we observed significant changes in 24-h systolic BP (exercise -6.9 + or - 13.5 mm Hg vs. control 3.8 + or - 7.9 mm Hg, -0.8 + or - 1.5 standard deviation score [SDS] vs.
0.4 + or - 0.8 SDS), diastolic BP (-0.5 + or - 1.0 SDS vs. 0 + or - 1.4 SDS), hypertension rate (-12% vs. -1%), office BP, BMI z-score, abdominal fat, and VO(2)max. At 6 months, change differences in arterial stiffness and IMT were significant. Conclusions: A regular physical activity program reduces BP, arterial stiffness, and abdominal fat; increases cardiorespiratory fitness; and delays arterial wall remodeling in pre-pubertal obese children.

Baynard et al. (2009) documented that short-term exercise training improves aerobic capacity with no change in arterial function in obesity. The aim of the study is to determine the effects of short-term high-intensity exercise on arterial function and glucose tolerance in obese individuals with and without the metabolic syndrome (MetSyn). Obese men and women (BMI > 30 kg/m(2); 39-60 years) with and without MetSyn (MetSyn, n = 13; Non-MetSyn, n = 13) participated in exercise training consisting of ten consecutive days of treadmill walking for 1 h/day at 70-75% of peak aerobic capacity. Changes in aerobic capacity, flow-mediated dilation (FMD), and arterial stiffness using central and peripheral pulse wave velocity (PWV) measurements were assessed pre- and post-training. These measurements were obtained fasting and 1-h post-test meal while the subjects were hyperglycemic. Aerobic capacity improved for both groups [Non-MetSyn 24.0 +/- 1.6 vs. 25.1 +/- 1.5 mL/(kg min); MetSyn 25.2 +/- 1.8 vs. 26.2 +/- 1.7 mL/(kg min), P < 0.05]. There was no change in body weight. FMD decreased by ~20% (P < 0.05) for both groups during acute hyperglycemia (MetSyn, n = 11; Non-MetSyn, n = 10), while hyperglycemia increased central PWV and not peripheral PWV. Exercise training did not
change FMD in the fasted or challenged state. Central and peripheral PWV were not altered with training for either group (MetSyn, n = 13; Non-MetSyn, n = 13). A 10-day high-intensity exercise program in obese individuals improved aerobic capacity and glucose tolerance but no change in arterial function was observed. Acute hyperglycemia had a deleterious effect on arterial function, suggesting that persons with impaired glucose homeostasis may experience more opportunities for attenuated arterial function on a daily basis which could contribute to increased cardiovascular risk.

Obert et al. (2009) organized a research on two months of endurance training does not alter diastolic function evaluated by TDI in 9-11-year-old boys and girls. Objective: Superior global cardiac performance (ie stroke volume) is classically reported after training in children. Current knowledge of the impact of exercise training on myocardial relaxation, a major component of left ventricular (LV) filling and subsequently stroke volume, is, however, limited in the paediatric population. This study aimed to investigate the effect of aerobic training on LV wall motion velocities by tissue Doppler imaging (TDI) in healthy children. 25 children (11 girls, 14 boys) were enrolled in a 2 month high-intensity aerobic training programme and 25 (12 girls and 13 boys) served as controls. The children (9-11 years old) performed a graded maximal exercise test on a treadmill to evaluate maximal oxygen uptake. Standard Doppler echocardiography and TDI measurements were performed at baseline and end of the study. Tissue Doppler systolic, early and late myocardial velocities were obtained at the mitral annulus in the septal, lateral,
inferior and posterior walls. Results: Maximal oxygen uptake increased by 6.5% (before: 51.6 (SD 4.2), after: 55.0 (4.5) ml/min/kg p<0.001) after training. A modest but significant increase in left ventricular end-diastolic diameter was also noticed (before: 46.1 (3.4), after: 48.3 (4.3) mm.BSA(-1/2), p<0.001), whereas left ventricular wall thickness and mass were unchanged. Neither transmitral inflow velocities nor early and late wall motion (Em: before = 18.4 (2.7), after = 18.0 (2.3) cm/s, Am: before = 6.8 (1.2), after = 6.7 (1.3) cm/s) were affected by training. Shortening fraction and regional systolic function (Sm: before = 10.1 (1.6), after = 10.2 (1.4) cm/s) by TDI were also unchanged. Conclusion: High-intensity aerobic sessions repeated over a 2 month period failed to improve regional diastolic function assessed by TDI in healthy young children.

Baynard, et al. (2008) listed those short-term training effects on diastolic function in obese persons with the metabolic syndrome. The aim of this study was to determine the effects of a short-term high-intensity exercise program on diastolic function and glucose tolerance in obese individuals with and without metabolic syndrome (MetSyn). Obese men and women (BMI > 30 kg/m(2); 39-60 years) with and without the MetSyn (MetSyn 13; non-MetSyn 18) underwent exercise training consisting of 10 consecutive days of treadmill walking for 1 h/day at 70-75% of peak aerobic capacity. Subjects performed pre- and post-training testing for aerobic capacity, glucose tolerance (2-h meal test), and standard echocardiography. Aerobic capacity improved for both groups (non-MetSyn 24.0 +/- 1.6 ml/kg/min vs.
25.1 +/- 1.5 ml/kg/min; MetSyn 25.2 +/- 1.8 ml/kg/min vs. 26.2 +/- 1.7 ml/kg/min, P < 0.05). Glucose area under the curve (AUC) improved in the MetSyn group (1,017 +/- 58 pmol/l/min vs. 883 +/- 75 pmol/l/min, P < 0.05) with no change for the non-MetSyn group (685 +/- 54 pmol/l/min vs. 695 +/- 70 pmol/l/min). Isovolumic relaxation time (IVRT) improved in the MetSyn group (97 +/- 6 ms vs. 80 +/- 5 ms, P < 0.05), and remained normal in the non-MetSyn group (82 +/- 6 ms vs. 86 +/- 5 ms). No changes in other diastolic parameters were observed. The overall reduction in IVRT was correlated with a decrease in diastolic blood pressure (DBP) (r = 0.45, P < 0.05), but not with changes in glucose tolerance. Body weight did not change with training in either group. A 10-day high-intensity exercise program improved diastolic function and glucose tolerance in the group with MetSyn. The reduction in IVRT in MetSyn was associated with a fall in blood pressure. These data suggest that it may be possible to reverse early parameters of diastolic dysfunction in MetSyn with a high-intensity exercise program.

**Calbet et al. (2008)** examined that is pulmonary gas exchange during exercise in hypoxia impaired with the increase of cardiac output? During exercise in humans, the alveolar-arterial O(2) tension difference ((A-a)DO(2)) increases with exercise intensity and is an important factor determining the absolute level of oxygen binding to hemoglobin and therefore the level of systemic oxygen transport. During exercise in hypoxia, the (A-a)DO(2) is accentuated. Using the multiple inert gas elimination technique it has been shown that during exercise in acute hypoxia the contribution of
ventilation-perfusion inequality to (A-a)DO(2) is rather small and in the absence of pulmonary edema intrapulmonary shunts can be ruled out. This implies that the main mechanism limiting pulmonary gas exchange is diffusion limitation. It is presumed that an elevation of cardiac output during exercise in acute hypoxia should increase the (A-a)DO(2). However, no studies have examined how variations in cardiac output independently affect pulmonary diffusion with increases in exercise intensity. We have consistently observed that during steady-state, submaximal (100-120 W) exercise on the cycle ergometer in hypoxia the lung can accommodate an increase in cardiac output of approximately 2 L x min(-1) without any significant effect on pulmonary gas exchange. This result contrasts with the predicted effect of cardiac output on (A-a)DO(2) using the model of Piiper and Scheid, and thus indicates that an elevation of cardiac output is not necessarily accompanied by a reduction of mean transit time and (or) diffusion limitation during submaximal exercise in acute hypoxia. It remains to be determined what the influence of changes is in cardiac output per se on pulmonary gas exchange during high-intensity exercise.

Lynch et al. (2002) conducted a research on comparison of VO2max and disease risk factors between perimenopausal and postmenopausal women. Objective: This study determines whether maximal oxygen consumption (VO2 max) is higher in perimenopausal women compared with similarly aged postmenopausal women and whether the lower VO2 max in postmenopausal women is associated with a higher total and visceral fat mass, less favorable
lipid and glucose metabolism, and lower bone mineral density (BMD). Design: Participants were 18 perimenopausal women (mean +/- SD; irregular menstrual cycle in the past 6 months) aged 49 +/- 4 years and 18 postmenopausal women (no menstrual cycle in the past year) aged 52 +/- 2 years who were matched for body mass index and race. Women were sedentary, and none were on hormone replacement therapy. Body composition (dual-energy x-ray absorptiometry and CT), VO2 max, fasting concentrations of sex steroid hormones, lipoproteins, insulin, and glucose were determined. Results: VO2 max was 17% lower (22 +/- 3 v 27 +/- 7 mL.kg.min; P </= 0.01) and resting metabolic rate was 5% lower (P = 0.06) in postmenopausal women compared with perimenopausal women. Percent body fat was 11% higher, and visceral fat area was 42% higher in postmenopausal women, whereas total body and lumbar spine (L2 -L4) BMD were 5% and 11% lower, respectively (P < 0.05). Low-density lipoprotein cholesterol, high-density lipoprotein cholesterol ratio, and fasting glucose concentrations were 21%, 20%, and 8% higher, respectively, in postmenopausal versus perimenopausal women (P < 0.05). Except for total body and lumbar spine BMD, the effect of menopause status on these variables is independent of age. In all women, percent body fat, visceral adipose tissue, and low-density lipoprotein cholesterol high-density lipoprotein cholesterol ratios related indirectly to VO2 max (P < 0.05). Conclusions: Our data suggest that postmenopausal women have a lower VO2 max than perimenopausal women of a similar age and diposity, which may be associated with an increased risk of total and central obesity and cardiovascular disease.
LeMura et al. (2000) documented that lipid and lipoprotein profiles, cardiovascular fitness, body composition, and diet during and after resistance, aerobic and combination training in young women. The purpose of this study was to evaluate the effects of various modes of training on the time-course of changes in lipoprotein-lipid profiles in the blood, cardiovascular fitness, and body composition after 16 weeks of training and 6 weeks of detraining in young women. A group of 48 sedentary but healthy women [mean age 20.4 (SD 1) years] were matched and randomly placed into a control group (CG, n = 12), an aerobic training group (ATG, n = 12), a resistance training group (RTG, n = 12), or a cross-training group that combined both aerobic and resistance training (XTG, n = 12). The ATG, RTG and XTG trained for 16 weeks and were monitored for changes in blood concentrations of lipoprotein-lipids, cardiovascular fitness, body composition, and dietary composition throughout a 16 week period of training and 6 weeks of detraining. The ATG significantly reduced blood concentrations of triglycerides (TRI) (P < 0.05) and significantly increased blood concentrations of high-density lipoprotein-cholesterol (HDL-C) after 16 weeks of training. The correlation between percentage fat and HDL-C was 0.63 (P < 0.05), which explained 40% of the variation in HDL-C, while the correlation between maximal oxygen uptake (VO2max) and HDL-C was 0.48 (P < 0.05), which explained 23% of the variation in HDL-C. The ATG increased VO2max by 25% (P < 0.001) and decreased percentage body fat by 13% (P < 0.05) after 16 weeks. Each of the alterations in the ATG had disappeared after the 6 week detraining period. The concentration of total
cholesterol (TC), TRI, HDL-C and low density lipoprotein-cholesterol in the blood did not change during the study in RTG, XTG and CG. The RTG increased upper and lower body strength by 29% (P < 0.001) and 38%, respectively. The 6 week detraining strength values obtained in RTG were significantly greater than those obtained at baseline. The XTG increased upper and lower body strength by 19% (P < 0.01) and 25% (P < 0.001), respectively. The 6 week detraining strength values obtained in XTG were significantly greater than those obtained at baseline. The RTG, XTG and CG did not demonstrate any significant changes in either VO2max, or body composition during the training and detraining periods. The results of this study suggest that aerobic-type exercise improves lipoprotein-lipid profiles, cardiopulmonary fitness and body composition in healthy, young women, while resistance training significantly improved upper and lower body strength only.

Shephard (1996) conducted a study on worksite fitness and exercise programs: a review of methodology and health impact. Purpose: To examine the methodology of worksite fitness and exercise programs and to assess their effect on health-related fitness, cardiac risk factors, life satisfaction and well-being, and illness and injury. Research methods: The 52 studies reviewed cover English-language literature for the period from 1972 to 1994, as identified by a search of the Cumulative Index Medicus, Medline, the Canadian Sport Documentation Centre's "Sport Discus," computerized bibliography, and my own files. Reports were divided into five controlled experimental studies, 14 quasi-experimental studies with matched controls (one
reported in abstract), and 33 other interventions of varied quality. Summary: Methodologic problems include difficulty in allowing for Hawthorne effects, substantial sample attrition, and poor definition of the intervention (exercise or broad-based health promotion). Findings are analyzed by specific fitness and health outcomes. Program participants show small but favorable changes in body mass, skin folds, aerobic power, muscle strength and flexibility, overall risk-taking behavior, systemic blood pressure, serum cholesterol, and cigarette smoking. Claims of improved mood state are based heavily on uncontrolled studies. Quasi-experimental studies suggest reduced rates of illness and injury among participants, but seasonal and year-to-year differences in health weaken possible conclusions. Conclusions: Participation in worksite fitness programs can enhance health-related fitness and reduce risk-taking behavior, but population effect is limited by low participation rates.

Ogawa et al. (1992) examined that effect of aging, sex, and physical training on cardiovascular responses to exercise. Background: The relative contributions of decreases in maximal heart rate, stroke volume, and oxygen extraction and of changes in body weight and composition to the age-related decline in maximal oxygen uptake (VO2max) are unclear and may be influenced by sex and level of physical activity. Methods and Results: To investigate mechanisms by which aging, sex, and physical activity influence VO2max, we quantified VO2, cardiac output, and heart rate during submaximal and maximal treadmill exercise and assessed weight and fat-free mass in healthy younger and older sedentary and endurance exercise-trained
men and women. For results expressed in milliliters per kilogram per minute, a three-to-four-decade greater age was associated with a 40-41% lower VO2max in sedentary subjects and a 25-32% lower VO2max in trained individuals (p less than 0.001). A smaller stroke volume accounted for nearly 50% of these age-related differences, and the remainder was explained by a lower maximal heart rate and reduced oxygen extraction (all p less than 0.001). Age-related effects on maximal heart rate and oxygen extraction were attenuated in trained subjects (p less than 0.05). After normalization of VO2max and maximal cardiac output to fat-free mass, age- and training-related differences were reduced by 24-47% but remained significant (p less than 0.05). For trained but not sedentary subjects, maximal cardiac output and stroke volume normalized to fat-free mass were greater in men than in women (p less than 0.05).

Conclusions: A lower stroke volume, heart rate, and arteriovenous oxygen difference at maximal exercise all contribute to the age-related decline in VO2max. Effects of age and training on VO2max, maximal cardiac output, and stroke volume cannot be fully explained by differences in body composition. In sedentary subjects, however, the sex difference in maximal cardiac output and stroke volume can be accounted for by the greater percentage of body fat in women than in men.

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stroke volume can be accounted for by the greater percentage of body fat in women than in men.

**Uusitupa (1991)** organized a study on hypertension in diabetic patients -use of exercise in treatment. Prevalence of hypertension is greater than normal in patients with type 1 (insulin-dependent) and type 2 (non-insulin-dependent) diabetes. In those with type 2 diabetes insulin resistance and hyperinsulinaemia may play a part in the pathogenesis of hypertension independent of obesity. Regular physical activity increases insulin sensitivity through its effect on glucose utilization in peripheral (muscle) tissue. Furthermore, physical activity helps control weight, and it may reduce blood pressure and, serum cholesterol and triglycerides concentrations while increasing the amount of high-density lipoprotein cholesterol. So physical exercise programmes should be included in the management of patients with type 2 diabetes. Suitable exercise forms and programmes can be prepared for most patients.
2.3 STUDIES ON BIO-CHEMICAL VARIABLES

Sato (2014) organized a research on Effect of Variation of Lemon Intake and Walking in Daily Life on Various Indicators of Muscle Mass and Blood Biochemistry in Menopausal Middle-aged and Elderly Women. Objectives: We examined the factors considered to change body composition and blood biochemistry indicators in menopausal middle-aged and elderly women. These changes result from exercise by walking as part of their daily activities and lemon consumption by women who live on the small islands of the Seto Inland Sea, Japan's largest citrus fruit (lemon)-producing region. Methods: Between September 2011 and March 2012, we recorded the daily lemon consumption and the number of steps taken by 101 middle-aged and elderly female lemon farmers. We also measured their body dimensions, body compositions, and blood pressure pulse wave velocity and conducted blood tests before and after the survey period. The results before and after the survey period were compared by the t-test and associations were determined on the basis of Pearson's correlation coefficient. Covariance structural analysis was carried out to determine causal associations. Results: From the results of covariance structure analysis, lemon intake did not have a direct impact on each item examined. The third item, i.e., "the factors related to arteriosclerosis," was affected indirectly via citric acid and fatigue, and anticoagulation was shown. The fourth item, i.e., "the factors related to maintenance of muscle mass," which is affected by menopausal years and the change in walking speed, was shown to be associated with the second item, i.e.,
"the factors related to lipid metabolism." Menopausal years affected the first, third and fourth items. Conclusions: Lemon intake did not have a direct impact on each item. Lemon has been shown to indirectly affect the third item through citric acid. Walking affected the second item, the level of total cholesterol, such as HDL cholesterol, through the fourth item. The importance of providing services that lead to sustained physical activity and a well-balanced metabolism between lipids and carbohydrates has been shown.

**Persoon, et al, (2013)** conducted a research on Effects of exercise in patients treated with stem cell transplantation for a hematologic malignancy: a systematic review and meta-analysis. We performed a systematic review and meta-analysis evaluating the effectiveness of exercise interventions compared with usual care on physical fitness, fatigue and health-related quality of life in patients with hematologic malignancies treated with stem cell transplantation. Electronic databases were searched up to June 2012. We included randomized controlled trials comparing exercise with usual care, in which at least 75% of the patients had a hematologic malignancy. Standard mean differences were calculated and pooled to generate summary effect sizes (ES) and 95% confidence intervals (CI). The Cochrane Collaboration Risk of Bias Tool was used to assess the methodological quality of the studies. Eight studies met our inclusion criteria. Exercise had a statistically significant moderately favorable effect on cardiorespiratory fitness (ES=0.53, 95% CI=0.13-0.94), lower extremity muscle strength (ES=0.56, 95% CI=0.18-0.94) and fatigue (ES=0.53, 95% CI=0.27-0.79). Significant small positive effects were found
for upper extremity muscle strength, global quality of life, and physical, emotional and cognitive functioning. In conclusion, exercise seems to have beneficial effects in patients treated with stem cell transplantation. However, all studies had at least some risk of bias, and for cardiorespiratory fitness and lower extremity muscle strength substantial heterogeneity in effect sizes were observed. Further high quality research is needed to determine the optimal exercise intervention and clinical implications.

**Vallimurugan (2013)** examined the effect of aerobic dance training on haematological variables among Ball Badminton players. For the present study 30 female ball badminton players from Selvam Group of Institutions, Namakkal, Tamilnadu were selected at random and their age ranged from 18 to 25 years. For the present study pre test – post test randomized group design which consists of control group and experimental group was used. The subjects were randomly assigned to two equal groups of fifteen each and named as Group ‘A’ and Group ‘B’. Group ‘A’ underwent aerobic dance training and Group ‘B’ underwent no training. The data was collected before and after twelve weeks of training. The data was analyzed by applying Analysis of Co-Variance (ANCOVA) technique to find out the effect of aerobic dance training programme. The level of significance was set at 0.05. The findings of the present study have strongly indicates that aerobic dance training of twelve weeks has significant effect on selected haematological variables i.e., RBC and WBC of ball badminton players. Hence the hypothesis earlier set that aerobic dance training programme would have been significant effect on selected
aerobic dance training variables in light of the same the hypothesis is accepted. Significant effect of aerobic dance training was found on RBC and WBC.

Zaletel, et al. (2013) the training effects of contemporary aerobics programmes (hi lo, dance aerobics, step aerobics, aqua aerobics etc.) have been frequently investigated. However, we found no recent paper which reviewed aerobic programmes with regard to their training effectiveness, characteristics of the subjects involved, variables of interest and experimental design. In this paper we summarise the findings of more than 40 studies published in the 2000-2011 period that investigated the training effects of different forms of contemporary aerobics. In this review, the studies are grouped according to their characteristics (sample of subjects, variables of interest, study design, effects, etc.). Around 80% of the investigations dealt with females, with adults being most commonly observed. In the majority of investigations, the authors studied different variables at the same time (morphological anthropometric, motor, cardiovascular, biochemical indices, etc.). In recent studies a trend toward a psychological status examination is evident. In most instances positive training effects on motor-endurance and varsity of physiological variables are declared throughout a training period of 8 to 12 weeks. However, the positive changes in anaerobic endurance are not evidenced. Knowing the tendency of the overall increase of certain psychological disorders in population (including depression) there are indications that future, potentially highly interesting studies will deal with the psychological status of adults and older subjects.
Ravinder, et al. (2012) concluded the aerobic training reduce the Total Cholesterol, Triglycerides and LDL cholesterol levels. Different types of exercise programs on the lipid profiles of the individuals might contribute for the enhancement of knowledge in this area, and will be certainly useful to create different protocols of exercise to different individuals basing on the requirements of the individuals. Awareness of Anaerobic training and Aerobic training will help in creating new ideas, and may lead to considerate the knowledge on the effects of exercise on the individuals health related physical fitness. Lack of exercise (Detraining) for one month may increase the Total Cholesterol, Triglycerides and LDL cholesterol levels.

Wu, et al. (2012) participation in aerobic dance is associated with a number of lower extremity injuries, and abnormal joint loading seems to be a factor in these. However, information on joint loading is limited. The purpose of this study was to investigate the kinetics of the lower extremity in step aerobic dance and to compare the differences of high-impact and low-impact step aerobic dance in 4 aerobic movements (mambo, kick, L step and leg curl). 18 subjects were recruited for this study. High-impact aerobic dance requires a significantly greater range of motion, joint force and joint moment than low-impact step aerobic dance. The peak joint forces and moments in high-impact step aerobic dance were found to be 1.4 times higher than in low-impact step aerobic dance. Understanding the nature of joint loading may help choreographers develop dance combinations that are less injury-prone.
Furthermore, increased knowledge about joint loading may be helpful in lowering the risk of injuries in aerobic dance instructors and students.

Aranga & Kulothungan (2011) studied effect of different intensity aerobic exercise on body composition variables among middle aged men. Sixty male subjects were selected randomly divided four groups and each group consists of fifteen subjects each. The age ranged from 35 to 45. Group 1 underwent as low intensity aerobic exercise, group II underwent moderate intensity aerobic exercise, group III underwent high intensity aerobic exercise and group IV acted as control group. The experimental groups underwent their intensity aerobic exercise programme three days per week for twelve weeks. Control group did not undergo any training programme rather than their routine work. The body composition are percentage body fat and lean body mass were measured by using skin fold caliper. Prior to and after end of practice period all subjects were tested. The results of pre-test and post-test were compared with using Analysis of Co-variance. The results showed that high intensity aerobic exercises were significantly better than low and moderate aerobic exercises in percentage body fat. The moderate and high intensity aerobic exercises significantly influenced lean body mass of middle age men.

Edvardsen, et al. (2011) compared the aerobic capacity during maximal aerobic dance and treadmill running in fit women. Thirteen well-trained female aerobic dance instructors aged 30 ± 8.17 years (mean ± SD) exercised to exhaustion by running on a treadmill for measurement of maximal oxygen uptake (VO2max) and peak heart rate (HRpeak). Additionally, all subjects
performed aerobic dancing until exhaustion after a choreographed videotaped routine trying to reach the same HRpeak as during maximal running. The p value for statistical significance between running and aerobic dance was set to ≤0.05. The results (mean ± SD) showed a lower VO2max in aerobic dance (52.2 ± 4.02 ml·kg⁻¹·min⁻¹) compared with treadmill running (55.9 ± 5.03 ml·kg⁻¹·min⁻¹) (p = 0.0003). Further, the mean ± SD HRpeak was 182 ± 9.15b·min⁻¹ in aerobic dance and 192 ± 9.62 b·min⁻¹ in treadmill running, giving no difference in oxygen pulse between the 2 exercise forms (p = 0.32). There was no difference in peak ventilation (aerobic dance: 108 ± 10.81 L·min⁻¹ vs. running: 113 ± 11.49 L·min⁻¹). In conclusion, aerobic dance does not seem to be able to use the whole aerobic capacity as in running. For well endurancetrained women, this may result in a lower total workload at maximal intensities. Aerobic dance may therefore not be as suitable as running during maximal intensities in well-trained females.

**Stasiulis et al, (2010)** conducted a research on Aerobic exercise-induced changes in body composition and blood lipids in young women. The objective of the study was to assess changes in body composition, blood lipid and lipoprotein concentrations in 18-24-year-old women during the period of two-month aerobic cycling training. Material and Methods: Young, healthy, nonsmoking women (n=19) volunteered to participate in this study. They were divided in two groups: experimental (E, n=10) and control (C, n=9). The subjects of group E exercised 3 times a week with intensity of the first ventilatory threshold and duration of 60 min. The group C did
not exercise regularly over a two-month period of the experiment. The subjects
of group E were tested before and after 2, 4, 6 and 8 weeks of the experiment.
The participants of group C were tested twice with an eight-week interval.
Results: Body weight, body mass index, body fat mass, and triacylglycerol
(TAG) concentration decreased and high-density lipoprotein cholesterol (HDL-
ch) concentration increased after the 8-week training program in the
experimental group (P<0.05). Blood total cholesterol (Tch) and low-density
lipoprotein cholesterol (LDL-ch) concentrations did not change significantly.
Body weight and body mass index started to decrease after 2 weeks of the
experiment, but significant changes were observed only after 6 and 8 weeks.
Body fat mass was significantly decreased after 2 and 8 weeks of aerobic
training. A significant increase in HDL-ch concentration was observed after 4,
6, and 8 weeks. A significant decrease in TAG concentration was observed
after 2-week training. No significant changes in all the parameters except TAG
(it was slightly increased) were seen in the control group. Conclusions: The
two-month aerobic cycling training (within VT1, 60-min duration, three times a
week) may induce significant changes in the parameters of body composition--
body weight, body mass index, body fat mass, and blood lipids--in young
women. The following significant changes were observed: TAG level
decreased after 2 weeks, body mass and body mass index decreased after 6
weeks, body fat mass decreased and HDL-ch level increased after 8 weeks.
Peak oxygen uptake increased after 4 weeks.
Ravikumar (2009) conducted a study to find out the effect of selected yogic practices and aerobic exercises on somato type components and its relationship with health related physical fitness and biochemical variables. Forty-five college male students were selected randomly from in the Government boys’ hostel, lawspet, Puducherry. Their age ranges from 18 to 25 years. They were divided into three groups namely control group, yogic group and aerobic group. The training period the yogic group and the aerobic group underwent fourteen weeks of training on their respective program. The yogic group was trained on asanas and pranayama. The aerobic group was trained on aerobic exercises with rhythmic music with various types of aerobic type movements. The progressive load method was used up to fourteen weeks for the respective groups. The training was given during for 5 days a week. The data pertaining to pre test and post test of experimental variables were derived through the following methods. Health related physical fitness components such muscular strength and endurance, muscular flexibility, cardio vascular endurance & body composition significantly improved after yogic group and aerobic exercise group than the control group.

Shantha (2007) examined the effect of yogasanas and aerobic training on the selected physiological and bio chemical variables of middle aged women. Thirty middle aged women were selected and first 10 volunteers underwent 12 weeks training programme on yogasanas. The second 10 volunteers underwent training programme on walking for 30 minutes. The third 10 volunteers acted as control group. The suitable physiological and bio chemical
parameters (blood pressure and cholesterol) were taken before and after the training programme for all the three groups. ANCOVA was used to analyse the data obtained. The results showed that there is greater improvement in blood pressure and cholesterol levels in the experimental groups.

Slentz et al. (2007) conducted a research on Inactivity, exercise training and detraining, and plasma lipoproteins. Stride: a randomized, controlled study of exercise intensity and amount. Exercise has beneficial effects on lipoproteins. Little is known about how long the effects persist with detraining or whether the duration of benefit is effected by training intensity or amount. Sedentary, overweight subjects (n = 240) were randomized to 6-mo control or one of three exercise groups: 1) high-amount/vigorous-intensity exercise; 2) low-amount/vigorous-intensity exercise; or 3) low-amount/moderate-intensity exercise. Training consisted of a gradual increase in amount of exercise followed by 6 mo of exercise at the prescribed level. Exercise included treadmill, elliptical trainer, and stationary bicycle. The number of minutes necessary to expend the prescribed kilocalories per week (14 kcal x kg body wt(-1) x wk (-1) for both low-amount groups; 23 kcal x kg body wt(-1) x wk (-1) for high-amount group) was calculated for each subject. Average adherence was 83-92% for the three groups; minutes per week were 207, 125, and 203 and sessions per week were 3.6, 2.9, and 3.5 for high-amount/vigorous-intensity, low-amount/vigorous intensity, and low-amount/moderate-intensity groups, respectively. Plasma was obtained at baseline, 24 h, 5 days, and 15 days after exercise cessation. Continued
inactivity resulted in significant increases in low-density lipoprotein (LDL) particle number, small dense LDL, and LDL-cholesterol. A modest amount of exercise training prevented this deterioration. Moderate-intensity but not vigorous-intensity exercise resulted in a sustained reduction in very-low-density lipoprotein (VLDL)-triglycerides over 15 days of detraining (P < 0.05). The high-amount group had significant improvements in high-density lipoprotein (HDL)-cholesterol, HDL particle size, and large HDL levels that were sustained for 15 days after exercise stopped. In conclusion, physical inactivity has profound negative effects on lipoprotein metabolism. Modest exercise prevented this. Moderate-intensity but not vigorous-intensity exercise resulted in sustained VLDL-triglyceride lowering. Thirty minutes per day of vigorous exercise, like jogging, has sustained beneficial effects on HDL metabolism.

Prasad, et al. (2006) investigated the impact of pranayama and Yoga on lipid profile in normal healthy volunteers. The present study was conducted on normal healthy volunteers, 41 men and 23 women, to evaluate the Impact of pranayama and yogasanas on lipid profiles and free fatty acids in two stages. In stage I, pranayama was taught for 30 days and in stage II Yogic practices were added to pranayama for another 60 days. A significant reduction was observed in triglycerides, free fatty acids and VLDL cholesterol in men and free fatty acids alone were reduced in women at the end of stage I. A significant elevation of HDL cholesterol was seen only in the men at the end of stage I. At the end of stage-II, free fatty acids increased in both men and women, and
women demonstrated a significant fall in serum cholesterol, triglycerides, LDL and VLDL cholesterol. The results indicated that HDL cholesterol was elevated for men with pranayama, while triglycerides and LDL cholesterol decreased in women after yoga asanas.

Mosher, et al. (2005) exercise training can improve lipid and lipoprotein concentrations and reduce the risk of heart disease. Little information is available concerning aerobic dance training and lipoprotein concentration changes in women. The purpose of this study was to compare the effects of two different methods of step bench training on cardiorespiratory fitness, body composition, and lipoprotein concentrations in college-aged females. Subjects were assigned to one of three groups: a traditional continuous step (CS), an interval step group (IS), or a non-exercise control group (C). The CS and the IS groups participated in three 50 minute sessions for 12 weeks. The CS session included a warm-up, 30-35 min of continuous bench stepping, 10-15 min of calisthenic exercises, and a 5-min cool-down. The IS sessions included a 5-7 min warm-up, 35-40 min of alternating intervals of bench stepping and non-step aerobic dance, and a 5-7-min cool-down. Target heart rates were maintained within 70 to 85% of maximal heart rate. Results showed increases in HDL-C concentrations in the IS group (p<0.05). Decreases in percent body fat were evident in both dance groups (p<0.05) and cardiovascular fitness increased in both groups (p<0.01). No changes were evident in the control group. In college-aged women, 12 weeks of IS or CS training improved cardiorespiratory fitness and body composition. In addition,
IS training appears to have a greater effect on HDL-C concentrations than CS training.

Thompson, et al. (2004) organized a research on Apolipoprotein E genotype and changes in serum lipids and maximal oxygen uptake with exercise training. Physical activity improves lipid levels by altering triglyceride (TG) metabolism. Apolipoprotein E (Apo E) facilitates TG clearance by mediating lipoprotein binding to hepatic receptors, but Apo E also has less defined roles in skeletal muscle and nervous tissue. This study examined if variants in Apo E genotype affect the lipid and physiologic response to exercise training. Seven centers genetically screened 566 individuals to recruit 120 subjects into 6 gender-specific cohorts equal for the most common Apo E genotypes: E2/3, E3/3, and E3/4. Anthropometrics, exercise capacity (Vo(2)max), serum lipids, and post heparin (PH) plasma lipase activities were measured before and after 6 months of supervised exercise training. Difference in the response (Delta) to training among the Apo E genotypes was the primary outcome variable. Differences in pertaining serum lipids among the Apo E genotypes mimicked those observed in population studies: TGs were slightly higher in E2/3 subjects, whereas low-density lipoprotein (LDL)-cholesterol (C) was lower (P = not significant [NS]). TGs decreased 11% with training for the entire cohort (P <.0001) and 7%, 12%, and 14% for the Apo E 2/3, 3/3 and 3/4 groups, respectively (P = NS for Delta). LDL-C did not change in the entire cohort, but decreased slightly in the 2/3 and 3/3 subjects and increased 4% in the 3/4 group (P = NS for Delta). High-density lipoprotein (HDL)-C increased
2% for the entire cohort (P = .06) due to a 6% increase in the 3/3 group (P = .07 for Delta). Total cholesterol (TC)/HDL and LDL/HDL decreased with training in the 2/3 and 3/3 groups, but increased in the 3/4 subjects and these responses differed among the genotypes (P < .05 for Delta). VO\(_{2}\)max increased 9% to 10% for the entire cohort, but only 5% in the 3/3 subjects versus 13% in the 2/3 and 3/4 groups and these differences were significantly different among the genotypes (P < .01 for Delta). This is the first prospective study to demonstrate that the serum lipid response to exercise training differs by Apo E genotype in a pattern consistent with known metabolic differences among the variants. Surprisingly, Apo E genotype also affected the increase in aerobic capacity produced by exercise training possibly via undefined effects on nerve and skeletal muscle function.

Park et al. (2003) documented that the effect of long-term aerobic exercise on maximal oxygen consumption, left ventricular function and serum lipids in elderly women. The purpose of this study was to investigate the changes of maximal oxygen consumption, left ventricular function and serum lipids after 36 weeks of aerobic exercise in elderly women without the influence of drugs. Eight elderly women were studied by M-mode and Doppler echocardiography to assess left ventricular size, mass and function. Maximal oxygen consumption (VO\(_{2}\)max) was determined for each subject by administering a treadmill exercise test. The training intensity was decided by heart rate reserve. Subjects performed exercise for 40 minutes a day, 3 days a week at 50-60% of the heart rate reserve during the 36 weeks. Exercise
capacity was assessed by VO(2)max with a graded exercise test of the treadmill. Weight and % body fat decreased after training. Cardio respiratory function improved because of the increase in VO(2)max and VO(2)max normalized for body weight after training. Systolic blood pressure significantly decreased. There are no significant difference in all left ventricular parameters (end-diastolic dimension, end-systolic dimension, end-diastolic volume, end-systolic volume, stroke volume, cardiac output, ejection fraction, fractional shortening) after 36 weeks. Exercise training did not induce left ventricular (LV) enlargement as evidence of an absence of increase in left ventricular end-diastolic volume. The total cholesterol level and triglyceride level decreased after training. High density lipoprotein-cholesterol significantly increased and low density lipoprotein-cholesterol significantly decreased, atherogenic index (AI) significantly decreased and apolipoprotein A-I increased and apolipoprotein B decreased after training. In conclusion, although there was no significant change in left ventricular function, aerobic training showed a positive influence on body composition, maximal oxygen consumption and serum lipids.

Katzmarzyk et al (2001) examined that Changes in blood lipids consequent to aerobic exercise training related to changes in body fatness and aerobic fitness. The contribution of changes in body fatness and aerobic fitness to changes in blood lipids after aerobic exercise training was investigated. The sample included 295 men (77 black, 218 white) and 355 women (131 black, 224 white), aged 17 to 65 years, from the Heritage Family Study. Participants
underwent measurements at baseline and after 20 weeks of supervised exercise training on a cycle ergometer. Body fat mass (FM, in kilograms) was determined by underwater weighing, and aerobic fitness (maximal oxygen uptake, VO(2max), in milliliters per minute) was assessed by cycle ergometry. Blood lipid measurements included fasting plasma levels of high-density lipoprotein cholesterol (HDL-C), HDL(2)-C, HDL(3)-C, low-density lipoprotein cholesterol (LDL-C), total cholesterol (CHOL), CHOL/HDL, and triglycerides (TG). A composite lipid change index (LCI) was derived by subjecting the Delta scores for the individual blood lipids to principal components analysis. The exercise training was accompanied by a mean increase of 17.5% in VO(2max) and a mean decrease of 3.3% in FM. Partial correlations, controlled for age, between absolute changes in VO(2max) and changes in the blood lipids were consistently low and non-significant. On the other hand, absolute changes in FM were significantly (P < .05) associated with changes in HDL-C (r = -.23), HDL(2)-C (r = -.17), and CHOL/HDL (r = .24) and the LCI (r = -.27) in men and with changes in LDL-C (r = .22), CHOL (r = .19), and CHOL/HDL (r = .15) and the LCI (r = -.19) in women. Forward stepwise regression confirmed that the change in FM was a better predictor of changes in blood lipids than the change in VO(2max), entering as a predictor in 4 of 8 regressions in both men and women. Change in VO(2max) did not enter as a significant predictor in any regression. Further, there were no differences in LCI between the upper and lower quartiles of VO (2max) change. On the other hand, there were significant differences between the low
and high quartiles of FM change. No race effects were observed in any of the relationships, except that race was a significant predictor of changes in TG in both men and women. In conclusion, changes in blood lipids associated with aerobic exercise training do not appear to be related to changes in aerobic fitness per se; rather, they are weakly to moderately associate with changes in body fatness.

Durstine et al. (2001) organized a research on Blood lipid and lipoprotein adaptations to exercise: a quantitative analysis. Dose-response relationships between exercise training volume and blood lipid changes suggest that exercise can favorably alter blood lipids at low training volumes, although the effects may not be observable until certain exercise thresholds are met. The thresholds established from cross-sectional literature occur at training volumes of 24 to 32 km (15 to 20 miles) per week of brisk walking or jogging and elicit between 1200 to 2200 kcal/wk. This range of weekly energy expenditure is associated with 2 to 3 mg/dl increases in high-density lipoprotein-cholesterol (HDL-C) and triglyceride (TG) reductions of 8 to 20 mg/dl. Evidence from cross-sectional studies indicates that greater changes in HDL-C levels can be expected with additional increases in exercise training volume. HDL-C and TG changes are often observed after training regimens requiring energy expenditures similar to those characterized from cross-sectional data. Training programmes that elicit 1200 to 2200 kcal / wk in exercise are often effective at elevating HDL-C levels from 2 to 8 mg/dl, and lowering TG levels by 5 to 38 mg/dl. Exercise training seldom alters total cholesterol (TC) and
low-density lipoprotein-cholesterol (LDL-C). However, this range of weekly exercise energy expenditure is also associated with TC and LDL-C reductions when they are reported. The frequency and extent to which most of these lipid changes are reported are similar in both genders, with the exception of TG. Thus, for most individuals, the positive effects of regular exercise are exerted on blood lipids at low training volumes and accrue so that noticeable differences frequently occur with weekly energy expenditures of 1200 to 2200 kcal/wk. It appears that weekly exercise caloric expenditures that meet or exceed the higher end of this range are more likely to produce the desired lipid changes. This amount of physical activity, performed at moderate intensities, is reasonable and attainable for most individuals and is within the American College of Sports Medicine's currently recommended range for healthy adults.

Donnelly et al. (2000) compared the effects of 18 months of continuous vs intermittent exercise on aerobic capacity, body weight and composition, and metabolic fitness in previously sedentary, moderately obese females. Design: Randomized, prospective, long-term cohort study. Subjects performed continuous exercise at 60-75% of maximum aerobic capacity, 3 days per week, 30 min per session, or exercised intermittently using brisk walking for two, 15 min sessions, 5 days per week. Measures: Aerobic capacity, body weight, body composition, and metabolic fitness (blood pressure, lipids, glucose and insulin). Results: Significant improvements for aerobic capacity of 8% and 6% were shown for the continuous and intermittent exercise groups, respectively. Weight loss for the continuous exercise group was significant at 2.1% from
baseline weight and the intermittent group was essentially unchanged. The continuous group showed a significant decrease in percentage of body fat and fat weight while the intermittent group did not. HDL cholesterol and insulin were significantly improved for both groups. Conclusions: In previously sedentary, moderately obese females, continuous or intermittent exercise performed long-term may be effective for preventing weight gain and for improving some measures of metabolic fitness.

Kin, et al. (2001) examined the effect of 8 weeks of step aerobics and aerobic dancing on blood lipids and lipoproteins. Comparative training. Two months of physical fitness program. Forty-five sedentary female college student volunteers randomly assigned to one of the three groups as step aerobics (n=15), aerobic dancing (n=15) and the control group (n=15). The step aerobics and aerobic dancing groups participated in sessions of 45 min per day, 3 days per week for 8 weeks with 60-70 percent of their heart rate reserve. Total cholesterol (TC), triglyceride (TG), low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol levels (HDL-C), the ratio of total cholesterol to high-density lipoprotein cholesterol (TC:HDL-C). At the end of the 8 week period, a significant difference has been found between the step aerobics group and the control group and between the aerobic dancing group and the control group in TC levels (F[2,44]=8.38; p<0.01). A significant difference in HDL-C levels (F[2,44]=3.65; p<0.05) and TC:HDL-C ratio (F[2,44]=11.56; p<0.01) has been found only between the step aerobics group and the control group. These results indicate that step aerobics training is an
effective training mode for modifying lipid and lipoprotein profiles of female college-aged students.

Kraemer, et al (2001) conducted a study on resistance training combined with bench step aerobics which enhances women's health profile. Thirty five healthy, active women were randomly assigned to one of four groups that either a) performed 25 min of BSA only (SA25); b) performed a combination of 25 min of BSA and a multiple-set upper and lower body resistance exercise program (SAR); c) performed 40 min of BSA only (SA40); or d) served as a control group (C), only performing activities of daily living. Direct assessments for body composition, aerobic fitness, muscular strength, endurance, power, and cross-sectional area were performed 1 wk before and after 12 wk of training. All training groups significantly improved peak VO(2) (3.7 to 5.3 mL O(2).kg(-1).min(-1)), with the greatest improvement observed in the SAR group (P =0.05). Significant reductions in pre exercise heart rates (8-9 bpm) and body fat percent (5--6%) were observed in all training groups after training. Significant reductions in resting diastolic blood pressure were observed for the SAR and SA40 groups (6.7 and 5.8 mm Hg, respectively). Muscular strength and endurance only improved significantly in the SAR group (21 and 11% respectively). All groups demonstrated increased lower body power (11--14%), but only the SAR group significantly improved upper body power (32%). Thigh muscle cross-sectional areas measured via magnetic resonance imaging (MRI) increased primarily for the SAR group. BSA is an exercise modality effective for improving physical fitness and body
composition in healthy women. The addition of resistance exercise appears to enhance the total fitness profile by improving muscular performances, muscle morphology, and cardiovascular fitness greater than from performing BSA alone. Therefore, the inclusion of both modalities to an exercise program is most effective for improving total body fitness and a woman's health profile.

Scharff, et al. (1997) examined the effect of vertical impact forces during bench-step aerobics: exercise rate and experience, randomly performed 8- min. protocols of the "basic" bench-stepping technique and a more advanced "travel" technique at 30 and 33 cycles.min.-1. Analysis showed that the faster exercise rate yielded significantly higher vertical impact forces on a reference (B- 8) step height (20.3 cm). At 33 cycles.min.-1, the instructors, and novices responses were both higher than those at 30 cycles.min.-1. The mean peak vertical impact force ranged from 1.54 times the body weight for the novice group at 30 cycles.min.-1 to 1.87 times the body weight for instructors at 33 cycles.min.-1. A comparison of the groups' force curves showed a distinctive pattern in the loading of the impact forces. Specifically, the instructors consistently produced a transitory decrement in force prior to attaining peak force. In addition, the novices exhibited nonuniform increases in the production of vertical impact force across other step heights at the faster (33 cycles.min.-1) speed. Thus, experience with bench-step exercise may afford an ability to make uniform and force-absorbing adjustments in the resultant vertical impact forces at increased speeds.
Superko et al. (1991) documented that Exercise training, serum lipids, and lipoprotein particles: is there a change threshold? The role of lipoprotein manipulation in the treatment of atherosclerosis is well established. Improvement in lipoprotein cholesterol concentrations and subclass distribution through exercise training is often advised prior to pharmacologic intervention. As with other therapeutic interventions, dose must be stipulated to the patient. The dose of exercise training required to induce beneficial lipoprotein changes is unclear. This issue is further complicated by the potential effect of exercise training on lipoprotein subclass distribution (LDL I, LDL II, LDL III, LDL IV, HDL2a, HDL2b, HDL3a, HDL3b, HDL3c), enzymes, apoproteins, and transfer proteins and by the changes in diet and body composition that often accompany exercise training. These changes may be responsible for all or part of the lipoprotein change attributed to exercise. From available data, it appears that a threshold of approximately 15 miles/wk (-1) of jogging may be required to induce beneficial change.

Lampman et al. (1991) conducted a research on Effects of exercise training on glucose control, lipid metabolism, and insulin sensitivity in hypertriglyceridemia and non-insulin dependent diabetes mellitus. Exercise training has potential benefits for patients with hyperlipidemia and/or non-insulin dependent diabetes mellitus. In nondiabetic, nonobese subjects with hypertriglyceridemia, exercise training alone increased insulin sensitivity, improved glucose tolerance, and lowered serum triglyceride and cholesterol levels. These improvements did not occur when exercise training alone was
given to similar patients with impaired glucose tolerance. In severely obese (X = 125 kg) subjects without diabetes mellitus, a 600 calorie diet alone decreased glucose and insulin concentrations and improved glucose tolerance but did not increase insulin sensitivity. The addition of exercise training improved insulin sensitivity. Obese, non-insulin dependent diabetes mellitus subjects on sulfonylurea therapy alone increased insulin levels but failed to improve insulin sensitivity or glucose levels. In contrast, the addition of exercise training to this medication resulted in improved insulin sensitivity and lowered glucose levels. We conclude that exercise training has major effects on lowering triglyceride levels in hyperlipidemic subjects and can potentiate the effect of diet or drug therapy on glucose metabolism in patients with non-insulin dependent diabetes mellitus.

Marti et al. (1990) examined that effects of long-term, self-monitored exercise on the serum lipoprotein and apolipoprotein profile in middle-aged men. To study the effects of long-term, self-monitored exercise on the serum lipid profile and body composition of middle-aged non-smoking males, a controlled study was conducted in 61 sedentary, middle-class Swiss men. Thirty-nine men were randomly allocated to jog 2 h/wk for 4 months on an individually prescribed, heart rate-controlled basis, whereas 22 men served as controls. Despite varying adherence to the exercise regimen, the following 4-month net changes (effect in exercise group minus effect in control group) in lipids were seen: HDL cholesterol (C) +0.12 mmol/l (95% CI 0.02, 0.22; P = 0.028), LDL-C +0.08 mmol/l (ns), VLDL-C -0.26 mmol/l (-0.45, -0.07; P =
0.009), total triglycerides (TT) -0.21 mmol/l (ns), HDL-C/total C +0.02 (0.001, 0.05; P = 0.047). The net changes in endurance capacity and resting heart rate in favor of exercisers were significant as well, whereas no significant changes in apolipoprotein levels were seen. Exploratory analyses revealed, for example, associations of the increase in total physical activity with an increase in the HDL-C/total C ratio (r = 0.46; P less than 0.001), and of the change in estimated body fat content with an opposed change in the HDL-C/total C ratio (r = -0.40; P less than 0.001), or an inverse relationship of the change in subcutaneous fat with a change in the HDL2-C level (r = -0.39; P less than 0.001). Multivariable regression analysis suggested that much of the effect of jogging on HDL-C was apparently mediated through a decrease in body fat content. A change in the waist/hip ratio was unrelated to lipoprotein changes but was related to the change of TT level (r = 0.22; P less than 0.05). This study confirms that individually prescribed, unsupervised jogging can increase HDL-C levels and improve the serum lipoprotein profile in self-selected nonsmoking males. Although the effect is modest, it may be relevant to preventive cardiology, given the evidence for a reduction in cardiovascular risk even after apparently small decreases in risk factor levels.

2.4 SUMMARY OF RELATED LITERATURE

The relevant literature collected after exhaustive reviews of the different sources throw ample light with regard to aerobic activity on selected motor fitness, physiological and hematological variables. Thus, this chapter describes the review of related literature; which is essential to interpret the result to
support the present problem. The investigator presented fifty two literatures. Out of which more than 35 studies that are very closely related to the present study are given as supportive evidence in the fourth chapter under the heading of discussion on findings.