Chapter - II
CHAPTER-II

REVIEW OF RELATED LITERATURE

The review of related literature is the basics for all the research work. It gives an understanding of the previous work that has been made in the area under study to the scholar. It also helps the researcher to gather the related data and information for his study from the relative study of the other scholar. The study of the related literature is an essential step to get full picture of what has been done with regard to the problem under study. Such a review brings a new insight and help in the development of research procedure. The investigator has collected the related studies from Research Quarterly, E-Journals, Magazines and Thesis and listed down such studies in this chapter to add further dimensions and scope for this study. To achieve this purpose, the investigator first reviewed the available literatures and thesis which have been already of this nature. The investigator has compiled all the salient aspects related to this study and presented in this chapter.

2.1 Reviews related to Health Related Physical Fitness

Whitley and Schoene (1987) conducted a study to compare heart rate responses to water walking versus treadmill walking to determine whether the responses were of sufficient magnitude to elicit cardio respiratory training effects. The heart rates of 12 healthy, female college students were measured immediately after walking in waist-deep water and on a treadmill at the same distance, durations, and speeds (2.55, 2.77, 3.02, and 3.31 km/hr). A significant increase in heart rate with increased speeds resulted from water walking (p less than .05); from rest to the fastest speed, it was
135% (96 bpm). For treadmill walking, the increase of 19% (13 bpm) was not significant. The heart rates for the water condition were significantly higher (p less than .05) at each speed. These findings indicate that water walking could serve as an effective exercise mode, for example, for cardio respiratory fitness for individuals who are unable to perform such weight-bearing activities as jogging, fast walking, cycling, and dancing.

A research study was examined by Lehnhard et al. (1992) to assess current fitness levels in the state of Maine, more than 8,000 public school students, ages five through nine, were assessed using a nationally known (American Alliance for Health, Physical Education, Recreation and Dance) health related physical fitness test. National health goals include an increase in the physical activity and physical fitness of school-age children by the year 2000. Maine students were then compared with a national norm group on (1) the one-mile walk/run (minutes: seconds), (2) skin fold thickness (centimeters), (3) one-minute timed sit-ups (number performed correctly), and (4) the sit and reach test for flexibility (centimeters). Generally, Maine boys and girls scored higher than the norms on the sit-up, sit and reach, and one-mile walk/run; however, they had significantly larger skin fold thicknesses. Implications for assessment of health-related fitness in this age group were discussed.

Pierce et al. (1992) conducted a research study to determine whether such a tendency persists for entering college students, the authors evaluated 115 male and 143 female students for performance on the following fitness-related variables: (1) maximal oxygen consumption (estimated from Astrand cycling protocol), (2) body composition (skin-fold techniques), (3) muscle endurance (sit-up protocol), (4) muscle strength (bench-press protocol), and (5) joint flexibility (upper and lower body
protocols). Although neither men nor women exhibited high levels of cardiorespiratory fitness, the women in the study showed higher relative levels than their male counterparts. Both groups showed excellent levels of muscle strength (compared with normative standards), but they achieved only an average standard for muscle endurance. Findings of relatively low levels of cardiovascular fitness compared with levels of muscle strength, particularly in men, seem to be a reflection of an inappropriate concentration of physical activity.

Grant et al. (1992) conducted a research to find out the effects of a 10-week university fitness programme on health-related fitness variables. Twenty-one male exercisers, aged 37.0(10.3) years (mean (s.d.); range 21-58), and 22 male controls, aged 38.6 (7.9) years (mean (s.d.); range 17-54), volunteered to take part. Two sample t-tests and 95% confidence intervals were used to determine if the exercise group demonstrated a greater average improvement than the control group and the average improvement in both groups separately. The exercise group showed a greater average improvement over the controls from Test 1 (before fitness programme) to Test 2 (after) in the following: steady-state heart rate (beats min\(^{-1}\)) 95% confidence intervals (-7.8, -16.2); predicted VO\(_2\)max (ml kg\(^{-1}\) min\(^{-1}\)): 95% confidence intervals (3.2, 6.6); sit-ups (repetitions): 95% confidence intervals (3.1, 7.0); flexibility (cm): 95% confidence intervals (3.3, 6.9). There was no significant difference between the exercise group and control group in body weight, percentage body fat, blood pressure, total plasma cholesterol, high-density lipoprotein and triglycerides. The exercise programme improved aerobic fitness, local muscular endurance and flexibility. However, the increase in aerobic fitness did not coincide with beneficial changes in the coronary risk profile.
The influence of exercise training on body composition changes in children is examined in terms of muscle, bone, and fat development by Lohman (1992). Because of the inexact body composition methodologies in general use and an over-reliance on the two-component system—fat and fat-free body—the extent of changes especially for muscle and bone with exercise training has not been well quantified. With the recent development of new methodologies these limitations may be overcome. The relationship of body composition to health related fitness is also explored with an emphasis on establishing fitness standards for body fatness and the need for research on the etiology of lower back pain and osteoporosis.

Huddy et al. (1993) examined a study with three groups of students from a large Midwestern University (15 varsity swimmers, 15 varsity football players, and 15 non athletes) were administered a 20-item questionnaire concerned with body image and subsequently underwent skinfold measurements to assess percent body fat. Scores obtained were correlated to estimate the relationship between body image and adiposity. For the groups combined (N = 45) the relationship was significant and inverse (r = -0.51). For the non athletic group a significant value -0.76 was found; for the two groups of athletes there was no relationship (rs = 0.002 and -0.059 for football players and swimmers, respectively). We conclude that body image as measured in this study in inversely related to percent body fat among college men, especially among students not engaged in varsity sports.

Shephard and Bouchard (1995) administered a study to know the possibility of predicting health related fitness using questions on occupational and leisure activity was explored in 172 men and 178 women. ANOVA and multiple regression equations related questionnaire responses to objective fitness measures including body mass
index, circumferences, skin folds, body fat, blood glucose, uric acid, total cholesterol, HDL-cholesterol and triglycerides, PWC150, blood pressures, and resting heart rate. It was found that the reported occupational activities bore little relationship to health related fitness. Self-perceptions of moderately frequent and moderately intense leisure activity, plus at least average perceived fitness relative to age-matched peers, were associated with a favorable body fat content and lipid profile, whereas indicators of cardiovascular health (a low resting heart rate and a high PWC150) were linked with perceptions of frequent and intense activity, plus a perceived fitness level higher than that of a peer reference group. Based on these findings, a simple scoring of reported activity for use in fitness counseling is suggested.

Physical fitness, participation in physical activity, fundamental motor skills and body composition are important contributors to the health and the development of a healthy lifestyle among children and youth. The New South Wales Schools Fitness and Physical Activity Survey, 1997 was conducted by Booth et al. (1997) to fill some of the gaps in knowledge of these aspects of the lives of young people in New South Wales. The survey was conducted in February and March, 1997 and collected data on a randomly-selected sample of students (n = 5518) in Years 2, 4, 6, 8 and 10. Measures were taken on body composition (height and weight, waist and hip girths, skin folds), health-related fitness (aerobic capacity, muscular strength, muscular endurance, flexibility), fundamental motor skills (run, vertical jump, catch, overhand throw, forehand strike and kick), self-reported physical activity, time spent in sedentary recreation, and physical education (PE) classes. The methods were described to assist in the development of surveys of other populations and to provoke debate relevant to the development and dissemination of standard approaches to monitoring the fitness, physical activity habits and body composition of Australian children and youth.
Finally, they offer comments on some of the strengths and limitations of the methods employed.

Nupponen and Laukkanen (1998) conducted a research study which to develop introductory exercise courses for sedentary, moderately overweight adults. The aim was to offer a safe and motivating programme of physical exercise and, through experiential learning, to encourage and facilitate increased physical activity. The core of the programme was a course of 10-20 weekly exercise classes. The classes include a variety of physical exercises adapted to the special needs of overweight adults (BMI 28-34 kg/m²) and a number of health-related fitness tests. They outlined the underlying principles of the exercise courses, their structure and contents, the guidelines of instruction, and the use of formative evaluation. In addition, they reported on the implementation of five weight-reduction courses and six exercise courses involving a total of 209 participants. A fairly high level of programme acceptability (in terms of attendance rates and personal commitment) and programme feasibility (in terms of acceptability, changes in personal orientation towards health and weight reduction, and satisfaction among participants) was achieved.

Suni et al. (1998) conducted a study to evaluate the health-related content validity of nine fitness tests by studying how low, mid, and high levels of fitness are associated with perceived health and musculoskeletal functioning. Cross-sectional methodological study for a research institute for health promotion. Middle-aged (37 to 57 years) men (n = 245) and women (n = 253), evenly selected from five age cohorts of a random population sample. The odds ratios (ORs) of selected health outcomes for low (least fit 20%), mid (next 40%), and high (most fit 40%) fitness categories in the different tests adjusted for several possible confounders. Cardiorespiratory fitness, as
measured by 2-km walk test, was strongly and consistently associated with perceived health and mobility (stair climbing) in both genders (range of ORs, 2.4 to 17.6), and a somewhat weaker relationship was found with leg power and with leg strength (ORs, 2.5 to 7.2). Low fitness in back muscular endurance and upper-body strength were associated with mobility disability (ORs, 2.8 to 8.5) and with back dysfunction and pain (ORs, 2.9 to 6.1). High fitness in back endurance in men and in balance in women were related to positive back health (ORs, 2.5 to 3.7). Body mass index was associated with musculoskeletal disability in women (ORs, 2.4 to 5.3). Balance, leg strength, and leg flexibility in men; and leg power, trunk and leg flexibility in women were not associated with health outcomes. Among a middle-aged population, the majority of the evaluated fitness tests demonstrated health-related validity by strong associations with perceived health and musculoskeletal functioning, and by weaker associations with back symptoms.

A study has been conducted by Faigenbaum (1999) to compare the effects of a low repetition-heavy load resistance training program and a high repetition-moderate load resistance training program on the development of muscular strength and muscular endurance in children. This Design Prospective and controlled trial was conducted at Community-based youth fitness center for Eleven girls and 32 boys between the ages of 5.2 and 11.8 years. In twice-weekly sessions of resistance training for 8 weeks, children performed 1 set of 6 to 8 repetitions with a heavy load (n = 15) or 1 set of 13 to 15 repetitions with a moderate load (n = 16) on child-size exercise machines. Children in the control group (n = 12) did not undergo resistance train. One repetition maximum (RM) strength and muscular endurance (repetitions performed posttraining with the pretraining 1-RM load) were determined on the leg extension and chest press exercises. One RM leg extension strength significantly increased in both
exercise groups compared with that in the control subjects. Increases of 31.0% and 40.9%, respectively, for the low repetition-heavy load and high repetition-moderate load groups were observed. Leg extension muscular endurance significantly increased in both exercise groups compared with that in the control subjects, although gains resulting from high repetition-moderate load training (13.1 +/- 6.2 repetitions) were significantly greater than those resulting from low repetition-heavy load training (8.7 +/- 2.9 repetitions). On the chest press exercise, only the high repetition-moderate load exercise group made gains in 1-RM strength (16.3%) and muscular endurance (5.2 +/- 3.6 repetitions) that were significantly greater than gains in the control subjects. These findings support the concept that muscular strength and muscular endurance can be improved during the childhood years and favor the prescription of higher repetition-moderate load resistance training programs during the initial adaptation period.

The relationship between physical activity and health-related physical fitness was evaluated by Huang and Malina (2002) in 282 Taiwanese adolescents 12-14 years of age. The subjects were randomly selected from the 7th, 8th and 9th grades in two junior high schools in Taiwan. Physical activity was estimated as total daily energy expenditure and energy expenditure in moderate-to-vigorous physical activity from 24-hour activity records for three days, two week days and one weekend day. Health-related fitness was assessed as the one-mile run (cardiorespiratory endurance), timed sit-ups (abdominal strength and endurance), sit-and-reach (lower back flexibility), and subcutaneous fatness (sum of the triceps, subscapular, suprailliac, and medial calf skinfolds). Physical activity is significantly and positively correlated with one-mile run performance and the sit-and-reach, but not with sit-ups and subcutaneous fatness. Overall, the strength of the relationships between estimated energy expenditure and
specific fitness items in the total sample vary from low to moderate, with only 1% to 12% of the variance in fitness variables being explained by estimated energy expenditure. Comparisons of active versus inactive, and fit versus unfit adolescents provide additional insights. The more active (highest quartile) were also more fit in cardiorespiratory endurance and in the sit-and-reach than the less active (lowest quartile), and the more fit in the one-mile run (better time, lowest quartile) and the sit-and-reach (highest quartile) were more active than the less fit in each item, respectively.

Kim and Park (2006) conducted a study to analyze the effects of an exercise program on body composition and physical fitness of obese female college students. Data was collected from September 29, 2003 to December 29, 2003. The research design was a randomized control group pretest-posttest experimental design. The subjects were college nursing students at K University. Forty four students, 20 in the experimental group and 24 in a control group, with more than 30% body fat were randomly assigned. The subjects in the experimental group participated in an exercise program for 12 weeks, sixty minutes per session, five times per week. Body composition and physical fitness was measured by a body composition analyzer, cardiovascular endurance, muscle endurance, muscle strength (grip strength, back strength), flexibility, balance, agility (whole body reaction time) and power (standing long jump). Body weight ($F = 4.76, p=0.035$), body fat (kg) ($F = 5.68, p = 0.022$) and body mass index ($F=5.73, p = 0.021$) of the experimental group were significantly different from the control group, but there were no significant differences in body fat(%), lean body mass, muscle mass and WHR. Back strength ($F=6.50, p=0.015$), flexibility ($F=14.62, p=0.000$), muscle endurance ($F=7.98, p=0.007$), power ($F=5.76, p=0.021$) and balance ($F=2.46, p=0.018$) of the experimental group were significantly
different from the control group, but there were no significant differences in cardiovascular endurance, grip strength or agility. The exercise program was effective in improving body weight, body fat (kg), body mass index, back strength, muscle endurance, flexibility, balance and power of obese female college students.

2.2 STUDIES RELATED TO CALISTHENICS EXERCISES

Kieres and Plowman (1991) examined the effects of 2 different swimming and calisthenics exercise programs on body composition and swim performance. Subjects were forty-two students (M = 19; F = 23; mean age = 20.8 yr). The experimental groups (Swim-Land [SL], n = 14; Swim-Water, [SW], n = 16) participated in 35-40 min exercise sessions which consisted of a 5-10 min warm-up, 15-20 min of swimming, and 10-15 min of calisthenics three times per week for 8 weeks. The SL experimental group performed calisthenics on the Land with surgical tubing while the SW experimental group performed comparable calisthenics in the water. Subjects were pretested and posttested utilizing hydrostatic weighing to determine body density and calculate percent fat. Skinfold measures and the 12-min swim for distance were also measured. Results indicated a significant 20% increase in swim performance in both experimental groups (SL = 455 +/- 144 m to 553 +/- 114 m; SW = 465 +/- 122 m to 556 +/- 123 m; p less than 0.05) but no difference between groups.

Sandra Cassady and David Nielsen (1992) conducted a study on Cardiorespiratory Responses of Healthy Subjects to Calisthenics Performed on the Land Versus in the Water. This study evaluated the oxygen consumption and heart rate response curves for standardized upper- and lower-extremity exercise on the Land and in the Water. Forty healthy subjects performed one upper-extremity and one lower-extremity exercise at three selected cadences on the Land and in the Water Steady-state
heart rate was determined by electrocardiographic radiotelemetry and expressed as a percentage of age-predicted maximal heart rate (% APMHR). Percentage of age-predicted maximal heart rate was used as the criterion measure of relative exercise intensity. Oxygen consumption was determined by the open-circuit method. Results indicated systematic increases in VO₂ from 2 to 9 metabolic equivalents (METs) (1 MET = 3.5 mL O₂·kg⁻¹·min⁻¹) and % APMHR from 45% to 73% with increased cadence. The VO₂ responses were highest during water exercise, whereas % APMHR was greater during land exercise. Based on the magnitude of the responses, water calisthenics appear to be of sufficient intensity to elicit training adaptations. Training studies are needed to document these changes. [Cassady SL].

Dr. Jayakishan Santhoshi (2010) conducted a study to find out the effects of Calisthenics and Yogic exercises on selected Physical and Physiological variables. Research methodology involved the systematic procedure by which the research started from the initial identification of the problem to its final conclusions. The procedures and methods were applied in selection of subjects, experimental design, selection of variables, selection of test reliability of data, orientation of the subjects, training programme, administration of tests, collection of the data and statistical procedure followed in this study. The study was conducted on a total of 120 randomly selected male students from Yogashastra College. The groups were Group-A - only calisthenics exercise group Group-B - only yogasana practice group Group-C combined group, (calisthenics and yogasana group) Group-D - control group, (who didn't undergo any treatment). The experimental group A, B, and C were given treatment for one hour daily for six days a week for a period of twelve weeks and group D was not exposed to any treatment. Experimental groups went training between 7 am to 8 am. The pre and post test scores of all the four groups are given in
Table No-I. On physical fitness variables no significant difference was found between the pre and post scores of calisthenics group. Significant statistical differences have been found between the pre and post test scores of combined group on muscular endurance while no significant difference was found on speed. No significant difference have been found between pre and post test scores of controlled group on any of these physical fitness variables. From the intra and inter group comparisons the following conclusions can be drawn: From the intra group comparison it can conclude that physical and physiological fitness is improved by the training of all calisthenics exercises selected. From the inter group comparison, it can be said that combined group of Calisthenics and Yogasanas both are the best in improving the physical and physiological fitness of male students, so the training of calisthenics and yogasana both are the key to success in maintaining fitness.

2.3 Reviews Related to Water Exercises

Ford et al. (1989) conducted a research to determine the effects of participation in selected physical activities on scores of self-concept, body-cathexis and four items of health-related fitness, 88 women in university physical education service classes participated 3 hr. per week for 8 wk. in one of five activities (aerobic dance, jogging for fitness, swimming for fitness, life saving, and weight training). A total of 108 subjects participated in the study, with 20 students in health science classes serving as the controls. Few differences were noted between the activity groups and the controls on the posttest with pretest scores controlled. Specifically, joggers and aerobic dancers performed significantly more situps than did the controls, and joggers, aerobic dancers, weight trainers, and those in the lifesaving group displayed significantly greater flexibility on the sit and reach test than did the controls, on the posttest. None of the
activity groups differed from the controls regarding self-esteem, body cathexis, body fat, or the step test scores at posttest.

Maximizing the immediate psychological benefits of exercise might be one way to encourage adults to be physically active. The mood benefits of Hatha yoga and swimming, two activities that differ greatly in aerobic training benefits, were examined by Berger and Owen (1992). College students (N = 87) in two swimming classes, a yoga class, and a lecture-control class completed mood and personality inventories before and after class on three occasions. A multivariate analysis of variance indicated that both yoga participants (n = 22) and swimmers (n = 37) reported greater decreases in scores on Anget, Confusion, Tension, and Depression than did the control students (n = 28). The consistent mood benefits of yoga supported our earlier observation that the exercise need not be aerobic to be associated with mood enhancement. However, underlying and causal mechanisms remain uncertain. Among the men, the acute decreases in Tension, Fatigue, and Anger after yoga were significantly greater than those after swimming. Yoga may be even more beneficial than swimming for men who personally select to participate. The women reported fairly similar mood benefits after swimming and yoga. It seems that aerobic exercise may not be necessary to facilitate the mood benefits. Also, students with greater mood changes attended class more regularly than those who reported fewer psychological benefits.

Sideraviciūte et al. (2006) examined a study to evaluate the effect of long-term swimming program on body composition, aerobic capacity, and blood lipid/cholesterol level. Nineteen girls aged 14-19 years with duration of diabetes of 8.1+/-0.9 years and 28 healthy girls aged 14-19 years participated in the study. Before and after 14-week swimming program, weight, height, and four skinfold thickness were measured, body
mass index (kg/m\(^2\)) and body fat mass (%) were calculated, blood lipid levels (total cholesterol, high-density/low-density lipoprotein, and triglyceride) were estimated. Aerobic capacity was assessed by Ruffle test. Training sessions (each lasted for 45 min) were held twice per week for 14 weeks. A total of 28 trainings were performed in the swimming pool. Workload intensity was corrected by pulse measurement before and after every session in the water. After 14-week swimming program, body mass index did not change, but body fat mass decreased significantly in healthy (27.2 +/- 1.0 vs. 25.5 +/- 0.8%, p<0.001) and diabetics (34.8 +/- 1.2 vs. 32.1 +/- 1.2%, p<0.001) subjects. Both groups improved their aerobic capacity (p<0.01 in healthy and p<0.05 in diabetics). No significant changes in blood lipid profile were found in all subjects, only high-density lipoprotein concentration significantly increased in healthy girls (p<0.001). Long-term swimming program improved aerobic capacity, reduced body fat mass in all participants, and reduced high-density lipoprotein levels only in healthy subjects.

Wouters et. al (2010) examined a study in obese people the potential effectiveness of a six-week, two times weekly aqua jogging program on body composition, fitness, health-related quality of life, and exercise beliefs. Fifteen otherwise healthy obese persons participated in a pilot study. Total fat mass and waist circumference decreased 1.4 kg (P = .03) and 3.1 cm (P = .005), respectively. The distance in the Six-Minute Walk Test increased 41 meters (P = .001). Three scales of the Impact of Weight on Quality of Life-Lite questionnaire improved: physical function (P = .008), self-esteem (P = .004), and public distress (P = .04). Increased perceived exercise benefits (P = .02) and decreased embarrassment (P = .03) were observed. Aqua jogging was associated with reduced body fat and waist circumference.
and improved aerobic fitness and quality of life. These findings suggest the usefulness of conducting a randomized controlled trial with long-term outcome assessments.

2.4 Reviews Related to Yogic Practices

Patel C and North W.R (1975) studied on Randomized controlled trail of yoga and bio feed back in management of hypertension. Thirty four hypertensive patients were assigned at random either to six weeks of yoga methods with bio feed back or to general relaxation. Both group showed a reduction in Blood pressure although the decrease was significantly greater for yoga group. The control group was then trained in yoga relaxation and their blood pressure fell to that of other group.

Moorthy (1983) conducted a study on effect of yogic and non yogic exercise on minimum muscular fitness. 180 students (90 boys and 90 girls) were on each age group ranging from 6 to 11 years. He concluded that after discontinuing non yogic exercise as well as yogic exercises, the physical fitness decreased in non yogic exercise group when compared to the yogic group. Thus, yogic exercise helped to retain effects longer than the non exercise. Hence yogic exercises are more advantageous than non yogic exercises for boys and girls.

Khumar et al. (1993) made a study on effective of Shavasana on depression among University students. The effectiveness of yoga was examined as therputic technique to alleviate depression. 40 female university students were diagnosed with severe depression. 25 experienced 30 yoga sessions and 25 served as controls. The results revealed that 1. Yoga was an effective technique for alleviating depression and 2 continuation of the treatment for a long period resulted in a significantly increased positive change in the students.
Beera and Rajpurkar (1993) conducted a study on body composition, cardiovascular endurance and anaerobic power of yogic practitioners. 40 male high school students aged 12 to 15 years, practiced in a study on yoga in relation to body composition; cardiovascular endurance and an aerobic power were measured. The result revealed a significant improvement in ideal body weight, body density, cardiovascular endurance and an aerobic power following yoga.

Schell, Allolio & Schonecke (1994) conducted a study on physiological and psychological effects of Hatha Yoga Exercise in healthy women. Heart rate, Blood Pressure, and the Hormones Cortisol, Prolactin and growth hormone were measured in a yoga group and a control group of young female volunteers reading in a comfortable position during the experimental period. The yoga group has decreased heart rate during yoga. The yoga group had higher scores on life satisfaction and lower scores on excitability, aggressiveness and openness, emotionality and somatic complaints and coping with stress and mood by the end of the experiment. The yoga group also had higher scores on high spirits and extraversion.

Vedanthan et al. (1998) conducted a research on adult asthmatics, ranging from 19 to 52 years from an asthma and allergy clinic in a university setting volunteered to participate in the study. The 17 students were randomly divided into yoga (9 subjects) and non yoga control (8 subjects) groups. The yoga group was taught a set of breathing and relaxation techniques including breath slowing exercises (pranayama), physical postures (yogasanas), and meditation. Yoga techniques were taught at the university health center, three times a week for 16 weeks. All the subjects in both groups maintained daily symptom and medication diaries, collected A.M. and P.M. peak flow readings, and completed weekly questionnaires. Spirometry was
performed on each subject every week. Analysis of the data showed that the subjects in the yoga group reported a significant degree of relaxation, positive attitude, and better yoga exercise tolerance. There was also a tendency toward lesser usage of beta adrenergic inhalers. The pulmonary functions did not vary significantly between yoga and control groups. Yoga techniques seem beneficial as an adjunct to the medical management of asthma.

Malathi et al. (2000) examined a study on forty eight healthy volunteers who participated in the practice of yoga over a period of 4 months were assessed on Subjective Well Being Inventory (SUBI) before and after the course in order to evaluate the effect of practice of yoga on subjective feelings of well-being and quality of life. A significant improvement in 9 of the 11 factors of SUBI was observed at the end of 4 months, in these participants. The paper thus, reiterates the beneficial effects of regular practice of yoga on subjective well being.

Birkel and Edgren (2000) examined a study to determine the effects of yoga postures and breathing exercises on vital capacity. Using the Spiropet spirometer, researchers measured vital capacity. Vital capacity determinants were taken near the beginning and end of two 17-week semesters. No control group was used. This study was conducted at Midwestern university yoga classes taken for college credit for a total of 287 college students, 89 men and 198 women. Subjects were taught yoga poses, breathing techniques, and relaxation in two 50-minute class meetings for 15 weeks. The study showed a statistically significant (P < .001) improvement in vital capacity across all categories over time. It was not known whether these findings were the result of yoga poses, breathing techniques, relaxation, or other aspects of exercise in the subjects' life. The subjects' adherence to attending class was 99.96%. The large
number of 287 subjects is considered to be a valid number for a study of this type. These findings were consistent with other research studies reporting the positive effect of yoga on the vital capacity of the lungs.

Ray et al (2001) conducted a study on the Effect of Yogic Exercise on Physical and Mental Health of Young fellowship Course trainers. A study was undertaken to observe any beneficial effect of yogic practices during training period on the young trainees. 54 trainees of 20-25 years of age were divided randomly in two groups i.e. Yoga and control group. Yoga group (23 males and 5 Females) was administered Yogic practices for the first five months of the course while control group (21 males and 5 females) did not perform yogic exercise during this period. Physiological parameters like Heart rate, Blood Pressure, Oral Temperature, Skin Temperature, in resting condition response to maximal and sub maximal exercise, body flexibility were recorded. Psychological parameters like personality, learning, arithmetic psychomotor ability, mental well being also recorded. There as improvement in sub maximal level of exercise and in anaerobic threshold in yoga group. Shoulder, hip, trunk, and neck flexibility improved in the yoga group. There was improvement in various psychological parameters like reduction in anxiety and depression and a better mental function after yogic practices.

Bharshankar et al (2003) studied the effects of yoga on cardio vascular system in subjects above 40 years. This study was conducted to examine the effect of yoga on cardio vascular function in subjects above 40 years of age. Pulse rate, systolic and diastolic blood pressure were studied in 540 control subjects and 50 study subjects who had been practicing yoga for five years. It was observed that significant reduction in pulse arte occurs in subjects practicing yoga and systolic and diastolic blood
pressure between the study group and control group was also statistically significant. These results indicate that yoga reduces the age related determination in cardiovascular function.

Galantino et al. (2004) conducted randomized pilot study to evaluate a possible design for a 6-week modified hatha yoga protocol to study the effects on participants with chronic low back pain. Twenty-two participants (M = 4; F = 17), between the ages of 30 and 65, with chronic low back pain (CLBP) were randomized to either an immediate yoga based intervention, or to a control group with no treatment during the observation period but received later yoga training. A specific CLBP yoga protocol designed and modified for this population by a certified yoga instructor was administered for one hour, twice a week for 6 weeks. Primary functional outcome measures included the forward reach (FR) and sit and reach (SR) tests. All participants completed Oswestry Disability Index (ODI) and Beck Depression Inventory (BDI) questionnaires. Guiding questions were used for qualitative data analysis to ascertain how yoga participants perceived the instructor, group dynamics, and the impact of yoga on their life. To account for drop outs, the data were divided into better or not categories, and analyzed using chi-square to examine differences between the groups. Qualitative data were analyzed through frequency of positive responses. Potentially important trends in the functional measurement scores showed improved balance and flexibility and decreased disability and depression for the yoga group but this pilot was not powered to reach statistical significance. Significant limitations included a high dropout rate in the control group and large baseline differences in the secondary measures. In addition, analysis of the qualitative data revealed the following frequency of responses (1) group intervention motivated the participants and (2) yoga fostered relaxation and new awareness/learning. A modified yoga-based intervention may
benefit individuals with CLB, but a larger study is necessary to provide definitive evidence. Also, the impact on depression and disability could be considered as important outcomes for further study. Additional functional outcome measures should be explored. This pilot study supports the need for more research investigating the effect of yoga for this population.

Dileep (2005) conducted a study on Relative effect of selected yogic practices and physical exercise on Health Related Physical Fitness and Psychological variables of school boys. The purpose of the study was to find out the effect of selected physical fitness and psychological variables among the high school boys. For the purpose of the study, 90 subjects were randomly selected. The data collected were analyzed for significance by using ANCOVA. The study concluded that regular practices of yoga and exercise contribute significant improvement on health related physical fitness and psychological variables.

2.5 Reviews related to Physiological Variables

Park (1980) undertook a study to determine the effects ten weeks physical fitness programme on selected physiological and psychological variables of elderly 15 females of 65 to 82 years. Pre and post measurements were obtained for psychological variables. Body composition, flexibility, heart rate and blood pressure were measured. The subjects participated in the fitness programme half an hour in the morning three days a week for ten weeks. The ‘t’ test was to analyze the data. He found that the percentage of body weight, heart rate and anxiety level of subjects were decreased.

White (1984) conducted a study on the effect of aerobic dancing and walking on cardio vascular function and muscle strength in post menopausal women. Six weeks aerobic dancing and walking programme were examined in 51 post menopausal
women, Analysis of variance indicated that both group show significant increase in treadmill time and work accomplished while shown decrease in resting heart rate, rate pressure products and recovery heart rate.

Williams and Mortan (1986) conducted a study on change in Cardio respiratory responses to exercise and body composition following a 12 weeks aerobic dance programme. Cardio respiratory and body composition changes were evaluated in 25 sedentary females aged 18 to 30 years following 12 weeks aerobic dance training. Fifteen subjects from the same population, comprised a control group, they maintained their normal activity and dietary habits over the course of the study. Training effects were indicated by significant improvement in heart rate, \(V_O_2\)max and a significant decrease in percent body fat.

Argo (1988) studied the effects of low impact and high impact aerobic dance exercise on selected fitness measures such as \(V_O_2\)max, a sum of skin folds and a sit and reach flexibility test. 33 college females participated in 10 week study, three times a week for 45 minutes in each session. 't' test was applied to each variable. The result indicated a significant increase in the low impact group, but not significant increase in the low impact group. A significant difference was found between the groups in \(V_O_2\)max changes.

George et al. (1993) conducted a study to develop a submaximal field test for the estimation of maximal oxygen uptake (\(V_O_2\)max) using a 1-mile track jog. A second purpose was to determine the accuracy of the 1.5-mile run in estimating \(V_O_2\)max for both male and female subjects. \(V_O_2\)max was measured in 149 relatively fit college students (males = 88, females = 61) 18-29 yr using a treadmill protocol (mean +/- SD; \(V_O_2\)max = 47.7 +/- 6.3 ml.kg-1 x min-1). Multiple regression analysis
(N = 54) to estimate VO2max from the submaximal, steady-state 1-mile track jog yielded the following validation (V) model (r (adj) = 0.87, SEE = 3.0 ml.kg-1 x min-1): VO2max = 100.5 + 8.344* GENDER (0 = female; 1 = male) - 0.1636* BODY MASS (kg) - 1.438* JOG TIME (min.mile-1) - 0.1928* HEART RATE (bpm). To help ensure that a submaximal level of exertion was realized for the 1-mile track jog, elapsed jog time was restricted to > or = 8.0 min for males and > or = 9.0 min for females and exercise HR to < or = 180 bpm. Cross-validation (CV) of the 1-mile track jog comparing observed and estimated VO2max (N = 52) resulted in radj = 0.84, SEE = 3.1 ml.kg-1 x min-1. Multiple regression analysis (N = 50) to estimate VO2max from the 1.5-mile run (V: N = 49, radj = 0.90, SEE = 2.8 ml.kg-1 x min-1; CV: N = 47, radj = 0.82, SEE = 3.9 ml.kg-1 x min-1), used elapsed run time, body mass, and gender as independent variables.

Vehrs et al (1993) conducted a study to develop a single-stage submaximal treadmill jogging test for the estimation of maximal oxygen uptake (VO2max). VO2max was measured in 129 relatively fit individuals (males = 84, females = 45), 18-29 yr, using a maximal treadmill protocol (mean +/- SD; VO2max = 48.3 +/- 6.2 ml.kg-1 x min-1, range = 35.6 to 62.3 ml.kg-1 x min-1). The treadmill test required subjects to sustain a comfortable, submaximal jogging pace (4.3-7.5 mph; level grade) until a steady-state heart rate was achieved (approximately 3 min). To help ensure that a submaximal level of exertion was realized for the treadmill jogging test, treadmill speed and exercise HR criteria were established that restricted treadmill speed to < or = 7.5 mph for males and < or = 6.5 mph for females and steady-state exercise HR < or = 180 bpm. Multiple regression analysis (N = 66) to estimate VO2max from the treadmill jogging test yielded the following validation (V) model (r (adj) = 0.84, SEE = 3.2 ml.kg-1 x min-1): VO2max = 54.07 + 7.062 * GENDER (0 = female; 1 = male) -
0.1938 * WEIGHT (kg) + 4.47* SPEED (miles.hr^{-1}) - 0.1453 * HEART RATE (bpm).

Cross-validation (CV) of the treadmill jogging test comparing observed and estimated VO2max (N = 63) resulted in r(adj) = 0.88, SEE = 3.1 ml.kg^{-1} x min^{-1}. The results indicate that this submaximal single-stage treadmill jogging test based on multiple linear regression provides a valid and convenient method for estimating VO2max.

Palmer (1995) conducted a study of effects of a walking programme on attribution style, depression and self esteem in women. Few controlled studies describe the physiological effects of a walking programme on non clinical, pre menopausal women. The experiment measured the effects of an eight week walking programme on female volunteers (n=27) aged 29 to 50 years randomly assigned to a supervised walking group and non walking group. The non walking group showed significant improvement in diastolic blood pressure and rated self esteem.

Rauramaa et al. (1995) has conducted a study on a relation of habitual physical activity to various components of health-related fitness as well as the 12-month repeatability of the measurements were investigated in middle-aged men. Physical activity was assessed by 7-d recall interview. In the men with cardiopulmonary or musculoskeletal diseases total energy expenditure (TEE) correlated directly with maximal oxygen uptake (VO2max) and inversely with the sum of skinfolds, serum triglycerides, and plasma fibrinogen. Energy expenditure at rest (REE) associated inversely to VO2max and directly to skinfolds. In the healthy men REE correlated inversely with VO2max and HDL-cholesterol, and directly with skinfolds. TEE correlated directly with skinfolds but was not associated with VO2max. The associations were similar at both examinations. Correlation coefficients between baseline and follow-up examinations of TEE, REE, VO2max, and sum of skinfolds
were 0.60, 0.84, 0.88, and 0.87 for the diseased men, and 0.52, 0.70, 0.86, and 0.91 for
the healthy men, respectively (P < 0.001). Habitual physical activity associate
beneficially to Cardio Respiratory Endurance, body fatness and CHD risk factors,
essential components of health-related fitness, in middle-aged men with chronic
diseases.

George, Stone and Burkett (1997) conducted a study to develop a maximal
oxygen consumption (VO₂max) regression model derived strictly from self-reported
non-exercise (N-EX) predictor variables. The VO₂max (mean +/- SD; 44.05 +/- 6.6
ml.kg-1.min-1) of 100 physically active college students (50 females, 50 males), aged
18 to 29 yr, was measured using a treadmill protocol and open circuit calorimetry.
Questionnaire-based predictor variables used in the N-EX regression model included
(a) the subject's perceived functional ability (PFA) to walk, jog, or run given distances,
(b) habitual physical activity (PA-R) data, (c) body mass index (BMI), and (d) gender.
BMI (kg.m-2) was computed from self-reported body weight in pounds and self-
reported body height in feet and inches. The questionnaire-based N-EX regression
model (R = 0.85, SEE = 3.44 ml.kg-1.min-1) developed in this study exceeded the
accuracy of previously developed N-EX regression models and is comparable to many
exercise-based regression models in the literature. Cross-validation using PRESS
(predicted residual sum of squares) statistics demonstrated minimal shrinkage
(R = 0.84, SEE = 3.60 ml.kg-1.min-1) of the present regression model. The PFA data
were useful in explaining observed VO₂max variance (squared partial r² = 0.155, P <
0.0001) and enhanced the ability of the N-EX regression model to accurately predict
criterion VO₂max. These results suggest that a questionnaire-based N-EX regression
model provides a valid and convenient method for predicting VO₂max in physically
active college students.
Lohman (1999) studied exercise, training and body composition in childhood. The influence of exercise training on body composition changes in children were examined in terms of muscle, bone and fat development. Because of the excess fat, body composition methodologies in general se and over reliance on the two components system. - fat and fat - free body - the extend of changes especially for muscles and bone with exercise training had not been well qualified. With the recent development of new methodologies these limitations might be overcome. The relationship of body composition to health related fitness was also explored with an emphasis on establishing fitness standards for body fatness and the need for research on the etiology of lower back pain and osteoporosis.

Stewart et al. (2005) studied the effect of excise on blood pressure in old persons. This was 6 months randomized controlled trial of combined aerobic and resistant training, controls followed usual care physical activity and diet advice. Participants (aged 55 to 75 years) had untreated systolic BP of 130 to 159 mm Hg or diastolic BP of 85 to 99 mm Hg. A six months program of aerobic and resistance training lowered DBP but not SBP in older adults with hypertension more than in controls. Body composition improvements were associated with BP reductions and may be a pathway by which exercise training improves cardio vascular health in older men and women. Nakagaichi, Lee and Tanaka (2001) developed a useful equation for estimating health-related physical fitness age. This version of health-related fitness age was developed as an extension of the biological age index and was useful for evaluation of individual differences in functional abilities of middle-aged and older adults. This measure consists of 4 independent variables fitness (VO₂max, standing trunk flexibility, % fat, and grip strength). However, direct measurement of maximal oxygen uptake (VO₂max) was an invasive clinical procedure and not practical for large
scale work. In the current study, they attempted to assess the fitness age more feasibly. They selected a questionnaire method and a 12-min. sub maximal treadmill walk test as substitutes for the VO₂max test. The three fitness ages were computed for 23 Japanese men (M (age) 54.7 +/- 10.7 yr.), using actual VO₂max (actual fitness age), questionnaire VO₂max (predicted questionnaire fitness age), and treadmill VO₂max (predicted treadmill fitness age). Predicted questionnaire fitness age (61.0 +/- 10.5 yr.) and predicted treadmill fitness age (60.0 +/- 12.4 yr.) were significantly correlated with actual fitness age (60.1 +/- 12.4 yr.) (r = .96 and .97, respectively). There were no significant differences among the three indices, but there was a significant difference between actual fitness age and chronological age (p<.05). For VO+/−2 max substituting the questionnaire for the treadmill estimate is acceptable in assessing fitness age and reducing the clinical risk for middle-aged and older Japanese men.

Joy (2008) conducted a study of Effect of Aerobic dance training on VO₂max and body composition in early middle aged women. The purpose of the study was to investigate the effect of aerobic dance programme of 12 week duration on various physiological and psychological variables among early middle aged women. Twenty subjects were selected either experimental group (n=10) r control group (n=10) for this study. The group which was not required to undergo any training remained as control group. Te selected variables are VO₂max, body weight, BMI percentage of body fat. From this study, it was found that after twelve weeks of aerobics dance training, a significant reduction was noted in the body weight, BMI and percentage of body fat, and significant increase in VO₂max also. This study highlights that systematic aerobic dance training helps to increase the physical and cardio respiratory fitness also.
OVERVIEW

The studies reviewed above clearly demonstrated the effectiveness of Calisthenics Exercises on the Land, Calisthenics Exercises in the Water and Yogic Practices in the reduction of Blood Pressure, Heart Rate and also given an overview of the increase in Flexibility, Cardio Respiratory Endurance and Muscular Strength Endurance. The literatures collected by the investigator have given an idea about the changes occurred during the course of the training along with serious of testing modalities for the components like Body Composition and VO$_2$max to measure the fitness level of subjects.

The studies reviewed here helped the investigator to identify the strategies covered by the previous investigators. These studies also helped her in formulating the hypothesis for his study and to adopt a suitable method. The studies reviewed here deals with the benefits of Calisthenics on the Land, Calisthenics Exercises in the Water and Yogic Practices on the health related physical fitness and physiological variables. But the investigator found that the majority of these studies adopted only one intervention strategy to find out its effectiveness of Calisthenics on the Land, Calisthenics Exercises in the Water and Yogic Practices on the health related physical fitness and physiological variables. This prompted the investigator to select the present topic for a detailed investigation.