India is Study of the related literature comprises locating; reading and evaluating reports of research as well as reports of casual observation and opinion that are related to the individuals planned research report. A study of relevant literature is an essential step to get a full picture of what has been done with regard to the problem under study. The investigator has made an attempt to bring a brief review of research related to the present study to form the background for the present study.

Studies on Yoga

Guarracino et al. (2006), concluded that *hatha* and relaxation yoga had a statistically significant role in controlling weight, hypertension, and mood. Regular yoga practice was associated with attenuated weight gain, most strongly among individuals who were overweight. Although causal inference from this observational study is not possible, results are consistent with the hypothesis that
regular yoga practice can benefit individuals who wish to maintain or lose weight (Kristal et al. 2005).

Boyle et al. (2004) conducted a study on the effects of yoga training and a single bout of yoga on delayed onset muscle soreness in the lower extremity. The purpose of this study was to determine the effects of yoga training on the intensity of delayed onset muscle soreness. 24 yoga-trained and non-yoga-trained women were administered a bench-stepping exercise. Muscle soreness was assessed using a Visual Analog Scale. Groups were also compared on body awareness, flexibility using the sit-and-reach test, and perceived exertion. Muscle soreness decreased and flexibility increased using the sit-and-reach-test after yoga.

Tran et al. (2001) showed that ten healthy, untrained volunteers (nine females and one male), ranging in age from 18–27 years, were studied to determine the effects of hatha yoga practice on the health-related aspects of physical fitness, including muscular strength and endurance, flexibility, cardio respiratory fitness, body composition, and pulmonary function. Subjects were required to attend a minimum of two yoga classes per week for a total of 8 weeks. Each yoga session consisted of 10 minutes of pranayamas (breath-control exercises), 15 minutes of dynamic warm-up exercises, 50 minutes of asanas (yoga postures), and 10 minutes of supine relaxation in savasana (corpse pose). The subjects were evaluated before and after the 8-week training program. Isokinetic muscular strength for elbow extension, elbow flexion, and knee extension increased by 31%, 19%, and 28% (p<0.05), respectively, whereas isometric muscular endurance for knee flexion increased 57% (p<0.01). Ankle flexibility, shoulder elevation, trunk extension, and trunk flexion increased by 13% (p<0.01),
155% (p<0.001), 188% (p<0.001), and 14% (p<0.05), respectively. Absolute and relative maximal oxygen uptake increased by 7% and 6%, respectively (p<0.01). These findings indicate that regular hatha yoga practice can elicit improvements in the health-related aspects of physical fitness.

Harinath et al. (2004) conducted a study on effects of hatha yoga and omkar meditation on cardio respiratory performance, psychological profile, and melatonin secretion. Thirty healthy men were randomly divided into two groups. Controls performed body flexibility exercises for 40 minutes and slow running for 20 minutes during morning hours and played games for 60 minutes during evening hours daily for 3 months. Group 2 subjects practiced selected yogic postures for 45 minutes. Yogic practices for 3 months resulted in improved cardio respiratory performance and psychologic profiles. Plasma melatonin also increased after three months of yogic practices.

Govindarajulu et al. (2003) studied the effect of yoga practices on flexibility and cardio respiratory endurance on high school girls. Sixty (n = 60) high school girls (average age 12 years) volunteered for a pre-experimental group design, where the practice of selected yoga practice was given as an intervention to the experimental group ‘A’ (n₁ = 30) for a period of eight weeks. The control group ‘B’ (n₂ = 30) was not allowed to participate in the experimental treatment. The pre-and post-tests were conducted on flexibility and cardio-respiratory endurance. The results of ANOVA revealed that there was an improvement in the flexibility and no significant change was evident in the cardio-respiratory endurance. Thus, short-term yoga is useful in improving flexibility, but not the cardio respiratory endurance vent at the stage of puberty in girls.
Yoga is increasingly popular as a means of exercise and fitness training. Over the last 10 years, research studies have shown that the practice of Hatha Yoga improves strength and flexibility and may help control such parameters as blood pressure, respiration and heart rate, and metabolic rates (Raub 2002).

Venkatreddy et al. (2003) examine the effect of yoga on weight and fat fold thickness in obese women. In this study 30 obese women of age range 19-53, categorized into two groups, as per Body Mass Index (BMI), were exposed to one-hour practice of asanas and pranayamas in the morning for a period of 90 days. A significant reduction (P<0.05) in BMI was seen in both the groups. In-group II (BMI greater than 35) the reduction was greater as compared to group II (BMI 25-35). Lean Body Mass (LBM), however, did not show significant change in both the groups.

Telles et al. (2004) conducted a study on an evaluation of the ability to voluntarily reduce the heart rate after a month of yoga practice. This study determined whether yoga reduced heart rate and whether the reduction would be more after 30 days of yoga training. Two groups (yoga and control, n = 12 each) were assessed on Day 1 and on Day 30. During the intervening 30 days, the yoga group received training in yoga techniques while the control group carried on with their routine. At each assessment the baseline heart rate was recorded for one minute. This was followed by a six-minute period during which participants were asked to attempt to voluntarily reduce their heart rate, using any strategy. Both the baseline heart rate and the lowest heart rate achieved voluntarily during the six-minute period were significantly lower in the yoga group on Day 30 compared to Day 1 by a group average of 10.7 beats per minute (i.e., bpm) and 6.8 bpm,
respectively. In contrast, there was no significant change in either the baseline heart rate or the lowest heart rate achieved voluntarily in the control group on Day 30 compared to Day 1.

Madanmohan et al. (2004) conducted a study on modulation of cardiovascular response to exercise by yoga training. This study reports the effects of yoga training on cardiovascular response to exercise and the time course of recovery after the exercise. Cardiovascular response to exercise was determined by the Harvard step test using a platform of 45 cm height. The subjects were asked to step up and down the platform at a rate of 30/min for a total duration of 5 min or until fatigue, whichever was earlier. Heart rate (HR) and blood pressure response to exercise were measured in the supine position before exercise and at 1, 2, 3, 4, 5, 7 and 10 minutes after the exercise. Exercise produced a significant increase in HR, systolic pressure and a significant decrease in diastolic pressure. After two months of yoga training, exercise-induced changes in these parameters were significantly reduced.

Mishra et al. (2003) studied on Cardiac Efficiency of Long Distance Runners and Yoga Practitioners, the cardiac efficiency of 120 male students, in the age range 16 to 17 years, from the Aggarsain Public School, Kurukshetra, Haryana, was tested through Harvard Step Test. The students were divided into three equally matched groups viz., Long Distance Running Group (Group-A), Yoga group (Group-B) and Control Group (Group-C). Duration of the experimental period was 6-month which was divided into two sessions of 3 months each. Result of 2 × 3 Factorial ANOVA revealed that Yoga practitioners had higher cardiac efficiency than long distance runners.
Malhotra (2002) experimented on study of yoga asanas in assessment of pulmonary function in NIDDM patients aging 24 of type 2 diabetics. These middle-aged subjects were type II diabetics on antihyperglycaemic and a dietary regimen. Training in yoga asanas occurred 30-40 min/day for 40 days. There was a significant decrease in fasting blood glucose levels. The postprandial blood glucose levels also decreased. The FEV1, FVC, PEFR, MVV increased significantly.

Yoga has potential for benefit for patients with CAD. Yoga lifestyle intervention retards progression and increases regression of coronary atherosclerosis in patients with severe CAD. It also improves symptomatic status, functional class and risk factor profile (Manchanda et al. 2000).

Birkel and Edgren (2000) studied on hatha yoga: improved vital capacity of college students. To determine the effects of yoga postures and breathing exercises on vital capacity, researchers measured vital capacity using the Spiropet spirometer. Vital capacity determinants were taken near the beginning and end of two 17-week semesters. 89 men and 198 women were taught yoga poses, breathing techniques, and relaxation in two 50-minute class meetings for 15 weeks. The study showed a significant improvement in vital capacity across all categories over time.

Elias et al. (2000) described how ketosis with enhanced GABAergic tone promotes physiological changes in transcendental meditation. Transcendental meditation (TM) is a stylized form of physical and mental relaxation which is associated with changes in the secretion and release of several pituitary hormones.
The hormonal changes induced by TM mimic the effects of the inhibitory neurotransmitter gamma aminobutyric acid (GABA).

Devaraj (2000) conducted a study on the effect of yogic practice on health related physical fitness of visually impaired boys of the age group of 13 to 15 years. He selected 40 persons among which 20 were in the control group. He treated yogic practice on the experimental group. He treated yogic practice on the experimental group for six weeks to find out cardio-vascular endurance, flexibility, biceps and sub-exposal enhancement and made note at pre and post tests. The post test scores proved that there was significant improvement and enhancement among the boys due to the yogic practice.

The recovery from induced physiological stress in Shavasana (a yogic relaxation posture) and two other postures (resting in chair and resting supine posture) was compared. The results revealed that the effects of stress were reversed in significantly shorter time in Shavasan, compared to the resting posture in chair and in a supine posture (Bera et al. 1998).

Baldwin (1999) conducted study on psychological and physiological influences of Hatha Yoga training on healthy, exercising adults. The purpose of this study was to explore the psychological and physiological differences between adult exercisers who added a weekly yoga class to their regular exercise program and those who did not. Subjects were pre tested and post tested for mood state, stress response, recovery heart rate, and spinal/hamstring flexibility. Over a period of eight weeks, subjects in both groups continued their normal exercise habits and maintained exercise logs. Subjects in the Yoga Group added a weekly yoga class. Subjects in the Control Group received a yoga class at a later time. At the end of
eight weeks, exercise logs were collected and post tests were conducted. The results suggested: (1) more positive mood change in the Yoga Group over eight weeks, (2) more immediate positive affect from yoga than from cardiovascular or resistance training activities, (3) more compliance with yoga than with cardiovascular or resistance training activities, (4) comparable perceived exertion ratings for 'moderate' Hatha Yoga and routine aerobic exercise, (5) an 8% gain in spinal and hamstring flexibility in the Yoga Group over eight weeks, and (6) decreased vulnerability to stress in the Yoga Group, at the same time that sources of stress for that group increased.

_Bole and Lobo (1981)_ conducted study on Physiological investigations of head and shoulder stand. The systolic and diastolic blood pressure was seen to increase by 8 to 16% and 14 to 26% respectively during the maintenance of asanas.

_Ganguly (1981)_ conducted study on Effect of short term yogic Training programme on Cardio-Vascular Endurance. Daily one hour training in yogic physical culture for three weeks as per N.F.C. programme was found to improve Cardio-Vascular endurance significantly as measured by 20” Harvard Step Test.

_Telles et al, (1996) “Physiological Measures of Right Nostril Breathing”._ This study was conducted to assess the physiological effects of a Yoga breathing practice that involves breathing exclusively through the right nostril. This practice is called _Surya Anuloma Viloma Pranayama (SAV)_ . Twelve volunteers (average age 27.2 ± 3.3 years, took part on two consecutive days. The test sessions were conducted on two consecutive days. One day the test session involved practicing SAV Pranayama for 45 minutes (SAV session). During the test period on the
other day subjects were asked to breathe normally for 45 minutes (NB session). For half the patients (randomly chosen) the SAV session was on the first day and NB session on the next day. For the remaining six patients the order of the two sessions was reversed. After the SAV session (but not after NB) there was a significant ($P < .05$, paired $t$–test two tailed ) increase in oxygen consumption (17%) and in systolic blood pressure (mean increase 9.4 mm Hg). The latter two changes are interpreted to be the result of increased cutaneous vasoconstriction. These findings show that SAV has a sympathetic stimulating effect. This technique and other variations of unilateral forced nostril breathing deserve further study regarding therapeutic merits in a wide range of disorders.

*Rai et al. (1994)* conducted a study on Energy expenditure and ventilatory responses during Siddhasana-yogic seated posture various cardio-ventilatory responses were studies in states of the horizontal supine, chair-sitting and Siddhasan. It was observed that sitting in Siddhasana posture was characterized by greater minute ventilation, larger tidal volume, higher oxygen consumption, greater $CO_2$ elimination, and higher heart frequency greater oxygen pulse and lesser as compared with other two postures.

*Schell et al. (1994)* conducted a study on physiological and psychological effects of Hatha-Yoga exercise in healthy women. They measured heart rate, blood pressure, the hormones cortisol, prolactin and growth hormone and certain psychological parameters. There were no substantial differences between the yoga practicing group and a control group concerning endocrine parameters and blood pressure. The course of heart rate was significantly different, the yoga group had a decrease during the yoga practice.
Telles et al. (1993) studied the physiological changes in sports teachers following 3 months of training in Yoga. The report shows that in a group of 40 physical education teachers who already had an average of 8.9 years physical training, 3 months of yogis training produced significant improvement in general health (in terms of body weight and BP reduction and improved lung functions.) There was also evidence of decreased autonomic arousal and more of psychophysiological relaxation (heart rate and respiratory rate reduction) and improved somatic steadiness (decreased errors in the steadiness test). The changes at the end of 3 months in volar GSR in different direction (increase/decrease/no change), depending on the initial values, suggests that practicing yoga may help to bring about a balance in different autonomic functions, so that functioning is optimised.

Bera, and Rajapurkar (1993) conducted a study on body composition, cardiovascular endurance and anaerobic power of yogic practitioner. Forty male high school students, age 12-15 yrs, participated in a study on yoga in relation to body composition, cardiovascular endurance and anaerobic power. The subjects were assigned to a yoga group and control group. Body composition, cardiovascular endurance and anaerobic power were measured. The results revealed a significant improvement in ideal body weight, body density, cardiovascular endurance and anaerobic power following yoga.

Khanam et al. (1996) investigated whether autonomic functions and pulmonary functions improved in asthma patients after short term yoga training or not and the study was conducted with nine diagnosed bronchial asthma patients. Yoga training was given for seven days in a camp in Adhyatma Sadhna Kendra, New Delhi. The autonomic function tests to measure the parasympathetic
reactivity (Deep Breathing test, Valsalva Maneuver), Sympathetic reactivity (Hand Grip test, Cold Pressure test), and pulmonary function tests FVC, FEV1, PEFR, PIF, BHT and CE were recorded before and after yoga training. The resting heart rate after yoga training (P < 0.05) was significantly decreased (89.55 +/- 18.46/min to 76.22 +/- 16.44/min). The sympathetic reactivity was reduced following yoga training as indicated by significant (P < 0.01) reduction in DBP after HGT. There was no change in parasympathetic reactivity. The FVC, FEV1, PEFR did not show any significant change. The PIF (P < 0.01), BHT (P < 0.01) and CE (P < 0.01) showed significant improvement. The results closely indicated the reduction in sympathetic reactivity and improvement in the pulmonary ventilation by way of relaxation of voluntary inspiratory and expiratory muscles. The “comprehensive yogic lifestyle change programme for patients of Bronchial Asthma” has shown significant benefit even within a short period.

Seshein (1988) studied the effects of Pranayama and transcendental meditation on the pulse and blood pressure of the male students of the Sourashtra College, Madurai. For this purpose the college students were randomly assigned to two groups. Group I performed Pranayama, Group II performed transcendental meditation. Subjects in each group were trained with respective programmes for a period of 6 weeks fine days a week from Monday to Friday and two sessions of twenty minutes duration both in the morning and evening’, Prior to and at the end of training period all the subjects were tested for pulse rate and blood pressure. The results showed that the Pranayama reduced blood pressure only. Combined Pranayama and transcendental mediation showed very good effect on all the three parameters.
Makwana et al. (1988) conducted a study on effect of short term yoga practice on ventilatory function tests. Twenty five normal male volunteers undergoing a ten week yoga course were assessed by ventilatory function tests. The observations recorded at the end of ten weeks of the course showed improved ventilatory functions in the form of lowered respiratory rate, increased forced vital capacity, FEV1, maximum breathing capacity and breath holding time, while tidal volume and %FEV1, did not reveal any significant change.

Bhole (1982) conducted study on Breath Holding time after complete expiration and different conditions of the Abdominal Muscles. Relaxed, bulged out and contracted condition of the abdominal wall did not influence breath holding time of 22.28 sec. after deep expiration. Kapalbhati for 30 to 45 seconds was found to increase breath holding time by 12 and 9 seconds from the average value of 57 seconds for males and 41 seconds for females respectively.

Bhole (1979) conducted a study on Inspiratory volume and Breath-Holding Time in Pranaymic Breathing in Difference conditions of the Abdominal Wall. No significant difference was found in the inspiratory volume (3375ml) and breath-holding time (25seconds) in Pranaymic breathing with protracted relaxed and controlled conditions of the abdominal wall but the feelings varied to a great extent.

Bhole (1976) conducted a study on Breath-Holding time on difference conditions of the Abdominal Wall. The average breath-holding time of 50 seconds was not influenced significantly with relaxed protracted and contracted condition of the abdominal wall even though slightly contracted condition is advocated during the practice of pranayama.
Telles et al. (1993) “Improvement in Static Motor Performance Following Yogic Training of School Children”. Two groups of 45 children each, whose ages ranged from 9 to 13 years, were assessed on a staidness test, at the beginning and again at the end of a 10-day period during which one group received training in Yoga, while the other group did not. The steadiness test required insertion and holding for 15 sec. a metal stylus without touching the sides of holes of decreasing sizes in a metal plate. The contacts were counted as ‘errors’. During the 10-day period, one group (the ‘Yoga’ group) received training in special physical postures (Asanas), voluntary regulation of breathing (Pranayama), maintenance of silence, as well as visual focusing exercise (Tratakas) and games to improve the attention span and memory. The other group showed a significant (Wilcoxon’s paired signed-ranks test) decrease in errors, whereas the ‘control’ group showed no change.

Patel (1975) examined 34 hypertensive patients were assigned at random either to six weeks’ treatment by yoga relaxation methods with bio-feedback or to placebo therapy (general relaxation). Both groups showed a reduction in blood-pressure (from 168/100 to 141/84 mm/Hg in the treated group and from 169/101 to 160/96 mm/Hg in the control group). The difference was highly significant. The control group was then trained in yoga relaxation, and their blood-pressure fell to that of the other group (now used as controls).

Ganguly and Gharote (1974) conducted a study on cardio-vascular efficiency before and after Yogic Training. Cardio vascular efficiency was found to increase significantly at the end of 8 months training.
Bhole et al. (1971) conducted study on effect of yoga training on vital capacity and breath holding time. An average increase of 157ml. in vital capacity and of 15 seconds in breath holding time were observed in males after three weeks of training in Yogic physical culture as recommended by N.F.C programme.

Studies on Yoga and other Exercise

The value of yoga and weight training and offer a compare and contrast format to see their benefits. By analyzing the differing elements of weight training, one can see the vigorous approach that can be helpful for strength. However, yoga serves a different purpose. These two polar, yet complimenting methods serve different functions when dealing with the scope of health and fitness. Both concepts hold positive and negative traits, but can be done to compliment each other accordingly. (http://www.academon.com/lib/nr/order).

Gore et al. (2003) studied on the effects of yoga and aerobics training on cardio respiratory functions in obese people. As an outcome of one month programme of weight reduction using Yoga practice and Aerobics, Female Residential Yoga Group (FRYG) of 25-40 age range, showed a significant and consistent reduction in systolic Blood Pressure (SBP) in all the testing sessions. Their Peak Expiratory Flow Rate (PEFR) also improved in two of the follow up (FU) testing sessions. FRYG of 41-70-age range reduced their SBP significantly in two of the FU sessions as well as a significant increase in PEFR was recorded. Pulse Rate (PR) did not show significant changes. FNRYG (Female Non-Residential Yoga Group) of 25-40 age range with a normal BP and PR initially, showed a significant reduction in DBP in two of the FU testing sessions, while the increase in their PEFR was not significant. FNRYG of age 41-70 showed a
significant improvement in PEFR in post-test and first FU; yet, reduction in BP was non-significant statistically. Female Aerobic Group (FAG) of age range 25-40 showed non-significant reduction in BP and PEFR. However FAG of age range 41-70 age range did not show significant change in BP, and PEFR, however, MAG (Male Aerobic Group) of the same age range showed significant reduction in SBP only, in one of the FU testing sessions. Their PEFR showed non-significant reduction, MAG of age range 25-40 showed non-significant reduction in BP & PEFR.

Oken et al. (2004) conducted study to determine the effect of yoga and of aerobic exercise on cognitive function, fatigue, mood, and quality of life in multiple sclerosis (MS). There were no clear changes in mood related to yoga or exercise. Subjects with MS participating in either a 6-month yoga class or exercise class showed significant improvement in measures of fatigue compared to a waiting-list control group. There was no relative improvement of cognitive function in either of the intervention groups.

Sathyaprabha et al. (2001) conducted a study on efficacy of naturopathy and yoga in bronchial asthma--a self controlled matched scientific study. The present study was aimed at finding the efficacy of a non-pharmacological approach of naturopathy and Yoga in bronchial asthma. 37 patients received treatment including 1. Diet therapy 2. Nature cure treatment and 3. Yoga therapy. The various parameters including lung function test were measured on admission and once a week. The results showed significant improvement in PEFR, VC, FVC, FEV1, FEV/FEC %, MVV, ESR and absolute eosinophil count. Patients reported a feeling of well being, freshness and comfortable breathing.
Telles et al. (1993) “Improvement in Static Motor Performance Following Yogic Training of School Children”. Two groups of 45 children each, whose ages ranged from 9 to 13 years, were assessed on a staidness test, at the beginning and again at the end of a 10-day period during which one group received training in Yoga, while the other group did not. The steadiness test required insertion and holding for 15 sec. a metal stylus without touching the sides of holes of decreasing sizes in a metal plate. The contacts were counted as ‘errors’. During the 10-day period, one group (the ‘Yoga’ group) received training in special physical postures (Asanas), voluntary regulation of breathing (Pranayama), maintenance of silence, as well as visual focusing exercise (Tratakas) and games to improve the attention span and memory. The other group showed a significant (Wilcoxon’s paired signed-ranks test) decrease in errors, whereas the ‘control’ group showed no change.

According to Sesso et al. (1999) much of the research done on cardiovascular disease (CVD) has involved only male subjects. The studies that have included women have resulted in conflicting findings. Consequently, he was performed to determine if physical activity in women during their middle and late years influences the risk of CVD. For this a sample of 1,564 women who were initially free of CVD were periodically mailed questionnaires over a period of 31 years. The questionnaires assessed physical activity (daily number of stairs climbed and city blocks walked; type and number of hours involved in sports), diagnosis of CVD, and coronary risk factors. There were 181 new cases of CVD reported over the 31 years. There also appeared to be no overall association between higher levels of physical activity and CVD risk. However, walking
approximately 6 miles per week was associated with a 33% decreased risk of CVD. The findings of this study supported that as an important health benefit, walking is reducing CVD risk in women.

*Bowman et al. (1997)* conducted a study on effects of aerobic exercise training and yoga on the baroreflex in healthy elderly persons. The effects of aerobic exercise training and yoga, a non-aerobic control intervention, on the baroreflex of elderly persons were determined. Baroreflex sensitivity was quantified by the alpha-index, at high frequency (reflecting parasympathetic activity) and mid-frequency (reflecting sympathetic activity as well), derived from spectral and cross-spectral analysis of spontaneous fluctuations in heart rate and blood pressure. Twenty-six sedentary, healthy, normotensive elderly subjects were studied. Fourteen of the sedentary elderly subjects completed 6 weeks of aerobic training, while the other 12 subjects completed 6 weeks of yoga. Heart rate decreased following yoga but not aerobic training. VO2 max increased by 11% following yoga and by 24% following aerobic training. No significant change in alpha MF or alpha HF occurred after aerobic training. Following yoga, alpha HF but not alpha MF increased.

In summarizing the findings of his study on Muscular fitness, Yogic and physical exercises, *Moorthy (1982)* observes, that both experimental group I and experimental group II for boys showed significant improvement after six weeks’ training when compared to the control group. Although the percentage of improvement was seen much greater in Yogic exercises group than in physical exercise group, the differences between these two systems of exercises was not found to be significant.
Ommen T (1981) compared the isometrics, yogic physical culture and combination training on body composition and physical fitness status of high school boys. Results of this study have shown that all the three exercise groups showed a significant increase in toe-touching scores. The inter group differences show that yogic physical culture is more helpful in developing flexibility than the isometric and combination groups. And in dynamic flexibility, comparatively yogic exercises were the best in developing dynamic flexibility.

Gore and Bhole (1982) conducted study on Heart Rate during Paschimottanasana and similar type of isotonic exercises. Heart rate increased by 32% when Paschimottanasana was practiced with an isometric base, by 13% when it was repeated four times with an isotonic base and only by 6% when it was performed in a relaxed manner as a posture for one minute each.

Moorthy (1983) conducted a survey on minimum muscular fitness of school children of age group six to eleven years and compared the influence of selected logic exercises and physical exercises on them. He concluded that both the experimental groups showed significant improvement after six weeks’ training when compared to the control group. The percentage of improvement was seen much greater in yogic group than in the physical exercise group.

Studies on Aerobic Training

Jee et al. (1994) studied the effect of an eight week water aerobics program on selected physiological measurements of 54 female participants aged eighteen to twenty five years. The experimental group participated in a progressive water aerobic program three times per week for eight weeks. Each subject was pre and post tested using heart rate resting systolic blood pressure, resting diastolic blood
pressure, body weight and percentage of body fat. Analysis of covariance was used to determine if any significant difference between the two groups existed on the variables. The result of this study indicated a significant difference at the .05 level in resting heart rate between the groups. No differences were found in either systolic or diastolic pressure, body weight or percentage of body fat. It was concluded that water aerobics of sufficient intensity can increase fitness of the young individuals.

Kelly and Johnson (1994) conducted a study on the effects of aerobic exercise on resting systolic and diastolic blood pressure among normotensive adults. 438 subjects (289 exercise, 149 control) were statistically aggregated using the meta analytic technique small treatment effect (TE) reductions were noted for both resting systolic and Diastolic blood pressure. The results of this study suggest that aerobic exercise resulting small reductions on resting Systolic and Diastolic blood pressure among normotensive adults.

Denis et al. (1979) investigated comparative effects of aerobic type training on men and women. Pre and post training Cardio-respiratory, muscular blood tests revealed significant and similar increases of the maximal VO₂, oxygenated pulse, physical performance, muscular strength and resistance in both sexes, significant decrease of oxygen uptake, heart rate, ventilation, respiratory quotient, respiratory equivalent and systolic pressure at given sub-maximal work levels.

Faria (1970) demonstrated that half an hour training fours times a week, at a heart rate of 115-125 beats per minute, leads to a lower heart rate at rest and
during sub maximal exercise. Further, the study indicated that both maximal oxygen uptake and heart volume increase.

*Henry (1973)* conducted a test on eighteen college athletes to find out the cardiovascular changes before and after a season on competitive athletic program. It was concluded that, significant improvements were obtained on the following measures: heart rate peripheral resistance’s stroke volume, diastolic pressure etc.

According to *Aluzo (1962)* physical exercise produces certain measurable physiological effects such as lower pulse rate, increase in vital capacity, casing the heart to pump more blood with every stroke, probably promotes increased vascularisation and the growth of better network of blood vessels, which may contribute to the reduction of cholesterol level in blood, consistent exercise also tends to some extent, lower body weight.

**Studies on Resistance Training**

*Hetzler et al (1997)* have conducted a study on strength and power training in young male baseball players. Two groups of 10 pre-pubescent and pubescent male baseball players trained three times per week for 12 week using a variety of general free weight and machine exercises designed for both strength and power acquisition. For the experienced, notice and control groups respectively the following gains were recorded; leg press –41%, 40 % and 14% and bench press 23%, 18% and 0 %. Both training groups were significantly better than the control group. Similarly the two training groups improved in vertical jump.

*Bell et al. (2000)* investigated the effect of concurrent strength and endurance training on strength, endurance, endocrine status and muscle fiber properties. A total of 45 male and female subjects were randomly assigned to one
of four groups; strength training only (S), endurance training only (E), concurrent strength and endurance training (SE), or a control group (C). Groups S and E trained 3 days a week and the SE group trained 6 days a week for 12 weeks. Tests were made before and after 6 and 12 weeks of training. There was a similar increase in maximal oxygen consumption (VO2max) in both groups E and SE (P < 0.05). Leg press and knee extension one repetition maximum (1 RM) was increased in groups S and SE (P < 0.05) but the gains in knee extension 1 RM were greater for group S compared to all other groups (P < 0.05). Types I and II muscle fiber area increased after 6 and 12 weeks of strength training and after 12 weeks of combined training in type II fibers only (P < 0.05). Groups SE and E had an increase in succinate dehydrogenase activity and group E had a decrease in adenosine triphosphatase after 12 weeks of training (P < 0.05). A significant increase in capillary per fiber ratio was noted after 12 weeks of training in group SE. No changes were observed in testosterone, human growth hormone or sex hormone binding globulin concentrations for any group but there was a greater urinary cortisol concentration in the women of group SE and decrease in the men of group E after 12 weeks of training (P < 0.05). These findings would support the contention that combined strength and endurance training can suppress some of the adaptations to strength training and augment some aspects of capillarization in skeletal muscle.

Davis (2008) evaluated the effects of concurrent strength and aerobic endurance training on muscle strength and endurance, body composition, and flexibility in female college athletes and compared two concurrent exercise (CE) protocols. Twenty-eight women (mean age, 19.6 years) were divided into two
matched groups and evaluated before and after a vigorous, 11-week, 3-days per week CE training program. One group did serial CE consisting of a warm-up, resistance exercises at low heart rate (HR), aerobics, and a range of motion cool down. The other group did integrate CE consisting of aerobics, the same resistance exercises at high HR achieved by cardio acceleration before each set, and the same range of motion cool down. The two protocols were balanced, differing only in the timing and sequence of exercises. Serial CE produced discernible (p < 0.05) increases in lower- (17.2%) and upper- (19.0%) body muscle strength and fat-free mass (FFM) (1.8%) and trends toward greater lower-body muscle endurance (18.2%) and reduced upper-body flexibility (-160.4%). Integrated CE produced discernible increases in lower- (23.3%) and upper- (17.8%) body muscle strength, lower-body muscle endurance (27.8%), FFM (3.3%), and lower-body flexibility (8.4%) and a decline in fat mass (-4.5%) and percent body fat (-5.7%). Integrated CE produced discernibly larger gains than serial CE for six of nine training adaptations. Effect sizes were generally moderate (44.4% of discernible differences) to large (33.3%). We conclude that serial CE produces adaptations greater than those reported in the literature for single-mode (strength) training in athletes, whereas integrated CE produces discernibly greater gains than serial CE. The results suggest synergy rather than interference between concurrent strength and aerobic endurance training, support prescription of CE under defined conditions, establish the importance of exercise timing and sequence for CE program outcomes, and document a highly effective athletic training protocol.

Sillanpaa (2008) examined adaptations in body composition and physical fitness during a 21-wk strength and/or endurance training period in 40- to 65-yr-
old men. We also compared the usefulness of different methods for the analysis of body composition to detect training-induced adaptations. For this fifty-three men were randomized into the endurance training (E: N = 14), strength training (S: N = 13), combined strength and endurance training (SE: N = 15), or control (C: N = 11) groups. S and E trained 2 and SE 2 x 2 times a week for strength and endurance. Results of this study indicated that percentage of fat (fat%) decreased (5-8%) similarly in all training groups. Fat% measured by DXA at baseline and its change correlated with those recorded by bioimpedance (r = 0.90 and 0.66), skin folds (r = 0.80 and 0.78), and waistline (r = 0.84 and 0.74). Lean mass in legs (DXA) increased only in S (2.0 +/- 1.5%, P < 0.001), but the thickness of vastus lateralis and intermedius measured by ultrasound increased (7-11%) in all training groups, and that of triceps brachii increased in S (22%) and SE (20%). Maximal concentric force increased significantly in S, SE, and E (by 22, 23, and 7%), and maximal oxygen uptake increased in both E (11%) and SE (11%). Waist circumference and skin fold thickness seem to reasonably assess changes in percent body fat during training. However, only DXA was capable to separate small differences between the groups in training-induced changes in lean body mass. Combined strength and endurance training is of greater value than either alone in optimizing body composition or improving physical fitness in older men.

Donnelly et al. (2003) examined the long-term effects of a supervised program of moderate-intensity exercise on body weight and composition in previously sedentary, overweight and moderately obese men and women. He hypothesized that a 16-month program of verified exercise would prevent weight gain or provides weight loss in the exercise group compared with controls.
Participants were recruited from 2 Midwestern universities and their surrounding communities. One hundred thirty-one participants were randomized to exercise or control groups, and 74 completed the intervention and all laboratory testing. Exercise was supervised, and the level of energy expenditure of exercise was measured. Controls remained sedentary. From the results he concluded that moderate-intensity exercise sustained for 16 months is effective for weight management in young adults.

Abe et al. (2003) examined the absolute and relative changes in skeletal muscle (SM) size using whole body magnetic resonance imaging (MRI) in response to heavy resistance training (RT). For this three young men trained three days a week for 16 weeks. MRI measured total SM mass and fat free mass (FFM) had increased by 4.2 kg and 2.6 kg respectively after resistance training. From the results he concluded that RT induces larger increases in SM mass than in FFM. RT induced muscle hypertrophy does not occur uniformly throughout each individual muscle or region of the body. Therefore the distribution of muscle hypertrophy and total SM mass are important for evaluating the effects of total body RT on muscle size.

Cullenen and Caldwell (1998) recommended that a part of an adult fitness program should include strength training because of the additional benefits it provides. Also he stated that much of the strength training research has been done on male subjects. Consequently, he attempted to determine what effects weight training had on untrained healthy, young women. Twenty-three healthy, normal-weight women participated in the weight training program and 10 women served as the control group. The program consisted of two sessions per week and
included two sets of 10 reps for each exercise. At the end of 12 weeks, the weight-trained group demonstrated no change in body weight. However, percent body fat significantly decreased and fat-free mass) significantly increased. This represents an impressive 10% loss in percent body fat. Muscular strength also increased for the weight-trained women. From his study, the major findings of increased strength, fat-free mass, resting metabolic rate and decreased body fat indicate the potential favorable effect of resistance training in weight management programs.

Westcott (2001) conducted a study to assess the way to increase the intensity and effectiveness of resistance training by comparing training with a slower repetition speed to training with a conventional repetition speed. Slower repetition speed may effectively increase intensity throughout the lifting phase while decreasing momentum. Two studies were done with untrained men (N=65) and women (N=82), (mean age=53.6) who trained two to three times per week for eight to 10 weeks on a 13 exercise Nautilus circuit performing one set of each exercise. Participants exclusively trained using regular speed repetitions for 8 to 12 repetitions per set at 7 sec each (2 sec lifting, 1 sec pause, 4 sec lowering) or a slow(R) training protocol where they completed 4 to 6 repetitions per set at 14 sec each (10 sec lifting, 4 sec lowering). All of the participants were tested for either the 10 repetition-maximum (RM) weight load (regular-speed group) or the 5-RM weight load (slow-speed group). The results of the study were: In both studies, slow training resulted in about a 50% greater increase (p<0.001) in strength for both men and women than regular speed training. In Study 1, the slow training group showed a mean increase of 12.0 kg and the regular speed group showed an increase of 8.0 kg increase (p<0.001). In Study 2, the slow training group showed...
Review of Related Literature

a 10.9 kg increase and the regular speed group showed an increase of 7.1 kg (p<0.001). From the results he concluded that slow training is an effective method for middle-aged and older adults to increase strength.

According to Verill et al. (1992) circuit weight training has been recommended and has been reported to improve strength, lean body mass, self-efficacy, and may decrease risk factors for coronary artery disease. There appears to be considerable benefit and minimal risk of resistive exercise training for patients with cardiovascular impairment. This mode of exercise may allow patients to perform daily strength tasks safely, more efficiently, and with greater self confidence."

According to Stone et al. (1991) regular physical activity can improve cardiovascular fitness and may reduce the likelihood and debilitating effects of cardiovascular disease. Weight-training has generally been believed to have limited value in modifying risks of cardiovascular disease. Effects shown of resistance training on parameters associated with cardiovascular fitness and disease include: heart rate decreases for maximal work and recovery from short term weight-training, increased ventricular mass, and increased ventricular wall and septum thickness. Studies suggest that myocardial hypertrophy resulting from resistive training can be accompanied by positive myocardial adaptations.

Parker et al. (1996) studied the effects of strength training on cardiovascular responses during a sub maximal walk and weight-loaded walking test in older females. After 16 weeks of weight training women aged 60-77 showed reduced heart rate, systolic blood pressure, and rate pressure product while treadmill walking with and without a weight load of 40% bodyweight. They
concluded that strength training reduces cardiovascular stress during daily tasks in healthy older women.

According to Evans (1996) progressive resistance exercise can produce substantial increases in strength and muscle size, even in the oldest old. For many older patients, resistance training represents the safest, least expensive means to lose body fat, decrease blood pressure, improve glucose tolerance, and maintain long-term independence.

O'Hagan et al. (1995) studied the response towards the resistance training in young women and men. Six women and 6 men trained the elbow flexors 3 days per week for 20 wks, one arm performing in each session 3 5 sets of 10 maximal concentric actions on an accommodating resistance device, the other arm 3 5 sets of 8 12 coupled eccentric/concentric actions on a weight training device. With results collapsed across the two training modes, the women made significantly (p less than 0.05) greater relative increases than men in strength measured on the weight (116 vs. 46 percent) and accommodating (99 vs. 46 percent) resistance devices, and greater absolute (3.5 vs. 1.3 N.m) and relative (13.7 vs. 3.2 percent) increases in strength measured on an isokinetic dynamometer. Absolute (cm2) and relative (percent) biceps, brachialis, and total elbow flexor cross sectional area (from CT scans) increased significantly, however, the women's vs. men's respective relative and absolute increases did not differ significantly: biceps (13 vs. 7 percent, 0.9 vs. 1.0 cm2), brachialis (53 vs. 31 percent, 2.1 vs. 2.3 cm2), and total (26 vs. 15 percent, 3.1 vs. 3.3 cm2) flexor area. Biceps type I and II fiber area, and the II/I area ratio did not increase significantly. The data indicate that in
response to the same short term training program, muscle size increases similarly in women and men but women make greater relative increases in strength.

Walberg (1989) commented on the value of weight training in the treatment of obesity. He noted that resistance exercise appeared to prevent the loss of or even increase muscle mass during energy restriction. Walberg argued that resistance exercise is less likely than aerobic exercise to acutely increase lipid and energy utilization but may indirectly aid weight reduction by increasing lean tissue and metabolic rate. He concluded that the value of aerobic exercise during weight loss was apparent but the potential of resistance exercise in weight remained unclear.

Relational Studies between Physical Activity

Hassinen et al. (2005) studied the relationships of body composition, physical activity, and muscular fitness with balance and walking ability. For this men and women, age 70 to 74 y (n = 146), were randomly selected from the Finnish population register. Body composition [body weight, body-mass index (BMI), waist circumference], physical activity (questionnaire), muscular fitness (hand-grip strength), balance (commonly used field tests), and walking ability (20 m walking test) were assessed. As results he observed that: BMI ($r = -0.287$, $P < 0.001$), waist circumference ($r = -0.260$, $P = 0.002$), physical activity ($r = 0.206$, $P = 0.013$), and hand-grip strength ($r = 0.244$, $P = 0.003$) correlated with balance. BMI ($r = 0.330$, $P < 0.001$), waist circumference ($r = 0.237$, $P = 0.004$), physical activity ($r = -0.252$, $P = 0.002$), and hand-grip strength ($r = -0.307$, $P < 0.001$) also correlated with walking time. From the results he concluded that overweight
and central obesity as well as low muscular fitness associate with impaired balance and walking ability in the elderly.

_Hui (2005)_ studied the impact of physical activity, aerobic fitness, and body com-position on coronary heart disease (CHD) risk factors in Hong Kong Chinese adults has not been previously investigated. Methods: The study surveyed 707 middle-age Hong Kong Chinese by telephone for Physical Activity Rating (PAR). Three hundred and sixteen respondents (age: 45.1 ± 8.1 y) participated in subsequent aerobic fitness testing (and CHD risk factor screening. More than 70% of respondents did not have sufficient levels of physical activity. Fifty percent of the men and 19.5% of the women had two or more CHD risk factors. PAR correlated poorly with and CHD risk factors. showed significant associations with CHD risk factors. The adjusted odds ratios of having CHD risk factors for unfit participants ranged from 1.11 to 6.61 as compared to fit participants. Obese but fit individuals demonstrated lower odds of CHD risk factors than the obese and unfit individuals. WC was found to be a stronger predictor for CHD risk factors than BMI. Conclusions: The prevalence of CHD risk factors in middle-age Chinese in Hong Kong was high and was related to levels of aerobic fitness and obesity.

**Studies on Combined Aerobic and Resistance Training**

Resistance exercises involving weightlifting may prove as important as aerobic exercise for women in fighting fat. Health scientists at Johns Hopkins University in Baltimore and Arizona State University in Tempe found that resistance exercises push the body to burn calories for up to two hours after the workout. Aerobic exercises or jogging typically burn more calories during the workout than weightlifting but increase energy expenditure for less than an hour
afterward. "Resistance training could have a more lasting effect on metabolism than aerobic exercise," says researcher Carol Binzen. "It burns fat and increases muscle mass." Researchers studied a dozen women ages 24 to 34. On one day, the women did weightlifting exercises such as chest presses, leg presses, and bicep curls, while on another day, they sat still and watched a movie. On average, the exercises burned more than three times as many calories that were burned while watching the movie. "They studied regular women, not super fitness enthusiasts, so these results may apply to most moderately active women," Binzen says. For maximum workout, the researchers suggest a combination of both aerobic exercises and resistance training. The researchers reported their findings in the journal Medicine, Science Sports and Exercise (http://www.ensureyoursuccess.net/weightlosswomen.html).

The purpose of the study was to determine the effects of a ten-week concurrent resistance and endurance-training programme for improving physical fitness of middle-aged obese females. Eleven obese (body mass index BMI > 27.0 kg/m²) and 13 control (BMI < 27.0 kg/m²) females participated in the investigation. Three series of anthropometrical measurements were taken according to the O-scale Physique Assessment System. The ratio of waist to hip circumference (WHR) was calculated. Body composition was measured with the bioelectrical impedance method (Bodystat 500, UK). Individual physical working capacity (PWC) was measured with the cycle ergometer test. One repetition maximum leg extension (1RM LE) was used to assess maximal isoinertial strength. Training sessions were performed three times per week and resistance training consisted of four exercises (leg extension, bench press, sit-ups, leg press). The subjects
performed four circuits at maximal possible speed, using a work-to-rest ratio of 60 sec. The 75% 1RM load and 8-12 repetitions per set were used. The duration of resistance exercises was 32 min, which was followed by 30 min of continuous walking at the intensity of 75% maximum heart rate. Obese women had significantly higher (p<0.05) values for skin-fold, girth and breadth measurements. PWC and 1RM LE strength was also significantly higher in the obese group. WHR was significantly negatively related to all measured physical fitness indices in obese but not the control subjects. While lean body mass was significantly positively related to all measured physical fitness values in obese but not controls subjects. Body weight, body fat %, body fat amount and sum of 8SF were significantly decreased as a result of the training programme in middle-aged obese females. While no significant effects of training programme on body composition characteristics were observed in middle-aged control women. PWC values were significantly increased in both groups studied as a result of training programme. While 1RM LE strength was significantly increased after the training only in control subjects. In conclusion, the concurrent resistance and endurance training programme for the improvement of physical fitness of middle-aged obese females appears to be an acceptable form of physical activity to reduce body weight and increase cardiovascular fitness.

Pierson et al. (2001) examined the effects of performing combined resistance and aerobic training, versus aerobic training alone, in patients with coronary artery disease. For this thirty-six patients with coronary artery disease were randomized to either an aerobic-only training group (AE) or a combined aerobic and resistance training group (AE + R). Both groups performed 30
minutes of aerobic exercise 3 days/week for 6 months. In addition, AE + R group performed two sets of resistance exercise on seven different Nautilus machines after completion of aerobic training each day. Twenty patients (AE: n = 10; AE + R: n = 10) completed the training protocol with > 70% attendance. The results of the study are: strength gains for AE + R group were greater than for AE group on six of seven resistance machines (P < 0.05). VO2peak increased after training for both AE and AE + R (P < 0.01) with no difference in improvement between the groups. Resting and submaximal exercise heart rates and rate-pressure product were lower after training in the AE + R group (P < 0.01), but not in the AE group. AE + R increased lean mass in arm, trunk, and total body regions (P < 0.01), while AE increased lean mass in trunk region only (P < 0.01). Percent body fat was reduced for AE + R after training (P < 0.05) with a between group trend toward reduced body fat (P = 0.09). Lean mass gain significantly correlated with strength increase in five of seven resistance exercises for AE + R. From the results he concluded that resistance training adds to the effects of aerobic training in cardiac rehabilitation patients by improving muscular strength, increasing lean body mass, and reducing body fat.

According to Joseph (1990) concurrent strength and endurance training reportedly compromises strength gains and the ability to produce explosive movements. Possible reasons for compromises in strength-power adaptations with concurrent training are an increased likelihood of overtraining; differences in the organization of neuromuscular recruitment patterns; alterations in the concentrations of various hormones and differences in activation or repression of various anabolic/catabolic processes at the muscular level; and shifts in protein
isozymes such as myosin. Recent research suggests that strength training may enhance endurance performance.

With the purpose of investigating the comprehensive physiological alterations that take place during the combination of bench-step aerobics (BSA) and resistance exercise training Kraemer et al. (2001) conducted a study on resistance training combined with bench-step aerobics enhances women's health profile. For this he has selected thirty-five healthy, active women and they 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. The results of the study were: All training groups significantly improved peak O2 (3.7 to 5.3 ml O2 [middle dot] kg-1 [middle dot] 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. From the results he concluded as follows. 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.

Banz et al. (2003) performed a randomized trial to compare the effects of aerobic and resistance training regimens on coronary risk factors. Twenty-six volunteers who exhibited android obesity and at least one other risk factor for coronary artery disease were randomized to aerobic or resistance training groups. Body mass index, waist-to-hip ratio, glucose, insulin, body composition, 24-hr urinary albumin, fibrinogen, blood pressure, and lipid profile were measured at baseline and after 10 weeks of exercise training. Both groups showed a significant reduction in waist-to-hip ratio and the resistance training group also showed a reduction in total body fat. There was no significant change in mean arterial blood pressure in either group. Fasting plasma glucose, insulin, total cholesterol, low-density lipoprotein (LDL) cholesterol, and triglycerides were unchanged in both groups. High-density lipoprotein (HDL) cholesterol increased (13%) with aerobic training only. Plasma fibrinogen was increased (28% and 34%, P < 0.02) in both groups and both groups showed a significant decrease (34% and 28%, P < 0.03) in microalbuminuria after their respective training regimen. In conclusion, resistance
training was effective in improving body composition of middle-aged obese sedentary males. Only aerobic training was effective in raising HDL cholesterol.

Comparing an aerobic only exercise routine versus an aerobic and strength training routine. Total weight loss increases by 56% with aerobic and strength. The fat weight loss with aerobic and strength is plus 70%. Muscle weight changes with aerobic and strength is plus 40%. Increasing muscle composition of the body increases the body's ability to burn fat. Muscle workout sessions promote metabolism while at rest. Long term aerobic training helps muscles utilize oxygen more efficiently. Cardiovascular and respiratory endurance - the sustained ability of the heart and lungs to transport oxygen through the blood vessels to and from the cells is the most important element of fitness. There is less risk of over stress to the cardiovascular system when the workload is spread over more muscle groups. An extended movement range is more work performed. Research shows that exercising arms and legs together is aerobically more efficient and less stressful. Fat loss is 9 times greater with high intensity interval training. Pound for pound, muscles burn 25 times more calories than fat. One pound of muscle uses about 350 - 500 calories per week to survive - a pound of fat needs about 14 calories per week. Since muscle is metabolically active tissue, losing muscle slows your metabolism and so to counter this slowdown, build up calorie-burning muscle tissue. A very important reason for maintaining muscle mass is very recent evidence that muscle supports immunity, hence resistance to disease. The coordination of aerobics and strength exercise in conditioning is essential - aerobic exercise for producing oxygen to release fatty acids and oxygen for the body's
cells and strength exercise for muscle development, reduce body fat and maintain bone mass.

*Gregory Haff (2003)* investigated the effects of no training, aerobic training program, and combined resistance and aerobic training on middle aged women. The aerobic training group trained 6 days a week for 60 minutes at an intensity of 60 – 70% maximum heart rate, while the combination group performed resistance training 3 days per week (Monday, Wednesday, and Friday) and aerobic training 3 days per week (Tuesday, Thursday, and Saturday). Abdominal fat volume was evaluated with computed tomography before and after 24 weeks of training. Both the aerobic and combined groups experienced increases in maximal aerobic capacity (VO2max) and high-density lipoprotein-cholesterol. Of particular interest is the finding that only the combined group experienced significant increases in lean body mass. Also, the combined group experienced the greatest declines in subcutaneous fat (-61.8 cm3) and abdominal visceral fat (-93.0 cm3) when compared to the aerobic only training group (subcutaneous: -23.1 cm3; abdominal visceral fat: -82.6 cm3). The findings of this study suggest that utilizing a combination of aerobic and resistance training produces the greatest alterations in body composition.

*Park et al. (2003)* conducted a study to determine the effect of different training programs on body image in young women. One group performed aerobic training only and the other group performed aerobic training plus strength training and a third group performed no training. Body image was assessed with a Body Self-Image Questionnaire. Results indicated that the combined aerobics plus strength-training group had greater improvements in strength and fitness than the
other 2 groups. The combined training group also had a better decrease in body fat. Most importantly, the combined training group had significantly more positive body image profiles than the group that did not exercise. Females should perform both aerobic training and resistance training for health and body image reasons.

With the thought of weight training improves body image in women, Henry, and Michael investigated the effect of aerobic and aerobic/strength training on body image in females. 49 women participated in a strength-training program for 12 weeks. At the completion of the study most subjects reported feeling healthier and more fit and had a better attitude about their physical selves. A regular weight-training program can improve your quality of life and self esteem.

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