CHAPTER II

REVIEW OF RELATED LITERATURE

Review of related literature is very important and it plays a vital role to understand the problem thoroughly. In the present chapter the investigator is made an attempt to report the literature based upon the effects of different yogic exercises.

Aggarwal quotes that in the words of Walter R. Brog “The literature in any field form the foundation upon which all future work will be built”.

A study of relevant literature is an essential step to get a full picture of what has been done and said abroad and in one’s own country with regard to the problem.

The related studies pertaining to this research are presented in the following heads:

1. Studies related to Health fitness components, physiological and psychological variables on police
2. Studies related to Yogic Practices on Health Fitness Components
3. Studies Related to Yogic Practices on Physiological Variables
4. Studies Related to Yogic Practices on Psychological variables

2.1. STUDIES RELATED TO HEALTH FITNESS COMPONENTS, PHYSIOLOGICAL AND PSYCHOLOGICAL VARIABLES ON POLICE

Sassen B, et.al. (2009), conducted a study on 1298 (874 male and 424 female) police employees (aged 18-62 years) who participated in the Utrecht Police Lifestyle Intervention Fitness and Training study. Physical activity (PA) and physical fitness
(PF) are inversely associated with the clustering of cardiovascular disease (CVD) risk factors (RF) associated with the metabolic syndrome (MS). However, the role of individual components of PA, that is, intensity, duration and volume, and the inter-relationship with PF in the prevention of the MS and its individual components remains elusive. Cross sectional analysis. The study was based on 1298 (874 male and 424 female) police employees (aged 18-62 years) who participated in the Utrecht Police Lifestyle Intervention Fitness and Training study. PA was assessed with an extensive questionnaire. Peak oxygen uptake and metabolic markers, including blood pressure, fasting glucose, triglycerides, high-density lipoprotein cholesterol and waist circumference, were determined. The prevalence of the MS was 18.6% (22.5% in men, 10.6% in women). After adjustment for age and sex, average PA intensity, PA duration, PA volume and PF were each associated with reduced odds of MS. Regression analyses further showed an inverse relation between total CVD risk score and average PA intensity, the hours of PA performed at high intensity (>6 metabolic equivalent values) and PF, but no relation with total hours or the hours of PA performed at low or moderate intensity. When we adjusted our analyses for PF, the relations with the components of PA became non significant. Using pathway analysis, we found that peak oxygen uptake mediated 78% of the effect of average PA intensity and 93% of the effect of the hours performed at high intensity on total CVD risk score. PA and PF are inversely associated with the clustering of metabolic abnormalities. With regard to PA, it seems that intensity and more specifically higher intensity is the main characteristic of PA determining its effect on CVD RF. However, compared with PA, PF exerts greater effects on each of this individual CVD RF and its combination.
Takken T, et.al. (2009), reported the first paper that has used the training impulse (TRIMP) 'methodology' to calculate workload demand. It is believed that this is a promising method to calculate workload in a range of professions in order to understand the relationship between work demands and aerobic fitness. The aim of this study was to assess workload demand in police officers from the Utrecht police department in the Netherlands, during patrol by mountain bike. Maximum oxygen intake, maximum heart rate (HRmax), ventilator threshold (VT) 1 and VT 2 were determined with a maximal exercise test on a bicycle ergometer. Heart rates were registered throughout three shifts in 20 subjects using a heart rate monitor. Exercise intensity was divided into three phases: phase I (between 40% of HR max and VT1); phase II (between VT and the respiratory compensation point (RCP)); and phase III (>RCP). The total TRIMP score was obtained by summating the results of the three phases. Average daily workload demands of 355 TRIMPs per day and 1777 TRIMPs per week were measured. Workload demand approached and in some cases exceeded the upper limit of 2000 TRIMPs per week threshold level for physiological stress demands in professional male cyclists.

Nabeel I, et.al. (2007), explored the correlation between physical activity, fitness, and injury among police officers, a cross section of active-duty members of the Minneapolis Police Department were surveyed about their level of fitness, physical activity, and prevalence of injury and chronic pain within the past year. In the study, officers with the highest self-reported fitness levels were less likely to experience sprains (OR 0.27, 95% CI 0.08-0.88), back pain (OR 0.48, 95% CI 0.09-0.88), and chronic pain (OR 0.21, 95% CI 0.06-0.73) than those who considered themselves less fit. Officers who were the most physically active were about a third as likely to report back pain (OR 0.37, 95% CI 0.10-0.73) and less than half as likely to
report chronic pain (OR 0.42, 95% CI 0.19-0.91) as those who engaged in less activity. And officers with a BMI greater than 35 were 3 times more likely to report back pain (OR 3.36, 95% CI 1.17-9.66) than those who’s BMI fell in the normal range (18-25). Thus, officers who engage in higher levels of physical activity and are more physically fit have a lower prevalence of musculoskeletal injuries and chronic pain.

Slottje P, et.al. (2008), examined the relationships between exposure to the air disaster in Amsterdam and multiple physical symptoms among firefighters and police officers, and to explore the role of post-traumatic stress symptoms (PTSS) herein in the Historic cohort study. On average 8.5 years post-disaster, exposed professional firefighters (N=334) and police officers (N=834) and their non exposed colleagues (N=194 and N=634, respectively) completed questionnaires on disaster exposure and current symptoms. Logistic regression with adjustment for background characteristics was used to compare exposed and non exposed workers. PTSS were added to these models, as was the interaction between exposure and PTSS, to explore potential mediating and modifying effects, respectively. Exposed workers reported multiple physical symptoms significantly more often. Multiple physical symptoms seemed to have particularly affected the exposed firefighters who rescued people, and the exposed police officers who supported injured victims and workers, who were involved in the identification of or search for victims and human remains, who witnessed the immediate disaster scene or had a close one affected by the disaster. These exposure effects were essentially independent of PTSS, and no significant interactions between exposure and PTSS were found. In conclusion, the excess in post-disaster multiple physical symptoms in exposed workers could not be attributed to PTSS.
Boyce RW, e.al. (2006), found that employers seek to minimize business costs by creating conditions of employment. Relying on the presumably negative effects of smoking on variables such as workers' compensation claims, absenteeism and physical fitness scores, they seek a rational basis for requirements that employees refrain from smoking. No research has been found on police officer smoking rates relating to physical fitness, and the resulting economic variables of workers' compensation claims and absenteeism rates. To compare police officer non-smoker and smoker physical fitness, absenteeism rates and workers' compensation claims. The sample included 514 officers of a metropolitan police department. A physical fitness test was administered. Smoking status, yearly absenteeism rates and workers' compensation claims were collected. Male smokers were significantly older than non-smokers. An analysis of covariance controlling for sex and age indicated that smokers had significantly (P ≤ 0.05) lower fitness scores in sit and reach flexibility, sit-ups endurance, bench press strength and bicycle ergometer cardiovascular endurance. When neither age nor sex was controlled in males, a similar trend continued. However, in females only the sit and reach and sit-up tests demonstrated statistically significant differences. Fat percentage, step-test scores, absenteeism rates and workers' compensation claims were not statistically different. These data do not provide a rational basis for the requirement that officers refrain from smoking when considering body fat and the economic savings of lower absenteeism rates and workers' compensation. To some extent, smoking policies can be justified by officers' physical fitness but there are age, gender and test protocol considerations.

Sorensen L. (2005) documented that few studies exist on adherence to exercise within specific occupational groups. This study aimed at identifying factors explaining leisure-time physical activity among middle-aged Finnish police officers.
Middle-aged police officers (n = 103) participated in the study in 1981 and 1996. Frequency of and adherence to leisure-time physical activity and fitness were assessed. The factor 'enjoyment' was the most powerful determinant for both physical activity and fitness, but all the factors studied accounted for only 10% of the variability. Leisure-time physical activity in 1981 correlated significantly with leisure-time physical activity in 1996. The physical activity of the middle-aged police officers can be in part predicted from their physical activity in early adulthood. Enjoyment related to physical activity seems to be important with respect to enhancing adherence. Perhaps, being fit increases the feeling of enjoyment during exercise.

Wang X, et.al. (2003) assessed the incidence, types and risk factors of military training-related injuries in recruits of Chinese People's Armed Police Forces (CPAPF). A cohort study was made on the risk factors of injuries in 805 male recruits during the military training from December 25, 1999 to December 25, 2000. A total of 111 recruits (14%) experienced one or more injuries, and the cumulative incidence was 16.1 injuries per 100 soldiers in a year. And 77.7% of the injuries belonged to overuse injuries of the skeletal and muscular systems, the most common type of which were stress fractures. Most injuries occurred in the 3rd month of training. Univariate analysis and logistic regression analysis of possible risk factors for overuse injuries were carried out, and a number of risk factors were identified: history of agricultural labor, history of lower limb injury, flatfoot and less running exercise before entry into the army. But a suitable body mass index (BMI) was a protective factor. Examination of age, body height, smoking, body flexibility and frequency of 2-mile running revealed no significant association with the injuries. History of agricultural labor, history of lower limb injury, flatfoot, less running exercise before entry into the army and lower BMI were risk factors of the overuse injuries. In order
to decrease the incidence of overuse injuries, the young people with good physical ability and shapely body type should be selected during conscription. During the training, nutrition should be improved so as to decrease the incidence of injuries.

Shephard RJ and Bonneau J. (2002), documented that Human Rights Tribunals require application of non-discriminatory fitness standards in the hiring, promotion, and retention of employees. This issue has become controversial for public safety officers such as police, where differences in average levels of absolute fitness between men and women cause a high proportion of female applicants to fail many entrance tests. The present review summarizes the impact on physical working capacity of commonly encountered gender differences in size, body composition, hemoglobin levels, and muscular strength. The principles applied in designing content- and construct-validity occupational fitness tests are described, and Human Rights policies are reviewed in the light of the Meiotic judgment. Criteria are indicated for establishing a bona-fide occupational fitness requirement, and description is given of the approach used in developing standards that satisfy these criteria. Requirements are based on the task to be accomplished. The potential training response of female applicants is likely at least to match that of their male peers, and the needs of female police recruits are thus best accommodated by providing every opportunity to augment fitness to the required minimum level. The main weakness of any current requirement is that most police forces do not yet apply an equivalent criterion to older incumbent officers, where similar issues may arise.

Sorensen L, et.al. (2000), evaluated changes in the physical activity, fitness and body composition of 103 police officers during a 15-year follow-up. The absolute aerobic capacity was similar in 1981 and 1996, muscular performance had declined,
and body weight had increased approximately 0.5 kg/year. More than half the subjects (53%) had increased their leisure-time physical activity in 1996. The correlation was significant between physical activity in 1981 and physical fitness in 1996, but weak between physical activity in 1996 and fitness in 1996. It was also significant between waist circumference and waist/hip ratio in 1996 and physical activity during the previous 5 and 15 years. No significant correlations were found between physical activity and work ability or perceived physical or mental job stress. The physical fitness of middle-aged police officers seems to be predicted strongly by physical activity in early adulthood. Therefore health and fitness promotion measures should start at that time. This, together with regular systematic training, should help to sustain work ability of middle-aged police officers.

2.2. STUDIES ON YOGIC PRACTICES ON HEALTH FITNESS COMPONENTS

Reddy and Ravikumar (2001) conducted a study on yogasana and aerobic dance and their effects on selected Health fitness components in girl subjects. The speed, shuttle run, agility, sit and reach to test flexibility and 9 min run/walk to test cardio respiratory endurance were conducted for control, yogasana and aerobic dance groups. The training was given for a period of 12 weeks with 10 subjects in each group. The data were analyzed by ‘t’ test, analysis of co-variance and post hoc test was done with Scheffe’s test. It was concluded that the practice of Yogasana improved significantly the speed, agility, flexibility and cardio-respiratory endurance, while practice of aerobic dance also improved significantly the above factors and there was no difference in between yogasanas and aerobic dance groups after training with regard to the speed, agility, flexibility and cardio-respiratory endurance.
Maity and Samanta (2001) conducted a study on the effect of calisthenics and yogasanas on Health fitness status of fifth grade girls. Pre test and post test scores of Oregon Health Fitness test obtained from the calisthenics group, yogasana group and control group were analyzed by using ‘t’ test after 12 weeks training. It was concluded that (i) improvement of Health fitness as assessed on Oregon Health Fitness Test after 12 weeks of treatment justified the fact that both the programmes of calisthenics and yogasana were effective in developing Health fitness of fifth grade girls. (ii) Calisthenics exercise programme was found superior to yogasana in improving performance in each individual test item of Oregon Health Fitness test except crossed arm – curl ups. Gharote (1979) administered sit-ups test to note the strength and endurance of the abdominal muscles. 20 female subjects were given yogic exercise for duration of three weeks. He noticed significant muscles of 12 subjects.

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 (cardio respiratory endurance), timed sit-ups (abdominal strength and endurance) sit and reach (lower back flexibility), and subcutaneous fatness (sum of the triceps, sub scapular suprailiac, and medical calf skin folds). Physical activity is significantly and positively correlated with one mile run performance and sit-and-reach but not with sit ups and subcutaneous fatness. Over all, the strength of the relationship 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) are also more fit in cardio respiratory endurance and in the sit and reach than
the less active (lowest quartile), and the more fit in the one mile run (better tune lowest quartile) and the sit and reach (highest quartile) are more active than the less fit in the each item respectively.

_Tiken, Kosana, Joy and Inaobi (2002)_ have conducted a study on influence of specific yoga and aerobic exercise on physical fitness of SAI (NERC IMPHAL) STC Athletes. 30 boys and 30 girls from SAI NERC Imphal were divided into two groups according to their mean age and height of 17.5 years and 15 years and 172.8 cms and 156.4 cms respectively. Training was given twice in a week for four months. Vertical jump to test explosive power, push ups and sit ups to test strength endurance, sit and reach to test flexibility, 50 yards dash to test speed and 12 min run walk to test endurance were conducted for aerobic exercise and yoga group before the training and after the two months and four months of training. It was concluded that (i) Improvement of physical fitness assessed on three selected physical fitness tests after four months of yoga and aerobic had justified the fact that both yoga and aerobic exercise were effective in developing physical fitness and (ii) in yoga and aerobic exercise groups, boys were found superior to girls group in sit and reach (flexibility) and 12 min run – walk (endurance), 50 yards (speed).

_Tran, Holly, et. al., (2001)_ had conducted a study on the effect of hatha yoga practice elicited improvement on the health – related aspects of physical fitness. Ten healthy, untrained volunteers (nine female and one male), ranging in age from 18-27 years, were tested on muscular strength and endurance, flexibility, cardio respiratory fitness, body composition and pulmonary functions. Training was given two days in a week for a period of eight weeks. It was found out that regular hatha yoga can elicit improvement in the health – related aspects of physical fitness.
Madanmohan et al., (1993) had conducted a study on the effect of yoga training on reaction time, respiratory endurance and muscular strength. Twenty seven subjects were given yoga training for 12 weeks to test the visual and auditory reaction time, maximum expiratory pressure, maximum inspiratory pressure, 40 mm kg test, breath holding time after expiration, breath holding time after inspiration, and hand grip strength. It was concluded that yoga practice for 12 weeks results in significant reduction in visual and auditory reaction times and significant increase in respiratory pressures, breath holding time and hand grip strength.

Lohan and Rajesh (2002), studied the effect of asanas and pranayamas on physical and physiological components of boys between age group 12-16 years. One hundred and twenty subjects were equally divided into asana, pranayama, combined and controlled groups. Ten weeks training programme was given to test the abdominal strength, speed, agility, power and endurance by using AAPHER Youth fitness test battery and blood pressure, heart rate, vital capacity and pulse rate. Pre test and post test scores were analyzed by using ANACOVA. It was concluded that physical and physiological fitness was improved by the training of selected yogic exercise. The combined group of asanas and pranayama showed significant improvement in the physical and physiological fitness parameters. Michande (1996) study of physical fitness represented on of the several of fact of sports and physical activity, which could have, in short and long terms, definite Influences on the health and well being of children and adolescents, as well as adults and at the same time the measurement of physical fitness raised several conceptual methodological and technical problems which explained why surveys including such measures had been scarce until recently. Hence a Literature review had been made by michand and narring in search of the methodological problems linked with fitness measurements.
Describing the components of physical fitness as endurance, muscular strength, agility, co-ordination and body composition the researcher reviewing the main test batteries available recommended the utilization of the test batteries.

Chittibabu (2000) conducted a comparator study of anthropometric measurements and physical fitness components of physical education students of Kerala and Tamil Nadu. The study finds significant difference. In the components of physical fitness among male students of Kerala and Tamil Nadu significant difference (P<0.05) existing between Kerala and Tamil Nadu samples on speed (50 yard dash) strength (pull ups) and (sit ups) and power (standing jump broad jump). Tamil Nadu boys dominated on speed, strength and power.

ML.Gharote and Ganguly (1973) observed nine weeks practices in yogic culture was helpful to improve general physical fitness level of 49 cadet police who were already conditioned to physical activities. But the control group was engaged only in school schedule. The physical fitness of the subjects was judged through (a) Fleishman’s-basis fitness (b) Cure ton’s flexibility test (c) Skin fold and (d) Howard step test. The improvement was most significant in flexibility.

Chan, et al., (2001) made a study to determine the relationship between the psychometric profile and health related fitness of Chinese youths in Hong Kong. They selected 1,615 Chinese school boys as subjects. The physical self description questionnaire suggested by Marsh et al (1994) was used to provide psychometric profiles. Anaerobic fitness estimated from mile run, flexibility scores from sit and reach test, push up scores, curl up scores and percentage of body fat were also collected as health related fitness factors. The results indicated that health related fitness is highly related to psychometric items such as perceived sport competence,
perceived activity level, perception of body fat and global physical self concept. These results indicated the promotion of psychometric self perception of youth. The fact that male adolescents have more positive physical self perception than female signify the need to reevaluate the social values concerning physical fitness and perception that were placed on youth.

Mandanmohan, et al., (2003) conducted a study on effect of yoga training on handgrip, respiratory pressures and pulmonary function, i.e. maximum expiratory pressure (MEP), maximum inspiratory pressure (MIP), forced expiratory volume (FEV), forced expiratory volume in first second (FEV1) and peak expiratory flow rate (PEFR). 20 school children in the age group of 12 to 15 years were given yoga training (asanas and pranayamas) for 6 months. 20 age and gender-matched students formed the control group. Yoga training produced statistically significant (P < 0.05) increase in HGS and HGE. MEP, MIP, FEV, FEV1 and PEFR also increased significantly (P < 0.001) after the yoga training. In contrast, the increase in these parameters in the control group was statistically insignificant. Our study shows that yoga training for 6 months improves lung function, strength of inspiratory and expiratory muscles as well as skeletal muscle strength and endurance. It is suggested that yoga be introduced at school level in order to improve physiological functions, overall health and performance of students.

Harinath et al., (2004) had conducted the study on effects of Hatha yoga and Omkar meditation on cardio respiratory performance, psychological profile, and melatonin secretion. Thirty healthy men in the age group of 25-35 years volunteered for the study. They were randomly divided in two groups of 15 each. Group 1 subjects served as controls and 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 asanas (postures) for 45 minutes and pranayama for 15 minutes during the morning, whereas during the evening hours these subjects performed preparatory yogic postures for 15 minutes, pranayama for 15 minutes, and meditation for 30 minutes daily, for 3 months. Orthostatic tolerance, heart rate, blood pressure, respiratory rate, dynamic lung function (such as forced vital capacity, forced expiratory volume in 1 second, forced expiratory volume percentage, peak expiratory flow rate, and maximum voluntary ventilation), and psychological profile were measured before and after 3 months of yogic practices. Serial blood samples were drawn at various time intervals to study effects of these yogic practices and Omkar meditation on melatonin levels. Yogic practices for 3 months resulted in an improvement in cardio respiratory performance and psychological profile. The plasma melatonin also showed an increase after three months of yogic practices. The systolic blood pressure, diastolic blood pressure, mean arterial pressure, and orthostatic tolerance did not show any significant correlation with plasma melatonin. However, the maximum night time melatonin levels in yoga group showed a significant correlation (r = 0.71, p < 0.05) with well-being score. These observations suggest that yogic practices can be used as psycho physiologic stimuli to increase endogenous secretion of melatonin, which, in turn, might be responsible for improved sense of well-being. “Fitness level of American youth have shown a marked decline in the last decade according whether such a tendency persisted among students entering colleges, the authors evaluated 115 male and 143 female students for performance on the following fitness – related variables: (1) maximal oxygen consumption (estimated from A strand cycling protocol), (2) body composition (skin-fold techniques), (3) muscle endurance (sit up
protocol), (4) muscle strength (bench-press protocol), (5) joint flexibility (upper and lower body protocols). Although neither men nor women exhibited high levels of cardio-respiratory 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.

Kurukshetra, (1981) conducted a study to investigate the comparison of Isometrics Yogic Physical Culture and Combination Training on Body Composition and Physical Fitness States of High School Boys. It was noticed all the three exercises groups showed a significant increase in toe touching scores. The inter group differences showed that yogic physical culture group was more helpful in developing extent flexibility than Isometric and combination groups. And in dynamic flexibility, comparatively yogic exercise was the best in developing dynamic flexibility.

Sharma S.N (1990) attempted to compare the effect of yoga Proprioceptive Neuromuscular Facilitation (P.N.F) technique in improving the hip joint flexibility. The study was conducted on 72 boys ranging between 14 to 16 years of age. They were divided into two groups, consisting of 24 subjects each. The subjects practiced yogic asanas on alternate days and for a period of eight weeks. The initial and final measurements of the right and left hip joint flexion were taken. Analysis of variance was carried out to find out the significant difference between the three groups. As the ‘F’ ratio was found significant, the Scheffe’s post hoc-test was applied to find out the significant difference of the means.
Krishnan K (1977) studied the effect of selected yogic practices upon the development of flexibility. This study was conducted in the subjects selected from the YMCA College of Physical Education, Madras, and Tamil Nadu state. The result showed a good improvement in flexibility after training in yogic practices. In another study, investigating the effects of nine weeks yogic training programmers on physically conditioned young males.

Bower, et al.,(2005), Strength and Flexibility in a recent study on the fitness – related effects of hatha yoga, 10 yoga naïve and previously untrained subjects aged 18 to 27 years participated in 85 min of pranayama and hatha yoga practices twice a week for 8 weeks. These subjects should showed significant improvement in upper and lower body muscular strength, endurance, and flexibility. No statistically significant change in body composition or pulmonary function was observed.

Mark D. Tran, et al.,(2007) 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.

Alpert et al., (1990) had investigated the effects of aerobic exercise on a sample of 24 preschoolers. Thirty minutes of aerobic exercises were provided daily for a period of 8 weeks for a group of 12 children while the remaining 12 children engaged in free play on the school playground. The children were given pretests and posttests on the following measures: a sub maximal exercise test on a pediatric bicycle (baseline and three workloads), an agility test, a health knowledge test, a self-esteem scale, and an observational measure of their gross-Health activity. Despite comparability on pretests, significant group X repeated measures effects suggested that the aerobic exercise group showed decreases in heart rate at all three workloads as well as increases in agility and self-esteem following the exercise program. These findings suggest that cardiovascular fitness, agility, and self-esteem can be facilitated in preschoolers by an aerobic exercise program.

2.3. STUDIES ON YOGIC PRACTICES ON PHYSIOLOGICAL VARIABLES

Madan Mohan, et.al.(2000) studied 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 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 supine position before exercise and at 1, 2, 3, 4, 5, 7 and 10 minutes after the exercise. Rate-pressure product \([\text{RPP} = (\text{HR} \times \text{SP})/100]\) and double product \((\text{DoP} = \text{HR} \times \text{MP})\), which are indices of work done by the heart were also calculated. Exercise produced a significant increase in HR, systolic pressure, RPP & DoP and a significant decrease in diastolic pressure. After two months of yoga training, exercise induced changes in these parameters were significantly reduced. It is concluded that after yoga training a given level of exercise leads to a milder cardiovascular response, suggesting better exercise tolerance.

Ray, et.al. (2001) undertook a study to observe any beneficial effect of yogic practices during training period on the young trainees. 54 trainees of 20-25 years age group 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 exercises during this period. From the 6th to 10th month of training both the groups performed the yogic practices. Physiological parameters like heart rate, blood pressure, oral temperature, skin temperature in resting condition, responses to maximal and sub maximal exercise, body flexibility were recorded. Psychological parameters like personality, learning, arithmetic and psychologic ability, mental well being was also recorded. Various parameters were taken before and during the 5th and 10th month of training period. Initially there was relatively higher sympathetic activity in both the groups due to the new work/training environment but gradually it subsided. Later on at the 5th and 10th month, yoga group had relatively lower sympathetic activity than the control group. There was improvement in performance at sub maximal level of exercise and in anaerobic threshold in the 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. Hubert Dhanaraj (1974) studied the effects of yoga and 5Bx fitness plan on selected physiological parameters. The results indicated increase in basal metabolic rate, tidal volume in basal state. T-4 thyroxin, hemoglobin, Hemotocried blood cell PWC 130, vital capacity, chest expansion, breath holding time and flexibility after yoga training decreases in heart rate in barrel state and respiratory rate in barrel state were also observed. When yogic training was discontinued for six weeks, following the six weeks treatment, a significant declination in values of PWC130, flexibility and breath holding time were noticed.

Doherty R.Aand., (2003) examined the fifteen day cessation of training on selected physiological and performance variables. Fifteen middle distances, competitive female runners were divided into a cessation training group and maintenance training group for the duration of the 15 week study. The cessation training group completely ceased. Their training while the maintenance groups maintained their current training program. No changes were noted in Vo2 max, after five days of cessation of training. However at the completion of the 15days study the cessation training group was 4%. Slower on the 2400 meter time trial and has a 7.8% decrease in VO2 max when compared to the maintenance training group. The study point out that female middle distance runner can undertake short periods of no training without negative effects on their performance. This may be useful for rehabilitation travel and bouts of minor illness. However by 10 days without training physiological adaptations begins occur and performance may suffer.
K.Ivin,Jabakumar (2007) conducted a study on comparison of selected physical and physiological parameters between moderate altitude and sea level inhabitants. For the purpose, twenty-five sea level inhabitants from Chennai and twenty five moderate altitude inhabitants from kodaikanal were selected as subjects. Their age ranged from 18-25 years. The physical fitness variables (speed, agility, endurance) were selected and tested using 50mts dash, shuttle run cooper is 12 minutes run/walk respectively physiological variables such as breathe holding tune, pulse rate, blood pressure were selected and tested. The results of the study were there was significant difference in agility and breathe holding time and there was no significant between sea level and moderate altitude inhabitants on other selected variables.

Their age ranged from 18-25 years. Data was collected using standardized questionnaire like sports competition anxiety, smith’s aggression questionnaire for aggression and sports achievements, motivation questionnaire for achievement motivation etc. In addition, standardized physiological test were used separately for selected physiological variables like resting pulse rate and breath holding time two factorial ANOVA was used to find out whether and significant different existed. The result the study shows that there was no significant difference in competition anxiety and interaction among team sports players and no significant difference in competition anxiety aggressive behaviors, achievements, motivation, resting pulse rate among universities of different zones participants and the individual sports players had more breath holding time than the team sports players. South zone Inter university participants had more breath holding tune than the north, east and west zones Inter university participants.
Luttrell M., and Polteiger J., (2004) examined a study on effects of short-term training using power cranks on cardiovascular fitness and cycling efficiency. The study examines the effect of training by using power cranks or normal cranks on maximal oxygen consumption (VO2 max) and anaerobic threshold during a graded average test, and heart rate, oxygen consumption, respiratory exchange ratio and gross efficiency during a sub maximal one hour ride. The subjects were trained for an hour a day, Three day a week for 6 weeks no differences were observed between off within groups for Vo2 max (or) anaerobic threshold, however the power cranks group hand significantly higher gross efficiency, lower heart rate and Vo2 at various time during the 1 hour ride post training thus the training affairs to result in a decrease in energy expenditure and enhance physiological adaptations at a given workload, which may ultimately enable cyclist to increase speed more readily during competition and then by improves performance.

Makwana et.al. (1988) selected 25 normal male volunteers undergoing a ten course in the practice of yoga have been studied by some parameters of ventilator functions tests. The observations recorded at the end of ten weeks of the course have shows improved ventilator function in the form of lowered respiratory rate, increased forced vital capacity, FEVI, maximum breathing capacity and breath holding time, while tidal volume and %FEVI, did not reveal any significant change. Thus, a combined practice of yoga seems to be beneficial on respiratory efficiency.

Maria Barnai1, (2005) Rehabilitation including physiotherapy is an important part of the treatment used to help improve the quality of life of patients with cystic fibrosis (CF). The aim of this study was to determine the value of the breath-hold time as an index of exercise tolerance in patients with CF. Eighteen patients in
different states of CF were included. The breath-hold time was measured in all patients. The fitness level was assessed by means of a progressive exercise test on a cycle-ergo meter. During the test, oxygen uptake (VO2) and carbon dioxide elimination (VCO2) were measured breath by breath. The VO2 and working capacity (WC) were computed at the anaerobic threshold (AT) and at peak. Duration of breath-hold was 24.7±2.87 (mean ± SEM) seconds, varying between 10 and 58. The breath-hold time (BHT) displayed a significant correlation with VO2 (r=0.898), WC (r=0.899) at the AT, and the peak VO2 (r=0.895). Regression equations were: VO2 at the AT (ml/kg)=5.53+0.42×BHT and WC at the AT (watt/kg)=0.56+0.38×BHT. Our results suggest that the voluntary breath-hold time might be a useful index for prediction of the exercise tolerance of CF patients.

Madanmohan et al. (2005) undertook a comparative study of the effect of short term (three weeks) training in savitri (slow breathing) and bhastrika (fast breathing) pranayams on respiratory pressures and endurance, reaction time, blood pressure, heart rate, rate-pressure product and double product. Thirty student volunteers were divided into two groups of fifteen each. Group I was given training in savitri pranayam that involves slow, rhythmic, and deep breathing. Group II was given training in bhastrika pranayam, which is bellows-type rapid and deep breathing. Parameters were measured before and after three week training period. Savitri pranayam produced a significant increase in respiratory pressures and respiratory endurance. In both the groups, there was an appreciable but statistically insignificant shortening of reaction time. Heart rate, rate-pressure product and double product decreased in savitri pranayam group but increased significantly in bhastrika group. It is concluded that different types of pranayams produce different physiological responses in normal young volunteers.
Mohan, M. et.al. (2004) studied the effect of inspiratory and expiratory phases of normal quiet breathing, deep breathing and savitri pranayama type breathing on heart rate and mean ventricular QRS axis was investigated in young, healthy untrained subjects. Pranayama type breathing produced significant cardio acceleration and increase in QRS axis during the inspiratory phase as compared to eupnoea. On the other hand, expiratory effort during pranayama type breathing did not produce any significant change in heart rate or QRS axis. The changes in heart rate and QRS axis during the inspiratory and expiratory phases of pranayama type breathing were similar to the changes observed during the corresponding phases of deep breathing.

Joshi, et.al. (1996) selected thirty three normal male and forty two normal female subjects, of average age of 18.5 years, underwent six weeks course in 'Pranayama' and their ventilator lung functions were studied before and after this practice. They had improved ventilator functions in the form of lowered respiratory rate (RR), and increases in the forced vital capacity (FVC), forced expiratory volume at the end of 1st second (FEV1%), maximum voluntary ventilation (MVV), peak expiratory flow rate (PEFR-lit/sec), and prolongation of breath holding time.

Makwana et.al. (1988) selected 25 normal male volunteers undergoing a ten weeks course in the practice of yoga have been studied by some parameters of ventilator functions tests. The observations recorded at the end of ten weeks of the course have shown improved ventilator 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. Thus, a combined practice of yoga seems to be beneficial on respiratory efficiency.
Chaya et.al (2006), investigated the net change in the basal metabolic rate (BMR) of individuals actively engaging in a combination of yoga practices (asana or yogic postures, meditation and pranayama or breathing exercises) for a minimum period of six months, at a residential yoga education and research center at Bangalore. The measured BMR of individuals practicing yoga through a combination of practices was compared with that of control subjects who did not practice yoga but led similar lifestyles. This study shows that there is a significantly reduced BMR, probably linked to reduced arousal, with the long term practice of yoga using a combination of stimulatory and inhibitory yogic practices.

Satyanaranaya, (1992). Santhi Kriya is a mixture of combined yogic practices of breathing and relaxation. Preliminary attempts were made to determine the effect of Santhi Kriya on certain psycho physiological parameters. Eight healthy male volunteers of the age group 25.9 +/- 3 (SD) years were subjected to Santhi Kriya practice daily for 50 minutes for 30 days. The volunteer's body weight, blood pressure, oral temperature, pulse rate, respiration, ECG and EEG were recorded before and after the practice on the 1st day and subsequently on 10th, 20th and 30th day of their practice. They were also given a perceptual acuity test to know their cognitive level on the 1st day and also at the end of the study i.e., on the 30th day. Results indicate a gradual and significant decrease in the body weight from 1st to 30th day (P less than 0.001) and an increase in alpha activity of the brain (P less than 0.001) during the course of 30 days of Santhi Kriya practice. Increase of alpha activity both in occipital and pre-frontal areas of both the hemispheres of the brain denotes an increase of calmness. This study also revealed that Santhi Kriya practice increases oral temperature by 3 degrees F and decreases respiratory rate significantly (P less than 0.05) on all practice days. Other parameters were not found to be altered
significantly. It is concluded that the Santhi Kriya practice for 30 days reduces body weight and increases calmness.

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

Barshankar, et.al. (2003) examined the effect of yoga on cardiovascular function in subjects above 40 yrs of age. Pulse rate, systolic and diastolic blood pressure and Valsalva ratio were studied in 50 control subjects (not doing any type of physical exercise) and 50 study subjects who had been practicing yoga for 5 years. From the study it was observed that significant reduction in the pulse rate occurs in subjects practicing yoga (P<0.001). The difference in the mean values of systolic and diastolic blood pressure between study group and control group was also statistically significant (P<0.01 and P<0.001 respectively). The systolic and diastolic blood pressure showed significant positive correlation with age in the study group (r1 systolic= 0.631 and r1 diastolic = 0.610) as well as in the control group (r2 systolic = 0.981 and r2 diastolic = 0.864). The significance of difference between correlation
coefficient of both the groups was also tested with the use of Z transformation and the difference was significant (Z systolic= 4.041 and Z diastolic= 2.901). Valsalva ratio was also found to be significantly higher in yoga practitioners than in controls (P<0.001). Our results indicate that yoga reduces the age related deterioration in cardiovascular functions.

**Stancak, et.al. (1991)** studied cardiovascular and respiratory changes during yogic breathing exercise kapalabhati (KB) in 17 advanced yoga practitioners. The exercise consisted in fast shallow abdominal respiratory movements at about 2 Hz frequencies. Blood pressure, ECG and respiration were recorded continuously during three 5 min periods of KB and during pre- and post-KB resting periods. The beat-to-beat series of systolic blood pressure (SBP) and diastolic blood pressure (DBP), R-R intervals and respiration were analyzed by spectral analysis of time series. The mean absolute power was calculated in three frequency bands--band of spontaneous respiration, band of 0.1 Hz rhythm and the low-frequency band greater than 15 s in all spectra. The mean modulus calculated between SBP and R-R intervals was used as a parameter of bar receptor-cardiac reflex sensitivity (BRS). Heart rate increased by 9 beats per min during KB. SBP and DBP increased during KB by 15 and 6 mmHg respectively. All frequency bands of R-R interval variability were reduced in KB. Also the BRS parameter was reduced in KB. The amplitude of the high-frequency oscillations in SBP and DBP increased during KB. The low-frequency blood pressure oscillations were increased after KB. The results point to decreased cardiac vagal tone during KB which was due to changes in respiratory pattern and due to decreased sensitivity of arterial bar reflex. Decreased respiratory rate and increased SBP and low-frequency blood pressure oscillations after KB suggest a differentiated pattern of vegetative activation and inhibition associated with KB exercise.
Virtanen et al. (2003) study was to determine whether psychological factors are associated with heart rate variability (HRV), blood pressure variability (BPV), and bar reflex sensitivity (BRS) among healthy middle-aged men and women. A population-based sample of 71 men and 79 women (35-64 years of age) was studied. Five-minute supine recordings of ECG and beat-to-beat photoplethysmographic finger systolic arterial pressure and diastolic arterial pressure were obtained during paced breathing. Power spectra were computed using a fast Fourier transform for low-frequency (0.04-0.15 Hz) and high-frequency (0.15-0.40 Hz) powers. BRS was calculated by cross-spectral analysis of R-R interval and systolic arterial pressure variability. Psychological factors were evaluated by three self-report questionnaires: the Brief Symptom Inventory, the shortened version of the Spiel Berger State-Trait Anger Expression Inventory, and the Toronto Alexithymia Scale. It was found anxiety and hostility is related to reduced BRS and increased low-frequency power of BPV. Reduced BRS reflects decreased parasympathetic outflow to the heart and may increase BPV through an increased sympathetic predominance.

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

**Brown and Gerbarg (2005)** found Yogic breathing is a unique method for balancing the autonomic nervous system and influencing psychological and stress-related disorders. Part I of this series presented a neurophysiologic theory of the effects of Sudarshan Kriya Yoga (SKY). Part II will review clinical studies, our own clinical observations, and guidelines for the safe and effective use of yoga breath techniques in a wide range of clinical conditions. Although more clinical studies are needed to document the benefits of programs that combine pranayama (yogic breathing) asanas (yoga postures), and meditation, there is sufficient evidence to consider Sudarshan Kriya Yoga to be a beneficial, low-risk, low-cost adjunct to the treatment of stress, anxiety, post-traumatic stress disorder (PTSD), depression, stress-related medical illnesses, substance abuse, and rehabilitation of criminal offenders. SKY has been used as a public health intervention to alleviate PTSD in survivors of mass disasters. Yoga techniques enhance well-being, mood, attention, mental focus, and stress tolerance. Proper training by a skilled teacher and a 30-minute practice every day will maximize the benefits. Health care providers play a crucial role in encouraging patients to maintain their yoga practices.
Yadav and Das (2001) found the effects of yogic practice on some pulmonary functions. Sixty healthy young female subjects (age group 17-28 yrs.) were selected. They had to do the yogic practices daily for about one hour. The observations were recorded by MEDSPIROR, in the form of FVC, FEV-1 and PEFR on day-1, after 6 weeks and 12 weeks of their yogic practice. There was significant increase in FVC, FEV-1 and PEFR at the end of 12 weeks.

2.4. STUDIES ON YOGIC PRACTICES ON PSYCHOLOGICAL VARIABLES

Schell, Allolio and Schonake (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 in a yoga practicing group and a control group of young female volunteers prior and after the experimental period. There were no substantial differences between the groups concerning endocrine parameters and blood pressure. The heart rate was significantly different in yoga group having a significant decrease in heart rate during the yoga practice. In the personality inventory the yoga group showed markedly higher scores in life satisfaction and lower scores in excitability, aggressiveness, openness, emotionality and somatic complaints. Significant differences could also be observed concerning coping with stress and mood at the end of the experiment. The yoga group had significant higher scores in high spirits and extravertedness.

Berger and David (1988) experimented stress reduction and mood enhancement in four exercise modes, swimming, body conditioning, hatha yoga and fencing. Students voluntarily enrolled in co-educational fencing, body conditioning,
swimming and yoga administered the POMS, a measure of mood states and the state anxiety subscale of the STM before and after class on three different days, students were significantly more fatigued than before. In body conditioning, the interaction between pre and post means was significant. Yoga participants felt significantly better after exercising on four POMS subscales.

**Berger, and Man (1993)** determined the exercise and mental health literature and then examined the influence of rational difference on the acute mood benefits of swimming on women college students (N=70) from Czechoslovakia and the United States. They completed the POMS before and after class on three occasions. The United States swimming classes met for 50 minutes twice a week through out a 14 weeks semester Czechoslovakian swimming classes met for 90 minutes once a week throughout a biweek semester in comparison with their respective controls. Czechoslovakian swimmers reported greater mood changes than the United States swimmers. The Czechoslovakian and United States swimmers reported mood improvement on tension, depression, anger, vigor and confusion.

**Kamel et.al., (2000)** examined the changes in brain waves and blood levels of serum cortical during yoga exercise in 7 yoga instructors and found that alpha waves increased and serum cortical decreased. These two measures were negatively correlated (r = - 0.83). Comparison with a control group of non practitioners is desirable.

**Raju et.al.,(1997)** examined the short-term effects of 4 weeks of intensive yoga practice on physiological responses in six healthy adult female volunteers ware measured using the maximal exercise treadmill test. Yoga practice involved daily morning and evening sessions of 90 minutes each. Pre and post-yoga exercise
performance was compared. Maximal work output (w max) for the group increased by 21% with a significant reduced level of oxygen consumption per unit work but without a concomitant significant change in heart rate. After intensive yoga tanning, at 154 w min.(-1) (corresponding to w max of the pre-yoga maximal exercise test) participants could exercise more comfortably, with significantly lower heart rate (P<0.05), reduced minute ventilation (P< 0.05), reduced oxygen consumption per unit work (P<0.05), and the significantly lower respiratory quotient (P <0.05) the implications for the effects of intensive yoga on cardio respiratory efficiency are discussed, with the suggestion that yoga has some transparently difference quantifiable physiological effects to other exercises.

Madanmohan et.al., (1992) conducted a study on the effects of yoga training on visual and auditory reaction times(RTs), maximum expiratory pressure (MEP), maximum aspiratory pressure (MIP), 40 mg Hg test, breath holding time after inspiration, breath holding after expiration (BHT exp), and hand grip strength (HGS). Twenty seven student volunteers were given yoga training for 12 breath holding after expiration (BHT exp), and hand grip strength (HGS). Twenty seven student volunteers were given yoga training for 12 weeks. Our results show that yoga practice for 12 weeks result for signification increase in respiratory pressures, breath holding times and HGS.

Dugalakshmi (1989) conducted a study on effects of yogic exercise on selected physiological variables of high school boys, “the groups consist of 60 students. The result of the study showed that systolic pressure was increased and diastolic pressure remains unchanged after six weeks training of yoga. The sores in breath holding time and vital capacity had also improved. It was statistically
significant. She also recommended that the athletes can adopt these exercises and increase the cardio respiratory function, and further, she adds, the yoga can be include in the regulate program of physical educations in the schools and collage.

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

**Giri (1987)** using a set of yogic exercise studied the effects of the program for six weeks on the five test of national physical efficiency. Drive viz., 80 meter sprint, 400 meter run. Cricket ball throw, pull-ups and running broad jump. He found a significant improvement among the experimental group in al the five sets as a result of yogic training however, when the group discontinued the practiced the yogic exercises for the same period of six weeks the effect was significant lost.

**Dhanraj (1974)** reported that 6 weeks practice of 15 minutes Hatha yoga daily. Produced a statistically significant (p< 0.05) change in breath holding time. This increase of 12 seconds from 54 seconds to 66 seconds was lost. However, when yoga practice was discontinued after 6 weeks of detraining, the average breath
holding time was 57 seconds. Another group practiced the 5BX programme for physical fitness for 6 weeks (of detraining, the average breath holding time was 57 seconds. Another group practiced the %BX pro) showed a much smaller yet statistically significant 4 seconds increase in breath holding time.

**Dhanraj (1974)** studied that the effects of yoga and the 5 BX fitness plan on selected physiological parameters. The results indicated increase in basal metabolic rate total volume in basal statue, T-4 thyroxin, hemoglobin, blood cell PWC 130, and vital capacity, and chest expansion, breath holding time and flexibility after yoga training. Decreases in heart rate were also observed. When yogic training was discontinued for six weeks following in treatment a significant decline in the values of PWC 130, flexibility and breath holding time were noticed.

**Bhole and Karambelkar (1971)** investigated the effect of three week programme of Hatha Yoga on physical education students. There was seen a statistical significant increases of 15 seconds in breath holding time. The range of increase was seen to be from 10 to 22 seconds.

**M.L. Garote (1970)** conducted a study to determine the “effect of everyday and alternate day yoga training on the physical fitness of School Children”. In his study were school boys with means age of 17 years when tested with the Fleishman battery of basic physical fitness tests showed significant improvement with six weeks yoga training given for 6 days a week as well as for 3 days a week in comparison to the control group.

**Hasrani and Hari (1999)** conducted a study of comparison of sports competition anxiety and aggression of two levels of male basketball players. The purpose of this study was to compare the competition anxiety and aggression of two
different levels male basketball players. The study was conducted on Inter collegiate and Inter-varsity male basketball players in 1977 to know the relationship if any between the competition anxiety and sports aggression traits. A total of one hundred (100) subjects in which 500 inter collegiate and 50 inter-varsity level basket ball players were selected as selected as subjects in this study. Sports competition anxiety questionnaire (SCAT) and sports aggression in ventory were administered on male basket ball players before their major competition. In order to compare low trains results, the Pearson’s product moment correlations and ‘t’ test were applied as statistical techniques.

Baig and Joshi (1999) conducted the study an “comparative study of sports anxiety in normal school children and Juvenile delinquents”. Thirty normal school children who participate in cricket have been administered the sports anxiety scale. Thirty Juvenile delinquents participating in cricket tournament and playing regularly were also administered the same scale. Children in both the groups were taken from the age group of 14 years to 16 years. The difference between the two groups was studied by the ‘t’ test. It was found that Juvenile delinquents experience more anxiety than the normal school children. This result is discussed in view of the institutional atmosphere Juvenile delinquents anxiety was the result of their post history and experience of life.

Reddy and Devander (1999) conducted “the study of the competition anxiety between medalist and non-medalist boxers”. The study was conducted on a total sample of forty subjects drawn from the Andhra Pradesh (A.P.) Senior state level boxing championships held at Warangal from 1st to 3rd October 1999. The subjects were selected at random and divided in two groups-medalists and non-medalists. For
the purpose of the collections Marten’s competition anxiety questionnaire was employed prior to the competition and date, were collected on analysis of data by ‘t’ ratio, it was found that the competition anxiety levels of the medalist and non-medalist boxers is equal.

**Boon (1997)** investigated arousal and anxiety of gymnastic performance. Anxiety was assessed by means of the state trait anxiety inventory. The college women’s varsity gymnastic team (N=18) were tested, the inter correlation matrix of all variables, gymnastic ability, pulse rate, palm-sweating, state anxiety, trait anxiety and gymnastic performance and arousal were analyzed.

**Kim (1980)** studied twelve members of men inter collegiate volleyball team of spring field colleges. All subjects completed the state anxiety inventory three times, once two minute before a practice session it was found that trait anxiety cannot be used to predict state anxiety. The three competitive situation of practice regular sessions game and tournament game do not produce, different state anxiety reactions or interaction exists between trait anxiety and the three competition situation a positive relation exists between trait anxiety and tournament state anxiety.

**Genochi (1981)** conducted a study sought to determining the relationship between competitive trait Anxiety State and good performance in a field setting. Ten moderate and high CTA Collegiate Golfers (N=30) Performed in a practice round on day one and day two of a competitive tournament, state anxiety results indicated a significant in CTA main object with low CTA subjects displaying lower state anxiety than moderate of high CTA subjects. The competition main effect was also significant with post-hoc tests indicating higher levels of state anxiety during day 2 than during the practice round. Performance result produced. Significant CTA main effects with
low CTA subjects display higher levels of performance than moderate of high. CTA correlation between SCAT State anxieties indicated that SCAT was god predictor of pre competitive state anxiety.

Adejoa (1982) conducted a study on the relationship of anxiety and level of aspiration among physical education student’s thirty on Physical Education College male students of eastern Illinois University were administered the anxiety questionnaire designed by the institution of personality and anxiety testing. The level of aspiration of performance is on the group of strength test. There was no relationship between levels of aspiration in high and low anxiety student and also no difference between high and moderate or moderated and low anxiety groups.

Jones (1983) studied the effect of anxiety and need for achievement on the performance of high school wrestlers. Data were obtained from the match perception test anxiety questionnaire expectancy rating by the individuals and by their and observation. It was concluded that the personality traits of anxiety, both the expectancy and the actual performance of these high school wrestler subjects who measured low in anxiety level performed better than those high in anxiety. The groups scoring highest in performance was that of low anxiety and high of achievement. The lowest level of performance was that of low anxiety and high level of achievement. The lowest level of performance was demonstrated by the group high in anxiety and low in need of achievement.

Anderson and Williams (1987) conducted a study and tested whether there was significant and sport competition anxiety differences among sex typed (masculine males, Feminine Females) cross sex types (masculine female, feminine males) and rogynous (males and females who gave strong masculine and feminine dimensions).
Each subject was tested for Competition anxiety using the Sport Competition Anxiety Test (SCAT). A one way ANOVA of SCAT scores by groups was significant = (5,210 = 6.52) 6.52, p.001, post hoc analysis revealed that feminine had significantly more competitive anxiety than all other groups androgynous female were more anxious than masculine males (p.05) the result are discussed in terms of gender scheme theory.

**Horvath (1987)** reported the finding of the statistical integration of thirty-eight primary research investigations of the influence of A-trait and A-state anxiety level upon athletic performance. Meta analytic methods were used to validate the scores and specific suggestions were presented towards the relationship between anxiety and performance anxiety levels. Comparisons obtained from the t-test between the following pairs of variables were analyzed individual v/s team sports (Individual Sport Athletic displayed a larger amount of anxiety) A trait and A-state anxiety influenced to a greater extent in performance.

**Hasarani (1991)** conducted a study on competitive anxiety of basked ballers and track and field athletes. A sample of twenty five basket ballers and twenty two athletes were administered SCAT (Martens 1997) questionnaire a day. Prior to their competitions found difference in anxiety level of basket ballers and track and field athletes. It was also revealed that basket ballers had better experience in coping with pre competition anxiety than track and fiel athletes.

**Pandy, Jayashree and Shyalja (1991)** conducted a study on analysis of precompetitions anxiety among the athletes of sexes and were delimited to track and field athletes. Fifty College level athletes who participated in Inter Collegiate Meet were administered sports competitive anxiety test (SCAT). The result indicated that female
athletes showed lower anxiety level than male athletes. It was found that experience and achievement level play an important role in the management of a state prior to the competition.

**Mace and Carral (1995)** conducted a case study of two squash who used stress inoculation training to control their anxiety on the squash court both players, on male and one female suffered playing documents, as a result of anxiety levels that were too high. The players were introduced to stress inoculation training so they could learn to control their. Both players were given eight training sessions pre and post state anxiety result and the player’s ratings at their performance revealed that both individuals reported their levels decreased considerably and their performance improved.

**Matheson and Mathens (1991)** examines changes in cognitive anxiety, somatic anxiety and self confidence as measured by the competition state anxiety inventory-2 in a sample of 50 female high school gymnasts prior to their performance at a practice session dual meet and district championship meet. The purpose of the study was to examine (1) the relationship between state anxiety and performance getting (2) experience and (3) difficulty of movement’s tasks. Analysis showed that at the dual meet athletes experienced significantly greater cognitive and somatic anxiety and lower self-confidence that at the practice or district championship. Stat anxiety did not very significantly with the athletes overall experience or the difficulty of the routines. They performed the unexpected finding that the dual meet was the most anxiety provoking was attributed to the greater uncertainly of outcome in a competition and the face that the dual meet occurred early in season.
Neeraj and Sandhu (1999) conducted a study on “the effects of exercise on state anxiety and trait anxiety. The relationship between behavior and biology was heuristically organized around three themes: health impairing and health promoting habits, illness-related decisions and action, and the psycho-physiological effect of stress. The present study was based on evaluating the effects of exercises on state anxiety and trait anxiety. The sample consists of 120 male individuals (90 exercisers of different durations and 30 non-exerciser controls) aged 17 to 23 years. State trait anxiety inventory (SCAT) was applied on each subject. The result of the present study exhibits that exercise has substantial effects on reducing both the state anxiety and trait anxiety levels. The maximum difference is seen in case of state anxiety when non-exercisers are compared with exercisers of one-year duration (t value=4.12) and in case of trait anxiety, when non-exercisers are compared with exerciser of six-month duration (t value=5.26).

2.5. SUMMARY OF THE LITERATURE

Study of related literature implies locating and reading, evaluating reports of research as well as reports of causal observation and opinion that are related to the individuals report planned research.