Chapter II

REVIEW OF RELATED LITERATURE

A Review of literature relating to the studies thus on the effect of Hatha Yoga and Aerobic training on Physiological, Psychological and Physical fitness variables, and further the studies on the differences as well as relationship of Physiological, Psychological and Physical fitness variables to various sports proficiencies as the scholar could glean from the published reports available in the libraries of Lakshmibai National University of Physical Education, (Deemed University), Gwalior (M.P). The University of Burdwan, Burdwan, (W.B). Nikhil Banga Sikshan Mahavidyalaya, Bishnupur, Bankura, (W.B). And Bankura Christian College, Bankura, (W.B) are abstracted in this chapter to provide the background material for this study. The review of literature is divided into four sections. Studies pertaining to the Physiological variables are included in section (I). Section (II) covers Psychological variables and Section (III) pertaining to the Physical Fitness.
Section -I

Physiological Variables

Studies pertaining to the physiological variables have been found reported in the professional literature.

Dhanaraj\(^1\) studied the effect of yoga and a fitness plan on selected physiological parameters. The result after practice of yoga indicated an increase in vital capacity, chest expansion; breathe holding time and body flexibility. But there was a decrease of the heart rate.

Ghosh\(^2\) studied a comparative effect of physical exercise, Yogic practices at the combination of both on selected physiological variables among high schoolboys. The result after practice of yoga indicated relaxation of pulse rate and respiratory rate.

Chinnaswamy\(^3\) conducted a study namely “Effects of Asanas and Physical exercise on selected physiological and bio-chemical

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\(^1\) V.Hubert Dhanaraj, “The effect of yoga and the 5 Bx fitness plan on selected Physiological parameters” Unpublished Doctor of Philosophy Thesis, The University of Alberta, Edmonton, 1974).


variables among school boys”. In this study the investigator selected ninety male students at random from Govt. Higher secondary school, the initial score was measured for the selected Physiological and Biochemical variables, namely pulse rate, systolic pressure, diastolic pressure, hemoglobin content and blood sugar level. The treatment was given for a period of six weeks for the experimental group. The analysis of variance was applied to analyses the result. The hemoglobin content and blood sugar were improved significantly with the effect of Asana and physical exercise, whereas the pulse rate and diastolic pressure had lowered in resting condition. There was no significant change in systolic.

Bhole and Karmbelker\textsuperscript{4} measured vital capacity in two groups at 24 males’ mach, and trained them for three weeks. The result should be significant increase in vital capacity after Yogic training in the experimental group when compared group.

According to Gharote\textsuperscript{5} Cardio-vascular fitness plays a vital role in the maintenance of proper health and physical fitness. The purpose was to determine the effect of long term yogic training programme on

\begin{itemize}
\item \textsuperscript{4} M.V. Bhole and P.V. Karmbelkar, “Effect of yoga Practices on vital capacity,” Research quarterly 31 (January 1961):312
\item \textsuperscript{5} M.L. Gharote and S.K. Ganguly “Effect of yogic Training on physical fitness” Yoga Mimansa, XV (January 1973):31.
\end{itemize}
Cardio-vascular efficiency Harvard step test was administered on eleven male students and the results of the study indicated that one hour of daily yogic exercises including pranayama schedule, significantly improve Cardio-vascular efficiency of the students.

Grayston Judith Jee\(^6\) studied the effect of an eight week water aerobic programme on selected physiological Measurements of 54 female participants aged eighteen to twenty five years. They were divided into control group and experimental group. The experimental group participated in a progressive water aerobic programme three times per week for eight weeks. The pre-test and post-test results were used to determine the significant difference between the two groups exited on the variables. The result of the study indicated a significant difference at 0.05 levels in resting heart rate between the two groups. No difference was found in systolic or diastolic blood pressure, body weight or percentage of body fat.

Gentry and Roy\(^7\) studied the effects of a nine week’s aerobic jogging programme on selected cardio-vascular functions of the fifteen

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college’s male students ranging in age from eighteen to twenty two years. The training programme consisted of jogging and walking up to a specified distance (one or two miles), significant decrease was observed in resting diastolic blood pressure and heart-rate while no change occurred in exercise of cardiac output, cardiac index in resting condition of higher secondary schools on selected physiological variables. The subjects of the study were one hundred and five girls from eleventh and twelfth standards were selected at random and also divided into three random groups namely Control, Aerobic and Anaerobic. The Aerobic and Anaerobic group were given twelve weeks training. The selected physiological variables were tested under three stages; pre-test, mid-test and post-test. The results of the study showed that significant difference had occurred of systolic blood pressure in favor of the aerobic group with regard to systolic and diastolic blood pressure, basal heart rate and recovery heart rate. It also showed that the basal heart rate and recovery heart rate were acceptable for changes quicker than other variables. Thus aerobic training could be constructed as having better training effects than that of the anaerobic training.
White\textsuperscript{8} evaluates the effect of a six month walking and aerobic dance programme on skeletal and cardio-vascular system of past menopausal females. His findings indicated that both walking and dancing were equally effective in increasing the efficiency of the cardio-vascular system in past menopausal women. Both groups showed significant increase in treadmill time while showing decrease in resting heart rate and recovery heart rate.

Chlocking\textsuperscript{9} studied the effects of two training programmes on selected cardio-respiratory variables on College women. The Physiological variables were pulse rate, respiratory rate, respiration amplitude, minute volume of respiration and oxygen consumption. The cardio vascular reaction was measured by counting the pulse rate. It was observed that the pulse rate and respiratory rate were decreased significantly after the training period regardless of the training programme prescribed.

\begin{footnotesize}
\begin{itemize}
\item[\textsuperscript{8}] Mary Kay White, "The effect of walking and Aerobic Dancing on the Skeletal and Cardio-Vascular system of past Menopausal Females," \textit{Dissertation Abstracts International} 42 (September 1981): 1049-A
\end{itemize}
\end{footnotesize}
Thomas and Dey\textsuperscript{10} investigated the effect of graded work-load on blood pressure and heart rate of high and low cardio respiratory fitness of students during and after exercise. Sixty students of eleventh class were selected as a subject. There was significant differences were found at 0.05 level of confidence. It was concluded that heart-rate response was more valid as an indication of cardio-respiratory fitness than blood pressure.

Adenian and Toriola\textsuperscript{11} assessed the comparative effect of eight weeks of continuous and interval jogging on body fat and blood pressure in fifty-five untrained Nigerian school boys whose mean age was sixteen years. The pre-test and post-test of the subjects were determined within one week of the beginning and one week after the end of the training programme. No significant decreases in systolic and diastolic blood pressure levels were noted in all the different categories of subjects. No significant positive association was also found between relative body fat and blood pressure. Thus it may be concluded that the continuous and interval jogging programmes are not superior to each


other in affecting the levels of body fat and blood pressure in male adolescent.

Arungiri Krishana\textsuperscript{12} conducted a study- “Effect of selected Bharathiyam exercises and yogic exercises on physiological variables among school boys”. The investigator selected ninety students at random from Govt. Higher Secondary School, and also divided them into three groups of which, one served as control group and other two served as experimental group with Bharatiyam exercise and Yogasana respectively. The subjects were measured for the selected physiological variables like pulse-rate, breath holding time, cardio-vascular efficiency and vital capacity before training as well as immediately after six weeks’ training.

The pre-test and post-test were conducted and the analysis of covariance was used for the analysis of the result. It was observed that the pulse rate of Bharathiyam and Yogic practice group has significantly decreased while breath-holding time, cardio-vascular efficiency and vital capacity have improved significantly.

Michael et al.,\textsuperscript{13} conducted a similar study to find out the pulse wave and blood pressure changes occurring during a physical training programme to the ninety High School students. It was concluded that the resting and post exercise systolic blood pressure measurement decreased significantly during training. The systolic blood pressure changes were significant after 16 weeks while the pulse rate had changed significantly in six weeks. During the detraining period the results of the measurements indicated reverse and significant changes in ten weeks.

Bain and Duglas\textsuperscript{14} studied the effect of exercise intensity of recovery Heart-rate and blood pressure for cross country athletes. The treatment was given in high and low intensity three times a day (morning, afternoon and evening). ANOVA was used to analyses the data. No difference was found with regard to the systolic and diastolic BP measurement- data. For heart rate, it was found that the afternoon and evening measurement- data were greater than that of morning measurements. Intensity level did not seem to produce any effect with heart-rate or blood pressure.

\textsuperscript{13} Earnest D Michale et al. "Pulse wave and blood pressure changes occurring during the physical training programme," Research Quarterly 31(March 1960):43.

Jetted, Sidney and Campbell\textsuperscript{15} conducted a twelve week training programme on selected cardio-vascular and work out indices in sedentary middle aged men and women and compared a laboratory procedures for prescribing an individualized programme of walking/Jogging with that employing a prediction formula which utilizes percentage of VO2 max along with height and weight.

Gore and Bhole\textsuperscript{16} conducted a study to find out the effect of paschimottanasana and similar type of muscular activity on pulse rate. It was concluded that the pulse rate differed significantly due to different types of muscular activities the tension was more in similar types of muscular activities on muscle, while in asana the tension in muscles happens to be released by withdrawing one’s effect to its optimum level. Naturally relaxed muscles put less strain and demands on the heart. So that the pulse rate was found to be lower significantly with the effects of Paschimottanasana in comparison to similar types of muscular activities.


Prabhavananda,\textsuperscript{17} conducted a study the pranayama is the second subtle sheath next to "annanaya", the food body. Prana is a vital principle, the force which vitalizes and holds together the body and the mind. It pervades the whole technically known as raja yoga, which is an eight fold path consisting of Yama (moral discipline): Asana (posture): Pranayama (breathing exercises): Pratyahara (releasing the mind from the thralldom of senses): Dharna (concentration): Dhyana (meditation): and Samadhi (the preconscious state). Prabhavananda further describes pranayama to be the forth limb of yoga, and it controls the vital energy of the principle. It is the energy that enables us to act, think and breath. Naturally then any control of respiration is likely to have a far reaching effect on the whole psycho-physiological system.

Alteri\textsuperscript{18} selected 63 college females between 17 and 22 years of age to study the effect of endurance and interval running on selected physiological parameters. Analysis of data revealed that due to endurance and interval running, resting pulse rate and resting systolic and diastolic blood pressure were lowered significantly.

\textsuperscript{17} Swami Prabhavananda, "Effect of pranayama on the Spiritual Heritage of India," \textit{Research Quarterly} 43 (October 1972), p.53.
Kshatriya\textsuperscript{19} studied the effect of 8 weeks of training programme on the cardio-respiratory endurance of Basketball players. In his training programme included 1/2 mile jogging, grass root drill, hill sprint, 50 yards sprint, stretching. These trainings were speed and endurance exercise. During the training programme, he has 1st, 2nd and 3rd treatment, 4th, 5th and 6th week treatment and 7th, 8th week treatment. Through this training programme, he found the development of heart rate, blood pressure and lungs capacity. There was significant improvement in the cardio-respiratory endurance.

Spanial\textsuperscript{20} investigated to determine the effects of combining periodized strength training and an aerobic muscular strength an aerobic power, an aerobic capacity and body composition. The subjects were 24 class-room volunteers who were randomly divided into two experimental treatment groups and one control group. Group-1 performed a three stage periodized strength training programme.


Harger\textsuperscript{21} determined differences in the effects of two frequencies of high volume interval training on the metabolic and cardio-respiratory responses of untrained college men. Specially, the following variables were compared and analyzed before and after training. Maximum oxygen consumption, physical work capacity, blood lactic acid concentration, maximum aerobic power, maximum ventilation, resting blood volume, resting heart rates, resting heart size, resting systolic intervals and resting hemoglobin concentration. He found that training four times weekly is not better than training two times per week. Both frequencies of training show a tendency to reduce resting hemoglobin as a result of seven weeks of high volume interval training.

Abraham\textsuperscript{22} investigated the effects of six weeks training programme on selected physiological variables (hemoglobin, pulse-rate, vital capacity, cardio-vascular endurance and peak expiratory flow rate) of professional college students. The data was collected before and after the experiment and analyzed with the help of ‘t’ test. The study concluded cardio-vascular endurance and peak flow rate was


\textsuperscript{22} K. Mathew Abraham, “Effect of six weeks of training on cardio-respiratory variables of professional college students”, (Unpublished Master’s Thesis, Jiwaji University,1980).
improved due to training. There was a significant reduction in resting pulse rate of the subjects and there were no significant changes in hemoglobin content and vital capacity after six weeks of training.

Sinha\textsuperscript{23} conducted a study on comparative effects of different conditioning programme on selected physiological variables. Total 65 girls students, 15 from class-vi, 25 from class-vii and 25 from class-viii standard students were selected randomly from Scindia Kanya Vidyalaya, Gwalior. This study concluded that conditioning programme improves maximal aerobic and anaerobic capacity, decrease the resting pulse rate and decrease the fat percentage.

Vijaylakshmi\textsuperscript{24} conducted a study to compare and analyses the physical adaptation resulting from aerobic and anaerobic training on girls of standards, were selected at random and also divided into three random groups namely Control, Aerobic and Anaerobic. The Aerobic and Anaerobic group were given twelve weeks training. The selected physiological variables were tested under three stages; pre-test, mid-test and post-test. The results of the study showed that significant


difference had occurred of systolic blood pressure in favour of the aerobic group with regard to systolic and diastolic blood pressure, basal heart rate and recovery heart rate. It also showed that the basal heart rate and recovery heart rate were acceptable for changes quicker than other variables. Thus aerobic training could be constructed as having better training effects than that of the anaerobic training.

Johnson\textsuperscript{25} studied the relationship that existed between physical skill as measured and the general intelligence of the college students. His results indicated that there was no significant skill and mental power or general intelligence.

Frank\textsuperscript{26} made an investigation of selected physiological parameters during terminal stages of several exercises. He selected nine physiological parameters and examined in five male subjects who were divided into secondary control group and an experimental group that was trained for eight weeks. The results showed that training had a beneficial effect on exercise, diastolic blood pressure, heart rate and


\textsuperscript{26} Meson Charles Frank, "An Investigation of selected physiological parameters during training stages of several exercises," \textit{Completed research in health, physical education and recreation} 6(19790):501.
oxygen consumption and the recovery rate of blood pressure and heart rate.

Wenger and Bagchi\textsuperscript{27} investigated on four yoga practitioners in relation to pulse and heart. Two practitioners claimed to stop the heart: one formerly made this claim but only demonstrated his method; the fourth claimed alveolar air without producing any respiratory alkalosis.

Pratap, Berettini and Smith\textsuperscript{28} observed that the reduction in minute ventilation during pranayama involving slow rate of breathing, does not affect the effective alveolar and blood gas composition. On the other hand the faster breathing of kapalbhati procedures some reduction in carbon-dioxide in the alveolar air without producing any respiratory alkalosis.

Bhole\textsuperscript{29} has mentioned that pranayama plays an important role in the development of the respiratory system, and out of many automatic functions in the body, it is only the respiratory activity which goes on continuously and which is partially under our control, involving a good number of skeletal muscles, It also influences many automatic

\textsuperscript{29} M.V. Bhole, "Pranayama and it is Rationale" Yoga Mimansa, VIII (January, 1966):10.
functions like the activity of the heart, circulation and digestion, directly as well as indirectly. Naturally then, any control of respiration is likely to have a far reaching effect on the whole psycho-physiological system. From the oldest times it has been claimed that pranayama lead to the eradication of the flows of psycho-physiological reaction.
Section II

Psychological variables

Studies pertaining to the psychological variables have been found reported in the professional literature.

Yogendra,\(^30\) conducted name specialized studies on yoga in psychology, physiology, sociology and experienced some inconvenience in relation to proper laboratory facilities, scientific methods and bonafide subjects, as well as lack of comprehensive hypothesis. He pointed out that among other tests. Searching Ph. Value of urine after Pranayama are the types of researches undertaken on a system that aspires for psychosomatic discipline and spiritual consciousness.

Daniels\(^31\) conducted a study on pain tolerance and cardiac responses to pain of low and high anxious subjects before and after exercise. It was the purpose of this study to investigate the effects of anticipating pain and experiencing pain upon resting heart rates and


\(^{31}\) Alice Diane Daniels, "Pain tolerance and cardiac responses to pain of low and high anxious subjects before and after exercise," Dissertation Abstract international 33 (November1972): 2147-A.
exercise heart rates of low and high anxious college women who scored in the fifteenth percentile or below and the eight-fifth percentile and above on the Spielberg Trait Anxiety Scale.

Young\textsuperscript{32} studied the effect of regular exercise on cognitive functioning and personality was investigated in 32 subjects representing 4 discrete groups based on sex and age. Before and after a 10 weeks exercise programme of jogging, calisthenics, and recreational activities, a test battery was administered to assess functioning in a number of domains: intelligence (WAIS Digit Symbol and Block Design); brain function (Trail-Making); speed of performance (Crossing-Off); memory and learning (WMS Visual Reproduction and Associate Learning); moral and life satisfaction (Life Satisfaction and Control Ratings); anxiety (MAACL); and depression (MAACL). Improvement was observed on several physiological parameters. ANOVA revealed significant sex and age differences on Digit Symbol and Block Design and age differences on Trail-Making, Crossing-Off, Associate Learning, and anxiety. Regardless of sex and age, significant improvement in performance was observed from pre to post-test on Digit Symbol, Block Design, Trail-Making, Crossing-Off, and on

Associate Learning. In addition, an increase on health status rating (p less than .01) and decrease in anxiety were observed from pre to post-
test.

Young and Ismail\textsuperscript{33} investigated personality differences among
high fit young, old and low fit young and old groups, before and after a
physical fitness programme using the 16 personality factors
Questionnaires. Results revealed that regardless of age, the high fit
group was more intellectually inclined, emotionally stable, compared
self-confident easygoing, relaxed, less ambitious and unconventional
than the low fit group.

Sevier\textsuperscript{34} determined from an administrative standpoint of view
that whether there were any changes in selected factors of physical
fitness and personality in a group of adult women following
participation in a six week programme of aerobic dancing. The subjects
were administered the YMCA physical fitness Test and psychological
inventory prior to the participation in a six week
programme of aerobic dancing. The subjects were administered the

\textsuperscript{33} Young and Ismail, \textit{“Effect of two training prrogramme on selected psychological variable of College women”}, \textbf{Research Quarterly 47} (October 1976): 515-519.

\textsuperscript{34} Vernon Alvin Sevier, \textit{“An administrative study of the Effects of Aerobic Dancing on Selected Physiological Fitness and Personality variables,”} \textbf{Dissertation Abstracts International 40} (January 1980): 3874-A.
YMCA Physical Fitness Test and 3 Psychological inventory prior to the participation in the program. Results indicated that the subjects improved significant in 5 areas of physical fitness and showed significant changes in 4 facets of personality, cardio-respiratory endurance, body composition, flexibility, muscular strength, muscular endurance, dominance, share of well being and capacity to create a good impression.

Naoyuki et al.\textsuperscript{35} examine how much effect a leadership skill training program had on personality traits of participants. The Funabashi Sports and Health College, a local extension programme sponsored by the Funabashi Municipal government, offered the leadership skill training programme in Chiba. A total of 139 students and their relatives participated in this study voluntarily. They answered the written questionnaire prior to and after this leadership training programme. The questionnaire consisted of twenty-seven question items regarding leadership. From factor analysis, three factors were extracted and the researchers named them as 'aggressiveness', 'fairness', and 'self monitoring' respectively. ANOVA (rater\times time) was conducted in order to determine the effects of leadership training programme on

personality traits in between prior to and after the programme. It was found that 1) both of the participants and their relatives evaluated the programs effective on 'aggressiveness' traits. On the other hand, 2) participants rated the programme effective on 'fairness' traits but their relatives rated it oppositely effective. And 3) 'self monitoring' traits were rated to have no apparent effect.

Pierce et. al 36 done a study on the effects of 16 weeks of physical exercise training on the psychological functioning of 90 patients with mild hypertension. At baseline and after 16 weeks of training, patients completed a psychometric test battery that included objective measures of neuropsychological performance and standardized self-report measures of psychosocial functioning. Patients were randomly assigned to one of three groups: aerobic exercise, strength training and flexibility exercise, or a waiting list control group. After training, there were no group differences on any of the psychological measures, even though patients who engaged in exercise perceived themselves as functioning better in a number of psychological domains.

Elsayed\textsuperscript{37} studied the effect of long term physical fitness programme on personality variables in adult men by using chattel's 16 personality factor questionnaire and concluded that there were personality differences between high and low fitness groups.

Koepl et. al\textsuperscript{38} in this study used the Minnesota Multiphase Personality Inventory to detect personality changes in 53 overweight, yet otherwise healthy, males who were participating in either a weight reduction or an aerobic exercise conditioning programme. Analysis of pre- and post-intervention scores revealed that only the participants in the aerobic conditioning group demonstrated the predicted desirable psychological changes. More specifically, this group displayed significant clinically desirable changes. Similar to the weight loss participants, a demographically matched nonintervention comparison group showed none of these desirable changes and actually yielded a significant increase. However, when compared to this "normal" group, both intervention programmes showed statistically significant changes.


differences, at least two Minnesota Multiphasic Personality Inventory scales.

In a study of 246 males who were required taking physical education at the state University of Iows at the beginning of the school Year; Weber\textsuperscript{39} concluded that there was no significant relationship in between the physical fitness scores and the nine measures of personality in the Minnesota multiphase personality inventory. He concluded that physically fit subjects had no stable traits of personality than physically unfit. He also found that there was no significant relationship between physical fitness scores and personality scores. The co-efficient of correlation was negative -.04.

Meiers\textsuperscript{40} administered the cattle 16 P.F. to 110 varsity athletes of different sports. He concluded that reserve athletes were more out-going and warm-hearted than string athletes.

Tillman\textsuperscript{41} administered A-S Reaction study of Allport, and Chattel's 16 Personality Factors Questionnaire and found that the

\textsuperscript{40} John C. Meiers, "The Relationship Between Sixteen Personality Factors of University First String and Reserve Varsity Athletes", Completed Research in Health, Physical Education and Recreation, 49 (1971):65.
\textsuperscript{41} Kenneth Tillman, "Relationship Between Physical Fitness and Selected Personality Traits, Research Quarterly, 36 (December 1965): 488.
upper physical fitness group had a significantly higher ascendance rating on the A-S Reaction Study Test than did the lower group. The upper physical fitness Group-A appeared more surgent (F), social dependence (Q2) and less tense (Q4) than the lower physical fitness group in Chattel’s 16 Personality Factors Questionnaire.

Merriman42 concluded that motor ability is related to personality traits. The upper motor ability group scored significantly higher than the lower motor ability group on the measures of intellectual and interest modes.

Sharp and Reilley43 investigated the relationship between aerobic physical fitness and selected personality traits measured by the Minnesota Multiphasic Personality Inventory for college males engaged in an aerobic conditioning class. Results indicated that physical fitness scores and selected scales on the Minnesota Multiphasic Personality Inventory were related in college males and that changes in aerobic physical fitness were related to score changes on selected scales of the Minnesota Multiphasic Personality Inventory for college males who participated in an aerobic exercise programme.

Garvin\textsuperscript{44} tested personality by using Chattel’s Personality Factors Questionnaire and Physical Fitness using Fleishman’s Basic Fitness Test and concluded that there was a strong relationship between personality and physical fitness.

Richardson\textsuperscript{45} conducted the study of the relationship in college women of high and low motor ability to personality, aptitude and scholastic achievement. He concluded that highly skilled student surpassed the low skilled in status, sociability tolerance and aptitude scores. They participated more in sports and associated with people who were more sports minded.

In a comparative study of personality profiles of high and poorly skilled male and female badminton players Gill\textsuperscript{46} concluded that highly skilled male badminton players were more suspicious, neither tough nor tender minded, as compared to the poorly skilled badminton players, who were less intelligent, tough minded and neither trusting nor suspicious.

\textsuperscript{44} Bobby Selby Garvin, “An Investigation into the Relationship of Personality and Physical Fitness”, \textit{Dissertation Abstracts International}, 33 (October 1972): 1487-A.


\textsuperscript{46} Ranjot Gill, “Comparative Analysis of Personality Profiles of Highly and Poorly Skilled male and Female Badminton player,” (Unpublished Master of Philosophy Dissertation, Jiwaji University, 1982).
Harsis\textsuperscript{47} composed high and low fitness college women in psychological traits and found that these is a tendency for the fit individual to appear more stable in certain psychological traits and to appear less anxious in other.

In a comparative study of physically fit and unfit junior high schools girls Dorothy\textsuperscript{48} conducted that physically fit students had better personality than physically unfit students.

Sahney and Khann\textsuperscript{49} (1993) studied Nutritional status, physical fitness and personality traits of sports vs. non sportswomen in Chandigarh. The major finding of the study were that majority of the sports girl belong to rural families and they started playing at the age of 12 to 14 years and 60 percent of them were vegetarian. Majority of the respondents in both the groups had satisfactory habits of health and personal hygiene. Sports girls were consuming more energy than their non-sport counterparts. Protein, carbohydrate, fat, iron and ascorbic acid were all in very low amounts in their diet than their requirements.


non-sport girls were also consuming low amount of energy protein, carbohydrate and iron. Sports girls performed significantly better on Harvard step test, recovered faster to basal heart rate and took less time in 100 meters running. Non sports women were tensed, restless and impatient while sportswomen were reserved, tender minded careful and practical.

Bhusan et al.$^{50}$ found differences in personality traits of high and low achieving badminton players. He administered 16 Personality Factors Questionnaire to 10 high achieving players who represented India at the International level and low achieving players who never achieved any distinction in their respective game. The high achievers scored significantly higher than the low achievers on dominance and urgency.

Singh$^{51}$ conducted a comparative study of psychological characteristics and socio-economic status of badminton players of high and low levels of proficiency. He found high level badminton players were emotionally stable, more conservative, whereas low level players

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were unstable and suffered from neurotic break down under stress and pressure.

O’Connor and Webb\textsuperscript{52} compared the personality traits of four groups of their collegiate female athletic competitors and one group of non-competitive students by administering the Chattel’s personality Factors Questionnaire and found significant differences on four personality factors of intelligence, radicalism, self-sufficiency and control. Personality profiles of national athletes showing significant differences have been found reported in the literature.

The Internal-External locus of control scale and creativity ratings showed the lowest correlations of all the major variables. Creativity and drive showed some positive relationship between manifest anxiety and creativity was negative and significant as hypothesized.

Section III

Physical fitness

Studies pertaining to the Physical fitness have been found reported in the professional literature.

Garber et al.\textsuperscript{53} conducted a study to compare the physiological effect of an eight week aerobic dance programme to those of a walk-jog exercise training programme, 60 male and female university employees ages 24-48 years were randomly assigned (N = 24), or a sedentary control group (N= 22), a walk-jog program (N= 24), 0r a sedentary control group (N=15). Subjects who had an exercise compliance rate 85% were dropped from the study, as were controlled subjects who had scheduling conflicts or illness precluding post treatment testing. Thirty five subjects completed the 8 week periods with a compliance rate 85% leaning 14 in the aerobic group. Significant increases (p< 0.0001) in maximal oxygen uptake occurred in both the aerobic (+ 3.9 ml/kg$^{-1}$/min.$^{-1}$), while no significant change was observed in the control group. Peak heart rate decreased significantly (p<0.05) in the aerobic (- 4 b/min$^{-1}$) and walk-jog group.

(-3b/min^{-1}) but was unchanged in the control group (-1 b/min^{-1}) following the treatment period. Body affects the aerobics, walk-jog and control groups throughout the treatment period. It was concluded that aerobic dance programme can result in similar improvements in aerobic power as a walk-jog program. Thus an aerobic dance programme is an effective alternative to a traditional walk-jog training regime.

Wilmore and other\textsuperscript{54} conducted a study on body composition changes with a 10 week programme of jogging. The following conclusion was drawn that the changes in body composition induced by training are as follows: (1) a decrease in total body fat, (2) no change or slight increase in lean body weight, and (3) a small decrease of total body weight. For the most part, these changes, particularly that of fat loss, are more pronounced for obese men and women than for the already ‘lean’ individual. It is important to note that more calories are expended when running rather than walking because weight is directly related to how many calories are expended during training.

Janaka\textsuperscript{55} investigated the relative effects on spot reduction of two types of exercises, one representing the anaerobic (abdominal exercises) or spot reduction model, and the other representing the aerobic (jogging/running) model.

William et al.\textsuperscript{56} conducted a study on 81 sedentary men aged 30-35 years, who were randomly assigned to either a super used running group, 48 men or to a sedentary control group-33mn. After 6 weeks the exercise group was asked to run 45 min. daily for 5 days/week. Laboratory measurements were taken at baseline and at 3, 6, 9 and 12 months. Waist, hip and thigh girths; estimated body composition; and calculated caloric intakes were also determined. Max Vo2 was measured by maximal treadmill testing.

Johnson and Thorn\textsuperscript{57} conducted a study on locus of control and effects of perceptual tasks on heart rate. The hypothesis was tested that the relationship, found in prior research, between heart rate changes, produced in biofeedback settings, and locus of control scores derives


\textsuperscript{56} P.T. William et al., \textit{"Effect of Exercise- Induced Weight Loss on LDL Subtraction in Healthy Men,"} (Stanford University: University of California, Beer Kelley University of Washington) cited in Roy J. Sheppard et al., \textit{Yearbook of Sports Medicine} (St. Louis, Mosby- Yearbook inc., 1990):73-75.

\textsuperscript{57} Patrick R. Johnson and Beverly E. Thorn \textit{"focus of Control and effect of perceptual tasks on Heart rate,"} Dissertation Abstract International 60 (January 1985):311.
from the heart brain relationship, described by the Laceys in 1967, as well as from “expectances for control”. 48 subjects were tested on two perceptual tasks known to elicit changes in heart rate. Significant heart rate changes were observed in response to both tasks, but those changes did not correlate with locus of control as measured by scores on the Rotter’s I-E scale and the Multidimensional Health locus of control scale.

Franklin and other\textsuperscript{58} conducted a study on lean and obese middle-aged female subject who participated in the 12 week aerobic training programme. The programme was started along ALSM guidelines (walking- jogging 15 to 25 minutes, 4 days per week, 75% max Vo2). Normal- weight subjects decreased their body fat from 24.7 to 23.9 %, obese subjects reduced from 38.0 to 36.2% and the sum of 10 skin folds decreased significantly in both groups. This moderate intensity physical conditioning programme affected both obese and leaner women in a similar fashion.

Panny\textsuperscript{59} investigated the effects of resistance running on speed, strength, power, muscular endurance and agility. The training programme consisted four forty minute’s session per week for six weeks.

Result indicated that:

1. A training programme of resistance running alone or supplemented by weight training, isometric contraction and repetitive sprinting would significantly increase speed, leg strength, leg power, muscular endurance and agility.

2. Resistance running supplemented by isometric leg exercises, isometric contraction and repetitive sprinting will not improve standing broad jump ability as significant as speed, leg strength, leg power, muscular endurance and agility.

Jainmitra\textsuperscript{60} took fifty four randomly selected male subjects to determine the effect of selected exercise on the physical fitness of secondary adults. The subjects were divided into two groups, one experimental group and the other control. Experimental group was


subjected to a training programme in selected exercises for six weeks. The study concluded the three were significant gains in mean of experimental group in abdominal and leg power and decreased in resting pulse rate.

Namara\textsuperscript{61} study was designed to compare the effect of their physical fitness training programmes on selected psychological and somatic (body composition, posture flexibility, muscular strength, muscular endurance and cardio-vascular endurance) variables on both males and females. Three treatments (Army Readiness, Calisthenics and Weight Training) were administered for ten weeks. Statistical analysis of data indicated that physical fitness training enhanced all the somatic variables irrespective of training programme.

Edward\textsuperscript{62} conducted a study on the effect of circuit training, weight training and interval training on cardio-respiratory endurance. Fifty one college males from development physical education classes at the University of Mexico were randomly assigned to one of the three exercises programme. The subjects trained for a ten weeks period at

\textsuperscript{61} Michael Joseph McNamara, "The Effects of Three Conditioning Programme on Selected Physical, Psychological parameters of College Students", \textit{Dissertation Abstracts International}, 38(June 1978):7212-A.

their respective exercises programme. Analysis of variance showed no significant differences between the three exercises programme in the measure of cardio-respiratory endurance.

Uppal et al.\(^63\) selected junior badminton players (N=15) from different states of India for the purpose of the study. The subjects were trained with 6- days a week for four weeks training programme included for the development of physical fitness. The results of the study shows that women badminton players having significant improvement in 8- minutes run/walk, standing broad jump, bent-leg sit-ups, but in case of 50M dash and shuttle run, the improvement was not statistically significant.

Bump\(^64\) conducted a study on Locus of Control, competitive anxiety, and level of aspiration in children. Subjects were 53 students (30 female, 23 Male) of 5\(^{th}\) standard at a middle class school in Saugerties, NY, the interaction between Locus of control and the Variables of competitive anxiety and level of aspiration was studied. The Nowicki-stickland Locus of control scale, the sport competitive anxiety test, and a target throwing task were used to asses each


\(^64\) Lenda A. Bump, "Locus of control, competitive anxiety, and level of aspiration in children," Completed Research in Health, Physical Education and Research: 21 (1979): 171.
variable, respectively. By one way ANOVA, it was concluded that those rating high in internality had lower competitive anxiety levels. No differences based on internality were found with level of aspiration or types of shift in aspiration. A $x^2$ was utilized to analyse types of shift. Level of aspiration was found to decrease as anxiety level increased by Person’s analysis. Sex differences were not found with respect to locus of control or competitive anxiety. Males appeared to have higher levels of aspirations than females. Data were analyzed by 3 independent one way ANOVA. It was concluded that the 3 variables were related.

Ross$^{65}$ selected IWOA Motor Fitness Test and AAHPER Youth Fitness Test to determine the changes in the physical fitness of junior and senior girls, after two semesters of physical education and after a period with no formal physical education. Significant gains occurred in abdominal strength, explosive power, co-ordination, flexibility and speed during the semesters of physical education but significant loss in physical fitness was noticed following the period of non-participation.

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Drake\textsuperscript{66} studied the effect of physical conditioning on speed and strength in the performance of selected ice hockey skills. The subjects were divided into two equal groups on the basis of the initial and shot velocity test. Three experimental groups undertaken a five weeks isometric exercise programme. The experimental group showed significant gains on the post–test both for the shot and six of the eight strength measures. The control group showed significant gains for one strength measure and wrist shot.

Carr\textsuperscript{67} studied the effect of isometric contraction and progressive body conditioning exercise on physical fitness and badminton achievement of college women. One group was given progressive body conditioning exercise for fifteen minutes and the second group was given isometric exercise for five minutes following by badminton instruction. The third group had given regular badminton instruction, for full period. He concluded that body conditioning exercise and isometric did not effect significant improvement than badminton instruction alone.


Elsayed\textsuperscript{68} studied the effect of long term physical fitness programme on personality variables in adult men by using Cattell’s 16 personality factor Questionnaire and concluded that there were personality differences between high and low fitness groups.

Dowdy et al.\textsuperscript{69} conducted a study to determine the effects of aerobic dance on physical work capacity, cardio-vascular function and body composition of 28 young middle aged women of 25 years- 44 years (18 experimental and 10 controls). Experimental group participated in 45 min. of aerobic dance, for 10 weeks. 3 days a week at 70-85\% of the heart rate reserve. Significant changes in VO2 max expressed in 5 min\textsuperscript{-1} or relative to body weight or fat free weight (5-7\% vs. – 5-8\%), heart rate during submaximal stages of the treadmill test (9\% vs.1\%) and resting heart rate (85 vs. 2\%). Resting systolic and diastolic blood pressure, body weight, % body fat, fat weight, fat free weight, estimated using underwater weighing; sum of 7 skin fold and sum of seven circumference did not change significantly in either

group. It was concluded that aerobic dance performed 30-45 min., 3
days week for 10 weeks significantly improves

Cardio-vascular function and physical working capacity, but
without dietary control, does not alter body composition in sedentary
middle-aged women.

Rosenstein and Frost\textsuperscript{70} concluded that the study of the physical
fitness of senior high school boys and girls participated in selected
physical education programme in New York State and found that
pupils participating in good programme improved significantly more in
physical fitness than participating in poor programme. The greater
improvement was strength with some gains in agility, balance and
endurance.

Jessey\textsuperscript{71} carried out a study on the effect of three methods of
training on physical fitness. These three groups, each of male
seventeen students at Rector High School was matched on AAHPER
physical fitness test scores, age, height, weight and strength. The
groups were assigned by chance to 11 weeks exercise programme in

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addition to regular physical education classes three times a week. The isometric exercise group used eight exercises requiring nine minutes per day five days a week. The calisthenics group used eight exercises requiring nine minutes a day three days a week. Comparison within groups by’s at the .05 level showed that groups improved significantly in physical fitness, strength and weight. The isometric exercise group had significantly greater strength on the post test than the calisthenics group.

Meyer\textsuperscript{72} selected adult males ( N = 52), described as sedentary, participated for a period of 8 weeks in prescribed exercise programmes of either running, swimming, calisthenics or sports activity while a group of control subjects continued to follow their normal routines. Subjects were pretested and post tested on parameters of cardio-vascular fitness, lean body mass and serum cholesterol content of the blood. A statistically significant difference was found between the increases in cardio-vascular fitness or the running group and all other groups. No significant differences were found when mean differences pre test and post test scores of the 5 groups we compared for the variables of lean body mass or serum cholesterol content of blood.

Namara\textsuperscript{73} study was designed to compare the effect of their physical fitness training programmes on selected psychological and somatic (body composition, posture flexibility, muscular strength, muscular endurance and cardio-vascular endurance) variables on both males and females. Three treatments (Army Readiness, Calisthenics and Weight Training) were administered for ten weeks. Statistical analysis of data indicated that physical fitness training enhanced all the somatic variables irrespective of training programme.

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Uppal et al.\textsuperscript{75} selected junior badminton players (N=15) from different states of India for the purpose of the study. The subjects were trained with 6- days a week for four weeks training program included for the development of physical fitness. The results of the study shows that women badminton players having significant improvement in 8-minutes run/walk, standing broad jump, bent-leg sit-ups, but in case of 50M dash and shuttle run, the improvement was not statistically significant.

Wiremen\textsuperscript{76} studied the relative effectiveness of three approaches to increase physical fitness (a) calisthenic games and sports with a periodic knowledge of result and (b) calisthenic games and sports without knowledge of result and (c) games and sports without knowledge of result. It was concluded that the knowledge of results seemed to have greater effect on physical fitness than 15 minutes calisthenics at the beginning of each class.


\textsuperscript{76} Billy O. Wiremen, “Comparison of Four Approaches to Increased Physical Fitness” Research Quarterly 31 (December 1960):655.
Young and Ismail\textsuperscript{77} investigated personality differences among high fit young and old, and low fit young and old groups before and after a physical fitness programme using the 16 personality Factors Questionnaire. Results revealed that regardless of age, the high fit group was more intellectually inclined, emotionally stable, composed self-confident, easygoing, relaxed, less ambitious and unconventional than the low fit group.

Richardson\textsuperscript{78} conducted the study of the relationship in college women of high and low motor ability to personality, aptitude and scholastic achievement. He concluded that highly skilled student surpassed the low skilled in status, sociability tolerance and aptitude scores. They participated more in sports and associated with people who were more sports minded.

According to Svatmarama\textsuperscript{79} Pranayama of low degree of merit generates heart that of an intervention degree, through, Cortaid blissful position is achieved in which it is ease for ‘prana’ to rise to the highest central point of brain. Hence one should train oneself in respiration by

\textsuperscript{77} Young and Ismail, “Comparison of personality differences among high fit young and old, and low fit young and old groups before and after a physical fitness programme,” \textit{Research Quarterly} 47 (October 1976): 513-519.


practicing Pranayama. One should rub over the body, pre respiration if any, caused by exertion due to Pranayama. By doing this the body attains strength and lightness.

Chatterjee, Jana and Jana\textsuperscript{80} done a study on Hand muscle strength, endurance capacity of hand muscles, speed and agility power studied in 200 Tribal and 200 Non-Tribal students of 10 different age groups. To facilitate the study, the two consecutive classes of age groups were bunched together to represent one age sub-group of 40 (forty) subjects. They were selected from schools and colleges of Midnapore District, West Bengal. Results reveal that both the Hand grip strength and Hand muscle endurance under age groups (13-14) and (15-16) was significant in Tribal's in respect of the Non-tribal’s. No significant changes were recorded in 50-yard Dash and Shuttle Run tests, excepting the age groups (17-18) and (19-20) where Non-tribal’s were superior to Tribal students.