CHAPTER 2

REVIEW
CHAPTER - 2

REVIEW

In this chapter the researcher attempted, to review the earlier studies in relation to aging and exercise and its allied areas. This chapter has been discussed under two headings.

1. PHYSIOLOGICAL PARAMETER.

2. PSYCHOLOGICAL PARAMETER.

1. PHYSIOLOGICAL PARAMETERS: -

   i. Blood Cholesterol

   THE EFFECT OF DYNAMIC EXERCISES

   While studying the clinical parameters Higuchi¹, et. al. 1988 selected 110 males of average age 79 years and 120 females of average age 81 years. The volunteers were selected from the Tokyo a metropolitan's city. All subjects were healthy and free from CHD and not taking any kind of medication that might affect the lipid blood concentration. Relative fat was estimated from triceps and sub-scapular skin fold thickness. Maximal $O_2$ uptake was determined during treadmill exercise. The records of the subjects kept for three consecutive days HDL (High-density lipoprotein) fraction of lipoprotein was isolated according to the method lipid research clinics. LDL cholesterol was estimated. TG (Triglyceride) was measured. Plasma apolipoprotein was also measured.

   The runner in both age groups had significantly higher $VO_2$ max. HDL cholesterol concentration between the elderly and middle aged runners had no significant

¹ M. Higuchi, et. al., Plasma Lipid and Lipoprotein Profile in Elderly Male Long Distance Runners. Clinical Physiology; (1988), 8 P. 137.
differences in body composition. Elderly runners had higher level of apolipoprotein (156 + 16 mg) than untrained man. The conclusion of the study was that persons regularly performed endurance running could bring about favorable changes of the lipid components.

Strong evidence had been presented that chronic effects of physical training programmes age increased amount of high-density lipoproteins in the cholesterol. Altekruse and Wilmore, 1973; evaluated 39 sedentary male subjects and engaged them in a ten week programme of physical conditioning consisting of walking and jogging, three times per week. Intensity and duration of exercise was progressively increased high density lipoproteins values 18.6 % while decreased low density lipoproteins were evident. An increased in high density lipoprotein in medical students who engaged in four, 30 minutes, session of intense exercise for seven weeks was noted by Lopez, et. al. 1974.

Woods, et. al., 1976; investigated the plasma lipoproteins profiles of middle aged runners. 41 male subject who had run more than 15 miles per week for the previous years differed significantly in high-density lipoprotein values form a group of randomly selected subjects of similar age. Runners showed high density lipoprotein values of 64 mg/100 ml compared only 43 mg/100dl for random subjects.

Lipoprotein fractions were measured in cross-country Skiers by Enger, et. al., 1976; a significantly higher HDL cholesterol and better total cholesterol / HDL ratio was noted in the Skiers as oppose to the untrained men. It was felt that elevated HDL level contributed to decrease morbidity from CHD in physically active men.

Anderson², et. al. 1997; Chromium is an essential nutrient involved in normal carbohydrate and lipid metabolism. The chromium requirement is postulated to increase

² R.A. Anderson, et. al., Elevated intakes of Supplemental Chromium Improve Glucose and Insulin Variables in Individuals with Type 2 Diabetes. Diabetes. 1997, 46(11), P.1786.
with increased glucose intolerance and diabetes. The objective of this study was to test
the hypothesis that the elevated intake of supplemental chromium was involved in the
control of type 2 diabetes. Individuals being treated for type 2 diabetes (180 men and
women) were divided randomly into three groups and supplemented with: 1) placebo, 2)
1.92 micro mole (100 micro gm Cr.) as chromium picolinate two times per day, or 3) 9.6
micro mole (500 micro gm Cr.) two times per day. Subjects continued to take their
normal medications and were instructed not to change their normal eating and living
habits. HbA1c values improved significantly after 2 months in the group receiving 19.2 p
mole (1,000 micro g) Cr per day and was lower in both chromium groups after 4 months
(placebo, 8.5 +/- 0.2%; 3.85 micro mole Cr, 7.5 +/- 0.2%; 19.2 micro mole Cr, 6.6 +/-
0.1%). Fasting glucose was lower in the 19.2-micromol group after 2 and 4 months (4-
month values: placebo, 8.8 +/- 0.3 m mole/l; 19.2 micro mole Cr, 7.1 +/- 0.2 m mole/l).
Two-hour glucose values were also significantly lower for the subjects consuming 19.2
micro mole supplemental Cr after both 2 and 4 months (4-month values: placebo, 12.3
+/- 0.4 m mole/l; 19.2 micro mole Cr, 10.5 +/- 0.2 m mole/l). Fasting and 2-h insulin
values decreased significantly in both groups receiving supplemental chromium after 2
and 4 months. Plasma total cholesterol also decreased after 4 months in the subjects
receiving 19.2 micro mole/day Cr. These data demonstrated that supplemental
chromium had significant beneficial effects on HbA1c, glucose, insulin, and cholesterol
variables in subjects with type 2 diabetes. The beneficial effects of chromium in
individuals with diabetes were observed at levels higher than the upper limit of the
Estimated Safe and Adequate Daily Dietary Intake.

Boyd, et. al., 1998; The effects of a 13 week daily chromium picolinate
supplementation (1000 µg/day) or placebo in a double-blind design were examined
using 20 college-aged students of both genders who were participating in a combined
aerobic and resistance exercise program. Strength, upper leg/upper arm
circumferences, lean body mass, total cholesterol, high density lipoprotein (HDL), low density lipoprotein (LDL), triglyceride, glucose, and insulin levels were examined in these subject before and after chromium picolinate supplementation with exercise. Exercise alone or coupled with chromium picolinate supplementation did not produce significant changes in strength, lean body mass, HDL, triglyceride, ferritin, or glucose levels. However, chromium picolinate supplementation with exercise did decrease total cholesterol (P<0.001) LDL (P<0.0002), and insulin (P<0.02) levels.

Kaats², G. R., 1999; When studying the effects of experimental interventions related to change in wellness bio-markers other than cholesterol, investigators might also wish to know the effect the intervention on serum cholesterol levels. Since participants in these studies were not selected using baseline serum cholesterol levels, the participant pool included individuals with a wide range of baseline serum cholesterol levels and questions arose as to how to best evaluate the efficacy of the intervention as it relates to serum cholesterol. Although it was desirable to lower serum cholesterol levels in excess of 200 mg/dl, it might not be warranted to alter serum cholesterol levels in the desirable range of 150 mg/dl 199 mg/dl. Furthermore, there were studies suggesting that it may be harmful to lower serum cholesterol below 150 mg. This study reported cholesterol data that was not reported in two previously published studies on body composition and compares the conclusions that would be drawn from these data with and without subdividing participants using three baseline total serum cholesterol levels: <150, 150-199, and >199 mg/dl. Subdividing participants in the treatment groups using their baseline total serum cholesterol levels. Serum cholesterol showed the reductions related to diet and exercise were almost exclusively attributed to individuals with baseline serum cholesterol levels >200 mg/dl, a pattern not observed in the placebo

groups where subdivide bore little relationship to baseline serum cholesterol reductions. Furthermore, no significant changes in either total or LDL serum cholesterol were found in the entire sample of individuals in placebo groups. In both treatment groups, calculation of the percentage of change from baseline revealed that the higher the level of baseline total serum cholesterol, the greater the percentage of reduction from baseline in both total and LDL serum cholesterol. Additionally, the data also provide support for the efficacy of the dietary supplements used in these studies to lower total and LDL serum cholesterol, a reduction that was even more pronounced among participants who had baseline total serum cholesterol levels greater than 200 mg/dl.

Lee, N. A. and Resner, C. A., (1994). A study was carried out to investigate the effect of chromium picolinate supplementation on the lipid profile of the predominantly Hispanic population of non-insulin-dependent diabetes mellitus (NIDDM) patients in San Antonio, Texas. Research design and methods—A prospective, double blind, placebo-controlled, crossover study was performed on 14 men and 16 women. Initially, each patient was randomly assigned to receive either chromium picolinate or placebo for 2 months. This initial treatment phase was followed by a 2-month washout period. Subjects were then crossed-over and received the alternate capsule for an additional 2 months. Fasting blood glucose, HbA1c, and serum lipids were compared at the end of each treatment phase. Twenty-eight of the originally enrolled 30 patients completed the study. There were no adverse reactions to chromium reported. There were no differences noted between the control and chromium-treated subjects in glucose control, high-density lipoprotein cholesterol levels, or low-density lipoprotein cholesterol levels. Triglyceride (TG) levels were reduced significantly (17.4%; P < 0.05) during the 2 months of chromium supplementation. The report of a significant reduction in serum TGs in a group of NIDDM patients treated with chromium. The low cost and excellent safety profile of chromium made it an attractive lipid-lowering agent for this population.
Long-term studies were needed to determine if the short-term changes in plasma lipids could be sustained.

Press, et al., (1990). Chromium had been implicated as a cofactor in the maintenance of normal lipid and carbohydrate metabolism. A deficiency of chromium results from diets low in biologically available chromium. Picolinic acid, a metabolite of tryptophan, forms stable complexes with transitional metal ions, which results in an improved bioavailability of the metal ion chromium. To determine whether or not chromium picolinate was effective in humans, 26 volunteer subjects were given either chromium tripicolinate (3.8 micromole [200 micrograms] chromium) or a placebo daily for 42 days in a double-blind crossover study. A 14-day period off capsules was used between treatments. Levels of total cholesterol, low-density lipoprotein (LDL) cholesterol, and apolipoprotein B, the principal protein of the LDL fraction, decreased significantly while the subjects were ingesting chromium picolinate. The concentration of apolipoprotein A-I, the principal protein of the high-density lipoprotein (HDL) fraction, increased substantially during treatment with chromium picolinate. The HDL-cholesterol level was elevated slightly but not significantly during ingestion of chromium picolinate. Only apolipoprotein B, of the variables measured, was altered significantly during supplementation with the placebo. These observations showed that chromium picolinate is efficacious in lowering blood lipids in humans.

This paper would briefly discuss the changes, which occur within the human body, when subjected to a period of physical overload and subsequent regression. Both long term and short-term endurance training results would be discussed. In addition, the physiological adaptations brought about via short duration-high intensity cycling, near or above VO₂ max; versus changes occurring as a result of moderate intensity-long distance training was explained.

---

Dvorak, et. al., (2000). 117, healthy older patients (53 men average age 68 years and 63 women average age 67 years). Exclusion criteria, hypertension, diabetes mellitus, CHD, smoking, major orthopedic ailments, thyroid disorder and for women hormone replacement therapy. Peoples using medication were also excluded. The test apply to the patients were subdivided into four groups.

Group
(I) High cardiorespiratory fitness and high physical activity.
(II) High cardiorespiratory fitness, and low physical activity.
(III) Low cardiorespiratory fitness and high physical activity
(IV) Low cardiorespiratory fitness and low physical activity

Participants were tested during overnight stays at the clinical research center. Cardiorespiratory fitness, VO2 (max) was assessed with a graded exercise test. Doubly labeled water assays (2H218O) that measures excretion of isotope in baseline, overnight and ten-day urine sample measured physical activity expenditure by indirect calorimetric method. Patients body composition was measured by dual-energy. X-ray absorptiometry (DEXA) and diet was assessed by three days recall. In addition plasma insulin, plasma cholesterol, triglyceride, low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C) concentration as also measured.

Cardiorespiratory fitness had a greater effect on cardiovascular disease risk profile. Regard less of their physical activity, participants who had higher cardiorespiratory fitness group 1 & 2 had low level of fasting insulin, triglyceride total cholesterol, total HDL-C ratio and lower waist circumference.

Furthermore, those patients with high cardiorespiratory fitness but low physical activity group 2 had a more favorable cardiovascular disease risk profile than those with low cardiorespiratory fitness but high physical activity group 3. Strong positive association, between high physical activity and high cardiovascular fitness and vice versa. Analysis showed that physical activity and high respiratory fitness were not highly
correlated \( r = 0.37 \) addition analysis done to control for variable such as body fat percentage and visceral adiposity measures revealed that cardiovascular fitness per-se, had no effect on disease risk profile. Finding suggested that CVD risk profile might be mediated to lower total or central adiposity.

In a duration study conducted by Tooshi, (1977), the jogging regimens were the same for three groups, but the lengths of participation varied 15, 30 and 45 minutes. The 15-minute group improved only in running times. The groups with longer participation improved in the same runs as also on several cardiovascular measures. The 45-minute group was the only one to significantly reduce serum cholesterol and body fast.

In a longitudinal study of 16 men indicated that normally the physical work capacity of men declined from 9 to 15 per cent during the ages 45 to 55 years. To examine whether vigorous physical activity would retard or protect against this decline. Kasch and Wallace, (1976), they studied the effects of an endurance type exercise programme on work capacity for 16 middlemen during 10 year span. The group averaged three days of training per week, 12 months per year for 10 years. The training mostly consisted of jogging. The finding indicated that these subjects maintained a relatively constant body length, resting heart rate, blood pressure, and max VO\(_2\). Further they increased in pulmonary ventilation.

Lee, et. al., (2001). Over the past 50 years are so many epidemiological studies had examined association between physical activity and physical fitness and CHD risk. The finding had been consistent, showing that physically active or fit men and women experience lower CHD risk than those whom were sedentary or unfit. On average active patients have half risk of sedentary patients. Data regarding the optimal amount, intensity duration of physical activity is less clear. It appears that at least 30 minutes moderate intensity physical activity of most days.
Russell, D. W. and Sherman, C., (1999). Exercise was a recommended component of diabetes management in both type 1 and 2 diabetes mellitus exercise can increased insulin sensitivity low blood glucose and had positive psychological effects. More marketable in type 2 than in type regular physical activity improves glycemic control reduces hypertension and normalizes liquids. Adjustment in involve dosage, careful blood glucose monitoring and attention to diet round the time of exercise over help to prevent hypoglycemia and hyperglycemia which are common regards of exercise in types diabetes. Special precautions were necessary for those who had diabetes complication such as retinopathy or peripheral neuropathy.

The Effect of Yoga Practices

Khare5, et.al.,(1988). Selected 128 cases comprises of 44 runners, 40 smokers and 40 subjects performing yoga were studied for a period of three months regarding the effects of total cholesterol and serum lipoproteins level. 20 healthy controlled subjects of similar age group were matched with above cases. Their values were compared.

Smokers had lower level of HDL-c. Yoga training and running causes the rise in HDL-c. Yoga training and running have definite value in lowering total cholesterol LDL-c and HDL-c. Results showed that total cholesterol was increased amongst age group 40-60 years as compared to 20-40 years male. Both runners and yogis had similar level of serum lipoprotein and total cholesterol.

Karambelkar, et. al., (1981). Attempted the investigation to examine the effect of three weeks yoga training on the cholesterol level of the 17 female subjects of the Teachers Training Certificate in Yoga. The yoga-training program consisted of 25 yoga practices as recommended by NFC syllabus. Yoga training imparted daily except for

Sunday. It was observed significant reduction in mean cholesterol of these subjects. No significant changes were observed in weight and skin fold during this period.

Cooper and Aygan, (1979). The study on cholesterol was conducted. In this study cholesterol levels were compared before and after a 1 year test period, using a regular formal relaxation technique (Transcendental meditation) as intervention. The test group mean drop from 254 to 225 while the control group mean remain essentially stationary (259 and 254). The significance level of the difference was P < 0.005. In the comment authors said that this reduction due to regular relaxation may be mediated through the reduction in adrenergic activity.

Electromyographic (EMG) studies had conducted on the performance of asanas by Karambelkar, et. al., (1969). The findings showed the muscle activity, of degree of excellence in the pose and comfortable position. Duration of holding the pose was changed as a result of practising the asanas. According to the perceptions of Patanjali yoga sutra. The two asanas investigated were the paschimotanasana (posterior stretching posture) and Ardhaa-Matsyendrasana (half-spinal twist). The EMG activity was registered from the latissimus dorsi, gluteus maximus biceps from femoris and gastrocnemius muscle during the performance of these postures. The improvement in relaxation of the gluteus maximum was significant for paschimotanasana and Ardhaa-Matsyendrasana on both left sides. Relaxation of biceps femoris was statistically significant only for paschimotanasana. It was paschimotanasana, it was increased in every subject from 10% to 50%.

Gopai et. al., (1975), investigated for EMG amongst two groups of subjects, one group had been trained two asanas for a period of six months; the second group and had no previous training in yoga but regularly engaged in dynamic exercise. During the performance by both groups of a sequence of 8 asanas, various EMG recording were obtained. In each of the non-integrated EMG was greater for the untrained subjects than
for the trained subjects. Training apparently made the performance of asanas involve less muscular work. It was found with yoga exercises that there was increase in flexibility.

II. Hemoglobin

THE EFFECT OF DYNAMIC EXERCISES 

The blood’s oxygen transport capacity changes only slight with normal variations in hemoglobin content. On the other hand, a significant decrease in the iron content of the red blood cells, as occurs in iron deficiency anemia, cause a decrease in the blood’s oxygen-carrying capacity and corresponding reduced capacity for sustaining even mild aerobic exercise. Gardner et al. (1975), had attempted a study on 29 iron-deficient-anemic men and women with low hemoglobin levels were placed in one of two groups; one group received intramuscular injections of iron over and 80-days period, were as the placebo group reduced similar intramuscular injections of colored salt solution. A third group with normal level hemoglobin served as controls. All groups were tested during exercise prior to the experimental and after 80-days of either iron therapy or placebo treatment. The results show clearly that the anemic group given the iron supplement improved significantly in exercise response compared to their non-supplemented counterparts. Peak hearted as measured during five minute stepping performance decreased from 155 to 133 beats per minute for men and from 152 to 123 beats per minutes for women this translated 15% more oxygen delivered per heart beat.

Davis*, J. E. and N. Brewer, (1935), found that blood volume first falls, then rises, above normal during a four to nine weeks training period in men and women. The increased blood volume persisted about four weeks after cessation of training. Kjellberg

---

and others, 1984; Observed similar results, blood volume were found to be 10%-19% higher after training than before. They also found blood volume was as much as 41%-44% higher in the athletically trained grouped than comparable untrained group.

Douglas, et. al., (1984). Attempted a study on High and Low dosage iron supplementation in iron deficient, endurance trained females. Females subject engaged in endurance exercise were screened for iron deficiency by blood. 12 females who met these criteria volunteered to participate in the study. The subject were assigned to either a low-dosage or high-dosage of iron supplementation. Dietary intake of recorded for 7 days analyzed to provide mean daily intakes of iron, energy, protein, carbohydrates, and fats. Pre supplementation hemoglobin values averaged 11.7 gm/dl and 13.2 gm/dl for the high dosage group and low dosage group respectively. Some subjects demonstrated progress to the more advanced stages of iron deficiency indicated by hemoglobin level less than 12 gm/dl.

Increases of total hemoglobin were found in dogs and humans as the result of physical conditioning. These increased seem to parallel the increased blood volume, so that no increased hemoglobin construction seemed to occur. Indeed, Dill and associates, 1974, found that hemoglobin construction to be four percent in highly trained runners than in controls. They concluded that endurance athletes have thin blood but so much that, their total hemoglobin exceeds than that of non-athletic. In 1949, Canstrup, et. al., showing that total amount of hemoglobin rather than the contraction in the blood determined factor for nichening a maximal VO₂.

While conducting the effect of prior exercise an T_{Lac} (Lactate) and T_{vent} Ventilator threshold Patrick, 1985; conduct the test to examine level of T_{vent} threshold 10 male subjects voltmeters to performed one legged cycling of maximal heart rate for 60-75 minute and by low maximal diet. Pre and post exercise test for measuring thresholds employed a 3 minute continuous protocol in 16 W increment. Muscles biopsies (N =3)
the prior exercises (PE) threshold holds the post PE threshold test and before testing the NE (non-exercised) leg. An IV catheter was used for determination of serial blood lactate concentration during rest. Biopsies shows that the PE and diet regimen reduced muscles glycogen in PE leg (46.7%) and NE leg (36.4%). Venous blood lactate and respiratory exchange ratio R were reduced at $T_{\text{lac}}$ and $T_{\text{vent}}$ both PE and NE leg. The $V_{\text{O}2}$ at the blood lactate conc. of 4n mole / lit was elevated in the PE leg (2.89 vs 2.461 lit / min) but not NE leg at $T_{\text{lac}}$.

These results suggested that lactate concentration of a $T_{\text{lac}}$ and $T_{\text{vent}}$ was reduced by endurance exercise performed 24 hours. Prior to testing and that the central circulation played a major role in this response. The use of lactate level was 4n mole / lit as a criteria for $T_{\text{lac}}$ should be interpreted continuous.

**The Effect of Yoga Practices**

Khare$^6$, et. al.,(1989). A group of 25 healthy adults who were performing yoga and age matched controls were compared in this study. The examination included biochemical, and hematological and ventilatory function tests. Slowing of pulse rate, corrective improvement in hematological values, significant decrease in blood sugar with increase in plasma protein specially albumin were noted in this study. Mild expiratory flows were found to have appreciable improvement in majority of the patients.

Respiratory variables have been among the most frequently measured physiological variables in scientific studies of Yoga. A number of studies have found the basal respiratory rate to be lower in the subjects who practiced yoga routine for some time.

---

Measurements by Wenger, (1961), Datey, et.al., (1969) and Patel, (1973) reported respiratory rate decreased during and after Shavasana. In all these cases respiratory rate decreased to less than 10 respiration per minute.

Miles, (1964) and Rao, (1968), studied respiratory variables before, during and after Ujjayi pranayama. In the data presented by Miles the mean respiratory rate for subjects was 20 per minutes. The Ujjayi pranayama trials was found 1.26 respiration per minutes. In the minutes prior to the Ujjayi practice respiratory rate averaged twenty-two. Subsequent to Ujjayi practice the respiratory rate was 19 in the first minute and 20 or 21 in next several minutes. In the subject student by Rao, respiratory rate during 10 minutes of Ujjayi was 1.5 at a low altitude of .520 kilometers and 3.0 at a high altitude of 3.800 kilometers. During normal breathing the respiratory rate was higher at time low altitude.

In a study over several years of the effect of a three-week programme of yogic training on physical education students Bhole, et. al., (1972), observed statistically significant improvement in breath holding time by 15 seconds.

Udupa, (1975), also seen same evidence for increase in breath holding time as a result of a practice of yoga postures and breathing exercises.

Moses, (1972), measured breath-holding time before and after a ten-week hathayoga class and 10-week physical education class. The two groups were compared by the mean values. Yoga group showed significant increase in the breath holding time after full exhalation. After full inhalation the breath holding time preceded by hyperventilation and after normal inhalation. There was insignificant difference between both the groups though increase in the breath holding time after full inhalation.

Bhole, (1976) and Joshi, (1981), had reported significant increase in the breath holding and time after the practice of Kapalbhati. The breath holding was increased by 30 sec. to 1 minute.
Rao, (1968), had observed increase in tidal volume in the subject practicing shirahasana. The headstand tidal volume was also found greater than erect standing volume that resulted in increased minute ventilation.

Gore and Gharote, 1981; observed significant increase in the peak expiratory flow rate in a study. The study evaluated the effect of 3 weeks yogic training programme on peak flow rate of 105 males and 30 females. This indicated an improvement in the ventilatory efficiency.

Nayar, et. al.,(1975), conducted a study on 53 cadets of the national defense academy divided into 3 groups as group doing routine NDA training, group doing NDA training plus athletics and group doing NDA training yoga exercises. The yoga group recorded increase in breath holding time and vital capacity. It also recorded in increase in forced expiratory volume.

III. C-R Index:

THE EFFECT OF DYNAMIC EXERCISES

The purpose of all exercise programmes was to contribute to the development of physical fitness in all its aspects and involving different components. These included muscular strength and endurance, cardio-respiratory endurance, motor fitness elements and body composition. In reviewing this problem it became obvious that the types of physical activities had different effects and might not be limited to a single fitness component.

Thus applying increased resistance to the muscles, it was best to develop muscular strength and endurance. Cardiorespiratory endurance was improved through activities that produce moderate contractions of large muscle groups over relatively long periods during which pronounced adjustments of the circulatory-respiratory complex were necessary. Motor fitness included muscular endurance, agility, and speed, running endurance, development of each of which had specific exercise applications.
The circulatory and respiratory responses to exercise of various intensities and duration had studied by many investigators. The intensity of exercise was closely correlated with the heart rate in the individual. Evidence is quite clear that physical training lowers the post-exercise heart rate. This was demonstrated in young men by Brouha, et al., (1944). These result had confirmed number of times by other workers like Harper, et al., (1969), Michael, (1963), Petroskey, (1945), Sloan and Keen, (1969) Skinner, et al., (1964) and O’Donnell, et al., (1968). The evidence showed that heart rate following a standard exercise was more sensitive to a training programme than maximal oxygen uptake.

In his extensive data Cureton, (1954), produced strong evidence that training increases the size of the brachial pulse wave.

Cardiovascular changes in 18 college athletes before and after a season of competitive athletics were compared with 15 controls by Henry, 1954; significant improvement were obtained in heart rate and peripheral resistance with multiplication of stroke volume.

Individual improvement was show in a study by Knuttgen and associates, 1973; to be related to initial fitness, i.e. the lower the level at the start of training the greater the increase in cardio-respiratory endurance for a given training programme.

Frank, (1969), the middle aged runners and calisthenics practitioners were selected for the study. Results showed that the middle-aged men in a running and calisthenics programme of conditioning were improved, more than aid those in a program of badminton or squash competition in resting and post-exercise systolic amplitude of the brachial pulse wave and left ventricular diastole, breath holding, trunk flexion and anxiety.
Rope skipping which was convenient and inexpensive form of exercise had proposed as beneficial for improvement and maintenance of cardio-respiratory endurance.

Kobayshi⁹, (1969), studied the effects of 8-week rope skipping programme on the cardiovascular fitness of 13 male high school non-athletes. Each boy skipped rope five minutes daily for 35 training sessions. Oxygen consumption and heart rate were determined from a standard treadmill run. As show by these tests, cardio-respiratory fitness was improved significantly. Powell⁸ studied rope-skipping effects on five 10 years old boys. These boys skipped five days each week for 10 weeks. They practiced the following three activities every day: (1) Performed as many skips as possible without missing, (2) took the chance as many turns as possible in five successive efforts, and (3) tried to perform as many skips as possible in 60 sec’s. Significant improvements were noted over the 10-week periods. The improvements were observed in leg and knee strength, speed of sprint, agility, jumping ability, flexibility, shoulder circumference and chest size. There is improvement in heart response too. Casino, (1977), conducted rope-skipping programme with men between 19 to 43 years of age as subjects. Their improvements followed the same general pattern as Powell’s. The over all gain in endurance was 25%.

De Vries, (1971), studied the exercise intensity threshold levels for improvement of the circulatory respiratory function. The subjects were older men between 60 and 70 years of age. They participated in a 6-week jogging programme. The Astrand bicycle ergometer test was utilized for the prediction of maximal oxygen consumption. Improvement in the Astrand score varied directly with the intensity of work as indicated by percentage of maximal heart rate. Improvements on the Astrand test varied inversely

with the physical fitness level of the men at the start of the program. The exercise intensity threshold for older men appears to be about 40% of maximum heart rate. Men in the 60’s and 70’s of average physical fitness may improve their fitness by raising their heart rates above 98 and 95 respectively.

Yamushita and Kariamori (1968), compared Harvard Step Test and actual circulation. They found that the index was closely related to the low degree of normal pulse. Index was closely related to the fast recovery of the pulse rate after exercise. The evidence shows that there were several distinct types of pulse recovery processes.

**The Effect of Yoga Practices**

Gharote\(^\text{10}\), (1973), evaluated the effect of 3-weeks yogenic training programme recommended in the NFC syllabus on the different fitness factors as measured by the Fleishman battery of fitness tests. The scores of different tests were converted into an overall fitness index. Results show that the 3-weeks of yoga training caused statistically significant changes in the fitness index for both males and females.

The investigation of the effects of a nine weeks yoga-training programme on conditioned young males, Gharote and Ganguly, (1979), reported similar significant improvement in the physical fitness index derived from Fleishman battery of basic fitness tests as a result of yoga training programme. The gain in extent of flexibility was particularly highly significant in the experimental group undergoing yoga training.

Giri, (1966), studied the effects of the yoga exercise programme of six weeks duration on the 5 tests of National Physical Efficiency Drive using secondary school boys as subjects. The tests included 80 meters sprint, 400 meters run, cricket ball throw, pull ups and Running Broad jump. Results show a significant improvement amongst the subjects of experimental of group in all the five tests as a result of yoga training. When

---

the subjects discontinued the yoga practices for the same period of six weeks the effects gained by yoga exercises for the period of six weeks was significantly loss.

An index widely used to determine overall cardiovascular efficiency is the Harvard Step Test. This step test has been mostly used because of the strenuous nature of physical exert. Higher scores indicate greater cardiovascular efficiency. Ganguly and Gharote, (1974), measured scores of Harvard Step Test in a study involving 11 clinically normal male of mean age of 26 years. They were tested before and after 8 months of yoga training programme. The training consists of hour daily yoga practices. Yoga practices include asanas, Cleaning practices known as Kriyas, breathing exercises known as pranayama, Bandhas, Mudras and Meditation. An average increase in C-R index was 7.6 in the test scores, it was found statistically significant after the completion of yoga training. It may look paradoxically, that a yoga-training programme, which does not involve vigorous exercises, has been able to promote cardio-vascular efficiency. It might create interest to compare such results in controlled conditions as opposed to programmes of vigorous exercise in terms of cardiovascular efficiency.

Gopal, (1961). The study effect of six-month yoga training on heart rate was attempted. Pre and post test results shows that subjects trained for 6 months for yoga training were finds decreasing heart rate. The heart rate decrease with the performance of a variety of yoga practices than performed without previous training.

iv. Medical Fitness

THE EFFECT OF DYNAMIC EXERCISES

In the editors note Anderson R. E., (2000), made a slogan healthy people 2010. He mentioned that in the year 1999 many of the health experts of the leading nations was outline the programme healthy people 2000 which contains 300 measurable public health goals. It was estimated that only 15% of the goals of healthy people 2000 were
achieved. Nevertheless a new agenda had set for healthy people, (healthy people 2010) which involved 487 objectives.

Crespo, C. J., (2000), also mentioned there was a need by physical activities in minorities for eliminating disparities by 2010. The objectives of these programmers were to reduce and eliminate disparities between population groups in terms of promoting health and preventing illness, disability and death. Physicians need to consider the unique need and constraints of minority patients when giving advice and prescribing exercise regimens. Some patients might do best in community sponsored recreational activities.

Biological and genetic predisposition could explain some health disparities, but societal and other environmental factors provided better clues on how to prevent disease and increase physical activities in minority.

In the article how to counsel patients about exercise, Duff, F. D. and Schnirring, Lisa, (2000), made an office approach, despite the demands of busy office setting, a brief physicians counseling session about exercise could be highly effective and well worth the previous time. Components included delivering a class message about exercise. Stepping back to assess the patients readiness to change and using the patients to set an activity agenda, physician counseling exercise was crucial to improve patients health status and to the success of several activity recommendation content Federal Governments healthy people report.

Anthropometric measurements were used to collect the data, Willgoose11, (1949). tested 300 university male students and showed the relationship between body type and PFI. The subjects those with mesomorphic components had a mean PFI 107 those with ectomorphic 100 and the primarily with endomorphic approximately 70. A correlation of –

0.93 had obtained between degrees of endomorphic and PFI. Indicating that more weight full an individual the lower his score. The correlation of PFI with endomorphic was 0.52 (19 cases) and with mesomorphic 0.09 (104 cases). It was found that a degree endomorph was a limiting factor to relative strength for predominantly mesomorphic individuals. The low insignificant correlation between PFI and ectomorphy indicates that the third component might not influenced PFI score to any great extent.

The measurements of anthropologist were used by the sports physiologist. Such studies involved the measurement of athlete's body type. An attempt was made to correlate body types with particular sports skills KukushKin, (1964), described the results of study that was undertaken in (1960) by the soviet union states general institute of physical education in which "adult sportsman" in the country were subjected that series of measurements. The results suggested that "Each type of sports has its own specific characteristics and influence upon the physical development and function capability of male "Hammer throwers" weightlifters, and wrestlers was found to have the target chest circumference. The basketball players had more capacity to expand chest. On the other hand, swimmer tended to have the greatest lung capacity.

Emerging from there clinical practices in medicine Kraus and associate, 1954; have presented a test of minimum muscular fitness. Originating a posture clinic, the test where further developed as a basic means of measurement in the treatment of low back pain. 60% of a total of over 4000 patients, free from the organic disease, were unable to pass one or more of the test items. When treated with therapeutics exercises, they improved as their test results improve. In a right year follow up, it was found that as the patient stopped exercising, they again failed the tests as their back complaints reappeared.

Clarke and Petersen, (1961). Conducted a study on contrast subjects of maturational, structural and strength characteristics of athletes and non-athletes. The
researchers pointed out that the size of the athletes as compared with non-participants was more significant at the junior high school than at the elementary school level; this was particularly true for the outstanding athletes. In the standing broad jump the means of the outstanding athletes and the regular players were significantly higher than the means of the non-participants at both school levels.

Pratt\textsuperscript{12}, et. al., (2000). The benefits of physical activity in reducing morbidity and mortality are well established, but the effect of physical inactivity on direct medical costs was less clear. The main object was to describe direct medical costs associated with physical inactivity. Cross sectional stratified analysis of the (1987) national medical expenditure survey that included US civilian men and non-pregnant women. Aged 15 and older who were not in the institution in(1987), main out come measure was direct medical costs. Results showed that, for those 15 and older without physical limitations, the average annual direct medical costs were $1019 for those who were regularly physically active and $1349 for those who reported being inactive. The costs were lower for active persons among smokers ($1079 Vs 1448) and non-smokers ($953 Vs $1234) and were consistence across age group and by sex. Medical care used. Mean net annual benefits of activities were $330 per persons in 1987. The regular moderate physical activity among the more than 88 million inactive American's over the age of 15 might reduced annual medical costs by as much as $29.2 billion in 1987 and $76.6 billion by the year 2000.

While comparing the general education teachers (GET) and physical education teachers (PET) Khan, Saifuddin, (1985), prepared a twelve-point medical fitness test. The test was administered on physical education teachers and general education

\textsuperscript{12} M. Pratt, et al., Direct Medical Cost Associated with Inactivity, (2000), Journal of The Physician and Sport Medicine, Volume 28 no. 10 P. 63.
teachers. Test–Retest reliability score of medical fitness test was very high. PET was better in health status than GET.

2. PSYCHOLOGICAL PARAMETERS

i. Neuroticism

The multidisciplinary character of this study made it possible to check the interdependencies of several of mental and physical growth and development. Jones 1965; tested boys, who were physically early maturing, appeared to be more stable, socially successful and dominant than late maturing boys. Those personality differences could still be traced long after the physical difference had disappeared, at the end of adolescent period. These differences were generalized and conformed by Weatherly (1964), who reported similar difference between early and late maturing girls.

The Dutch personality inventory youth version (DPI-Y) Bucking, et. al., (1975), measures: Independency (26 items), social inadequacy (13 items), rigidity (28 items) self sufficiency (24 items) dominance (15 items). The DPI-Y was derived from the adult version of DPI, Luteijn, (1974), which contained two more scales.

The construct validity inadequacy (IN), social inadequacy (SI) and rigidity scales was supported. Although Luteijn, et.al., (1981), and Van Dij and Luteijn, (1982), mentioned that the rigidity concept in adults and children had a different content for the scale in the youth version with the added description.

Though the years, number of researchers had concluded that personality could be described adequately by five major factors (Amelang and Brokenau, (1982), Digman and Takemoto-Chock, (1981), Goldberg, (1991), Norman, (1963), Tupes and Cristal, (1961), although these researchers had not always agreed on exactly which five factors those might be. Most recently, a five factor theory of personality developed by Paul T. Costa(1965) and Robert R. McCrae, (1989),Costa „(1991), MaCrae, (1991), MaCrae & Costa, (1987), Piedmont, et. al., (1991), had been received enthusiastically by the

1. Neuroticism, including dimensions such as worrying versus calm and even-tempered versus temperamental.

2. Extroversion, including dimensions such as loner versus joiner and sober versus fun-loving.

3. Openness to experience, including dimensions such as original versus conventional and preference for routine versus preference for variety.

4. Conscientiousness, including dimensions such as laziness versus hardworking and punctual versus late.

5. Agreeableness, including dimensions such as lenient versus critical, and good-natured versus irritable.

Effect of Dynamic Exercises

Jitendra, et. al. (1979). Made a comparative study of extroversion neuroticism, and attitude towards sports of handball players and non-players. This study had two objectives, i.e. to find out the difference in personality of players and non-players and to compare their attitude towards sports. Results indicated coincidences. Partridge, (1934), studied factors of leadership in six different boy Scout troops 226 boys by using a “five man to man” plan of rating. He found that outstanding leaders excelled others in age, intelligence athletic ability, scout rank, scout tenure and physique. Henry, (1947), obtained a positive correlation between general athletic ability and favorable attitudes about physical education. The correlation was highest in performance demanding extreme sustained physical exertion and lowest with agility and coordination. Reaney, (1914), tested more than 600 boys and girls on their ability to play certain games. It was found that the students who were playing were also superior in intelligence and general play ability.
Whiting (1965) undertook a study on the personality and the persistent non-swimmers. Non swimmers attending any course of instruction were divided into two categories. (i) Those who had received previous instruction were still unable to swim (category 1) and (ii) Those who had never received previous instructions were still unable to swim (category 2). Analysis of scores on Maudsley personality inventory given university male non-swimmers indicated that students in category 1 had a lower extroversion mean than those in category 2. No significant differences were found in neuroticism scores.

A study of Iravis, (1974), showed that there was no consistent relationship between personality characteristics and amount of spontaneous alpha between trials and subjects who scored high on the neuroticism scale of EPI showed more eyes-open alpha in the feed back setting than subjects with low scores. There were no differences the extroversion scale. There was no significant relationship between neuroticism scores amongst non-swimmers with previous instruction. The subjects having permanent contact with religious liturgical groups were more neurotic than those who had less such contacts. There was no consistent relationship between personality characteristics and alpha. Neurotic personality traits and neuroticism had significant relationship but there was no significant relationship between neuroticism and self-disclosure. Inverse relation between reading ability and neuroticism was found.

Cohen et. al., (2000). "Life expectancy of major league baseball umpires." Veteran major league baseball [M. L. B.] umpires raised questions regarding the mortality risks of this profession. To determine the life expectancy of M. L. B. umpires differs from that of the general population. A list of 441 national league an American

---

league umpires was selected. Ages of death of M. L. B. umpires were determine, and
differences between the ages of death and age-adjusted life expectancy were calculated.
Analysis was performed on the difference. Co-relational was also done on
many different factors, including umpire debut year, debut age, life expectancy at debut
and length of carrier. No significant difference was found between age and death of M.
L. B. umpire and their age adjusted life expectancy. Co-related analysis shows that only
length of carrier co-related with age at death. M. L. B. umpiring was not associated with
shortened life expectancy while there was not attributable to the professional no inherent
risk, it could also be explained by inherent by yet unidentified, unique factors.

prevent Alzheimer’s, middle aged adults who participated in physically or mentally
stimulating habits were less likely to develop Alzheimer’s disease. Author said that
people less active were three times more likely to develop the disease than those who
were more active. This studied involved 193 people with Alzheimer’s disease and 358
people without disease. Questionnaire was made to collect about the participated 26
activity patterns about at least 5 years before. Passive activities were defined as
watching television, partaking in social activities an attending the church. Pursuits
defined as active ranges from reading and to would working and from gardening to
racket sports. Healthy participants had been more active intellectually and physical
changeling activity ages 40 to 50. When compared with Alzheimer’s patients, even when
the data were adjusted to account for differences such as from, income gender and
education. The work sheet showed that people’s who had Alzheimer’s were disease
were active less physically active and had lower educational and occupational level.

15 Alzheimer’s disease: - first described in 1906 by German neuropathologist Alois Alzheimer’s.
Alzheimer's is a neuropathologist of the brain, which styles the people in their ages at 40 to 60, and above.
In the disease the de-generation of the neurofilbally triangle which in nerve cell.
Wells, (1958), administered a 38 items battery of physical fitness tests and Cattle's 16 personality factor inventory to 80 male college students. Dynamic strength related negatively to personality traits described as emotional tense and withdrawn, and positively with traits described as being less anxious, less emotional, more poised and less unsure. Various body measurement variables were related significantly to many personalities.

The Effect of Yoga Practices

Vinod, et. al., 1984; suggest that Asanas and meditation produced emotional stability and physical relaxation significantly. Accordingly the present study demonstrated that the yoga practitioners was slightly neurotic better than active subjects and inactive subjects.

Ives, and Sosnoff, J., (2000). Mind body exercise methods were spreading rapidly throughout the health fitness and rehabilitation fields. Many of the claimed benefits for their activities were not supported by clinical evidence as alternative therapies. They carried legal and professional ramifications, understanding the nature of mind body exercise and knowing the scientific evidence behind claims for its benefits could help clinicians made appropriate recommendations to patients. e.g. Yoga and Tai-Chi-Chuan\textsuperscript{16} could reduced stress, decrease hypertension, and exert cardiorespiratory benefits and Tai Chi could improved balance in seniors. However there was no enough evidence to support replacing conventional medical treatment by sociometric methods.

THE PERSONALITY DIFFERENCES

Lynn, (1959), conducted the study to examine the relationship of two personality dimensions of neuroticism and extroversion with academic achievements. The author

\textsuperscript{16} Tai chi ch'\textsuperscript{1}uan: - Tai chi ch'\textsuperscript{1}uan or tai chi is a physical condition exercise that evidences the flexibility of body movement. The slow, graceful elegant Jostens of Tai chi ch'\textsuperscript{1}uan routines hardly resemble the original hand and fort blains and blocks the pories they represent. There is little likelihood that the ch'\textsuperscript{1}uan used far practical modern self-defense, In china it is usually prouticed by individuals and by groups also gathers in to perform the movements in Unison.
found neuroticism to be a favorable factor for academic achievement. No much relationship was found with the extroversion factors. Bendien, (1963), aimed to search the neuroticism and extroversion in the subjects of psychosomatic disorders. The researcher found that the neurotic score differentiated between healthy subjects and psychiatric patients. Subjects with psychosomatic and somatic diseases showed high neuroticism. To found personality traits of extroversion and neuroticism, Singh, (1978) attempted a study on personality of truants. It was found that truants were significantly more extroverted and neurotic, obtained high scores in social maladjustment, value orientation and manifest aggression than non-truants. There was higher incidence of truancy among siblings of truants and there were significant differences in the ordinal position of the 2 groups. Kolinski, (1982), discussed neuroticism and personality traits. According to the researcher the relationship between the neuroticism and personality traits had been confirmed in the case of the dominant psychophysical status, emotional status, stability, sensibility, tolerance, aggression, irrationality, egocentric orientation, risk proneness existential and moral problems, interests and creativity.

Krishna and Agrawal, (1982), elaborated personality profiles in reading ability and found that subjects scoring high on anxiety and neuroticism scored significantly lower on reading ability than low and middle scores on these dimensions. There was a significant inverse relationship between reading ability and neuroticism and anxiety. Vidhu, (1989), studied the relationship of neuroticism and extroversion to intelligence and educational achievement at different age levels. The analysis of the data revealed that extroversion and neuroticism were inversely proportional to age. It was found that female scored higher on neuroticism than male at all the age levels.

Witkoski, (1972). Administered Eysenck personality inventory to 2 groups of subjects to compare their scores on neuroticism (N) and extroversion (E), group 1 consisted of 150 subjects age ranges from 19-27 years old subjects who had permanent
contact with religious liturgical groups. Groups 2 consist of 100 subjects age ranges from 18-26 years old subjects whose contact with such groups was not permanent. Permanent contact subjects where less neurotic and had higher ‘E’ scores than non-permanent contact subjects.

Eaves and Eysenck, (1976), attempted to separate the effects of genes which contribute to the mean expression of a trait in an individual from those which control an individual’s responsiveness to the environment in a genotype / environment interaction. Correlation was obtained between age, pair means and absolutes inter pair differences for neuroticism scores derived from response. Genetic variability in neuroticism scores became more pronounced with advancing age.

Reaction and Movement Time

THE EFFECT OF AGING

Number of studies has been completed in the field of RT. Amongst the adults. Most of the researchers Birren, (1964), Botniwick and Thomposn, (1966), Light, (1978), Pierson and Montoye, (1958), Waugh and Vyas, (1980). Concluded that RT lengthens with the age after early 20’s.

Hodkins, (1963) reported that reaction time and movement time shorted from early childhood to adulthood and then lengthened. Males are faster than females. Stevens Long, (1979), pointed out that the largest increased in reaction time after occurs between the ages of 40 and 60 years and the rate of change apparently levels off after 60 years. In fact RT. Lengthens with age even among presumable healthy persons.

Waugh and Vyas, (1980), reported that choice; R. T. lengthens at a much more rapid in late adulthood than does simple RT. It simply took the older subjects longer to either identify a signal or to select a response. A possible explanation for this might be the age related. A change that occurs to sensory organs, muscles and joints e.g. loss of
higher frequencies in hearing impairs the intelligibility of speech and reduced visual activity limits the absolute fitness.

Singleton, (1955), stated, a decrease of M. S. and stiffness of the joints obviously impairs of speed of action in some people in which across movements were required. Pierson and Montoye, (1958). In contrast it had noted that the speed of more accurate movements of smaller extend changes, relatively little with age.

Singleton, (1955), reported that the man slowing with age was not in execution of movements, but in the central processes involved in deciding which movements to make a signal to noise ratio in the brain. The systems, which resulted from slower, nerve cortical association areas. Welford, (1977), might therefore help explain reaction time decrement with aging fewer. An active brain cells lower the sensitivity of the brain to incoming signals and to strength of signals within the brain. Welford, (1977), Cross man and Czatram, (1956) and Gregory, (1974), reported that at least in certain circumstance the spontaneous random neural activity and in the brain tends to increase with age. This is called neural noise tends to confuse the perception of signals and the making of decision (Vickers, Nettleback & Wilson, (1972).

It was well documented that reaction time lengthens with age after the early 20's several possible causes of this age related slowing of performance had been suggested. Among these causes it was reduced signal to noise ratio in the presently observed in older people. Besides the obvious variability with which RT. Performance occurs a central rather than a peripheral component in thought to be a motor source of delay associated with RT. task. Reaction time shortens from childhood into the late 20s, then increases slowly until the 50s and 60s, and then lengthens faster as the person gets into his 70s and beyond. These results had documented by Welford, (1977), Jevas and Yan, (2001).
Effect of Dynamic Exercises

Although peripheral components such as motor time contribute little to reaction time task compared to CNS processing. Weiss, (1965), Kroll and Clarksan, (1978), emphasized that many motor tasks requiring reactions in life situation involve a load for ex. Lifting objects quickly or stopping quickly while driving. In such situations motor time would contribute a greater proportion to the total response time then without a load because muscle tension would be generated at slower rate upon a sudden loss of balance.

Kroll & Clarksan, (1978), suggested that an older person could be able to generate a neural signal to the muscle quickly enough but might not be able to develop muscles tension at a rate past enough to a move a time to prevent a fall. These one from a practical standpoint, they advocate the use of resisted reaction time resisted motor time had reported as running from 41% to 49% and from 38% to 42% of the total reaction time. The motor time of both older men and women who participate in a lifestyle of exercise was not significantly different from those of young persons, what mechanisms therefore might contribute to the shorter motor time of active older individuals? Gutman and Hanglikova, (1972), have proposed that the greatest effect of aging on the motor system was the decline in neurosecretary traffic exchange. It was suggested that the degree of impulse activity might influence traffic function. He also observed for example, that there was a relatively smaller decrease in transmitter release in the diaphragm and respiratory muscles which contracted on a continual basis throughout life, than in other smooth and skeletal muscles throughout the body.

Fujishima and Omae, (1980), confirmed the timing that mean transits time increased with age but prolonged transits time was probably due to an increase of brain blood volume in the aged. It was not known however whether reduced cerebral blood
flow results from decreased due to a decrease in cerebral blood supply. Gross et al., (1980), believed that slowing and performance decrements which occur $O_2$ availability and utilization. Spirduso, (1975), concluded that "Chronic exercise throughout a lifetime can maintain hormonal regulatory systems consequently controlling key enzymatic function that influence nervous system integrity".

Pierson, (1956), compared twenty-five fencers and an equal number of non-fencers to eight psychomotor measures and six anthropometric measures. A statistical analysis of the data revealed speed of arm movement to be the only discriminatory item. Further analysis demonstrated that there was no correlation between arm span and speed of arm movement, arm span and reaction time or speed of arm movement and reaction time.

A substantial amount of evidence reviewed in this section provided a basis to suggest that maintenance of neuromuscular system through various physical exercises could alter that rate of decline of reaction time. Whiting, (1969), stated that would not be surprising if a period of training in a relatively untrained person resulted in changes muscular latency leading to an apparent decrease in reaction time. Spirduso, (1975), observed that some evidence existed identifying a moderate level of physical fitness modulating an organism neuromotor capacity to perform psychomotor tasks even when the response required very little physical effort and was totally different from the physical activity used to develop physical fitness.

Earlier attempts indicated that the possibility of relative improvement in physical fitness with improvement in reaction time.

Spirduso, (1975), for example noted that the in several studies of psychomotor speed in which age had a factor the result had been reflective not only of the reactive capacities being measured, but also of the age differences in ability to adopt to novel testing situations. (e.g. reaction time tested without practice trails).
Munell, (1970), demonstrated that older individuals take longer and to adopt new situation of this earlier studies were cited, Burley (1944), reported that physically trained high school and college men had faster simple and choice reaction time than non-athlete. Winners were with the exception of varsity swimmers. Likewise, Barry, Steinmets, Page and Rodahl, (1966), noted that physical conditioning of an intermittent rhythmic type was associated with improved nervous system function. Subjects in this study improved in agility, muscular endurance ballistic movements like hand speed movements in which termination involved minimal muscular action. (Reaction time found by several investigators) Botwinick and Thompson, (1968), Spirduso (1975), Tweit had calculated the lifestyle of physical determining speed of simple and choice reaction time. Buccola, (1972), reported no significant effect of a 14 week physical training programme on reaction time. Mayers, Zimmerti, and Baschnagel, 1969 reported no discernible effect of stepping exercise upon reaction time since reaction time measures were taken immediately and four minutes after exercise a long term effect of aerobic exercise, was not evaluated. In the Mayers, et. al., (1969), study in addition Botwinick and Strands, (1974), concluded that physical exercise seem to be associated with quick reaction time in young adults, but not in older adults. In this study very low levels of fitness for the fitness category were required and it might be for this reason that they recorded no differences in their older group. Generally, in the study in which relationship between physical fitness and reaction time in aged humans was not reported, extremely small numbers of reaction time and traits were administered. Barry et. al., (1966), Boasman, (1977), Buccola, (1972), Freeway, (1978), enhance the reaction time capacity was not stabilized and it was doubtful if reactive capacity was attained.

More recent investigators Clarkson and Kroll, (1978), Hart, (1981), Spirduso and Clifford, (1978), also observed the effect of aerobic exercise on reaction time. Rotella and Bunker, (1978), reported that senior tennis players had faster simple reaction time
and total body response time than their non-active or sedentary counterparts. Sherwood and Seldom, (1978), reported that older physically active men reacted to stimulation moved their forearm over a 20 cm distance as quickly as young sedentary men. It was concluded by Hart, (1981), that lifetime habit of vigorous activity tends to enhance response time performance components dependent upon peripheral neuromuscular structure degenerate at a slower rate than centrally mediated performance components. Spiriduso, (1975), however, launched the hypothesis that the most of the slowing of responses in the aged was attributable to central nervous system processing rather than movement, decrements, since movement time results paralleled those of simple and choice reaction time. Noteworthy was the effect, that the movement task required by Spiriduso, (1975), was a large forceful movement with a terminating target. Similar to that used by Pierson and Montoya, (1958), where as investigators often test very small movements who attribute most of the delay to central nervous system processing.

McMorris\textsuperscript{17} et al., (2000), found no effect of exercise on reaction time in a test of soccer skill. Miller and Low, (2001), determined that the time for motor preparation (e.g., tensing muscles) and motor response (in this case, pressing the spacebar) was the same in all three types of reaction time test, implying that the differences in reaction time were due to processing time.

The Effect of Yoga Practices

Bijay Kumar Parida and Shirley Telles, (1999). The study was carried out to assess whether general yoga practices would improve the performance of adults on reaction time. 33 adults between 17-43 years of age were studied. The group underwent yoga training for 30 days. The yoga practice was consists of asanas, pranayama, meditation, devotional sessions, lectures and cleansing techniques. Assessment were

\textsuperscript{17} McMorris et. al, Performance of A Psychomotor Skill Following Rest, Exercise at The Plasma Epineprine Threshold, and Maximal Intensity Exercise. Perceptual and Motor Skills (2000), 91: P.553.
taken from the first day of the 28 days yoga training on reaction time to colored light cues. Each subject had four trials with following sequence- red, amber, green and red light cues. The same sequence was followed for all subjects on pre and post assessments. The group showed a significant improvement in reducing their reaction time to colored light cues. Statistical analysis was done using paired T test. The percentage changes were comparable, i.e., red- 22%, amber-22.2%, green-24.7%, and red-26.8%. The results showed that yoga practices help in reducing the reaction time to colored light cues.

It may be concluded that there were substantial evidences, which suggested that vigorous physical exercise could alter the rate of decline of reaction time. The effects of aerobic training on the nervous systems were well documented and many researchers have demonstrated their effects by reporting faster response times following a vigorous physical exercise programme and some investigators however, did not find a positive relationship between aerobic fitness and reaction time, but several methodological problems plagued these studies. The research in which a positive relationship was observed between aerobic fitness and reaction time also had methodological faults chief of which was the lack of a standardized measure of evaluate aerobic fitness (VO₂ max) in elderly subjects.