Chapter II

REVIEW OF LITERATURE

The review of literature is generally used as a basis for inductive reasoning for locating and synthesising all the relevant literature on a particular topic- Thomas and Nelson, (1990).

The purpose of this review of selected literature was to relate studies pertaining to the topic under study and to organise the collected review into meaningful sub sections as listed below.

A. Studies related to Aerobics and Exercise Training.

B. Studies related to Yoga and Exercise Training.

C. Studies related to Health related Physical Fitness Variables.

D. Studies related to Exercise Identity.

A. Studies related to Aerobics and Exercise Training

Silver (2002) This study examined effects of exercise on changes in percent body fat, resting metabolic rate (RMR), weight (BMI) and girth measures in obese women. Sixty five obese women completed six month treatment and received cognitive behavioural therapy (CBT) promoting dietary and exercise lifestyle changes and were randomly assigned to one of three exercise conditions: aerobic exercise alone (BT+A), slow-speed strength training alone (BT+ST), or concurrent aerobic exercise and slow-speed strength training (BT+AT+ST). This study also examined whether high adherence to the CBT/exercise program would enhance treatment outcomes. Following
treatment, participants were divided into two groups (a & nbsp;) high adherence (HA) or (b & nbsp;) low-to-moderate adherence (LMA). Results indicated that, as expected, all exercise groups experienced significant decreases in percent body fat, weight and BMI. Although results did not reach statistical significance, the BT+A+ST group evidenced the greatest decrease in percent body fat and the BT+A group evidenced the greatest decrease in weight and BMI, possibly due to loss of both fat and muscle tissue. Although predicted strength training would lessen the decline in RMR occurring with dieting, through a preservation or increase in muscle tissue, all exercise groups significantly decreased RMR. As expected, participants significantly decreased most girth measures. Results also indicated that the HA group experienced significantly greater declines in weight, BMI, fore arm girth and biceps girth. Overall, the results confirmed that in conjunction with CBT, slow speed strength training was effective in the short-term treatment of obesity, although there were no statistically significant benefits over aerobic exercise alone.

Kinjsler, Kosar and Korkusuz (2001) examined the effect of eight week step aerobics and aerobic dancing on blood lipids and lipoproteins. Comparative training setting for two months of physical fitness programme. Forty five sedentary female college student volunteers randomly assigned to one of the three groups as step aerobics (n=15), aerobic dancing (n=15) and the control group (n=15). The step aerobics and aerobic dancing groups participated in sessions of 45 minutes per day, three days per week for eight weeks with 50-70 % of their heart rate reserve. At the end of eight week period, a significant difference had been found between the step aerobics group and control group and between the aerobic dancing group and the control group. These results indicated that step aerobics training was an effective training mode for modifying lipid and lipoprotein profiles of female college-aged students.
Celine, Mary (2000) conducted a study on effects of aerobic dance exercise training and rope skipping training on selected physical, physiological and hematological variables of college women students. For the purpose of the study thirty college women students were selected at random whose age ranged between eighteen to twenty years. The subjects were divided into three equal groups each consists of ten. One was control and other two experimental group were aerobic group and rope skipping group. The investigator selected the variables such as cardio-respiratory flexibility, body composition, muscular endurance, muscular strength, speed co-ordination, hemoglobin and red blood cell count. ANCOVA was used aerobic and rope skipping groups and they were found significant. It was found they improved in cardiorespiratory, flexibility, body composition, muscular endurance strength, speed, co-ordination, hemoglobin and red blood cell count. When compared to the control group, aerobic group was found significantly better in flexibility when compared with rope skipping group.

Ness. K. et al., (2000) The study determined the effects of a physical therapist designed muscle strengthening and conditioning program on aerobic performance, strength, balance, and functional ability in individuals with chronic alcoholism. Thirteen subjects (mean age = 57 years) were recruited from an in-patient chemical dependency program in a long-term care facility. They participated in a six week supervised strengthening and aerobic conditioning exercise program specifically designed for older individuals with chronic chemical dependency. Subjects also participated in traditional individual and group psychotherapy sessions. Subjects were assessed for strength, aerobic fitness (six minute walk), balance (Berg balance) and functional performance (Physical Performance Test). There was no significant difference between pre-and post intervention resting or maximum heart rates, whereas grip strength, chest press strength, and leg
press strength significantly increased. Significant improvements in the Berg Balance and the Physical Performance Test Scores were also observed. The inclusion of aerobic conditioning and strengthening exercises in chemical dependency programme had significant functional benefits for the older chronic alcohol abuser.

Taylor and Lucian (1996) compared the effects of aerobic video instruction versus traditional aerobic instruction on youth fitness. The samples for the study comprised of forty four fourth grade boys and girls divided into two groups. Two low impact aerobics videotapes were created for the video instruction group, and a low - impact aerobics instructor was used for the traditional aerobic fitness instruction.

The prudential fitness gram pre-test / post-test was used to acquire data. The fitness gram was used for the purpose of comparing five fitness components consisting of a one mile walk / run, sit-ups, push-ups, sit and reach, and percent body fat. The two videotapes for the aerobic video instruction group were made by the investigator and were designed specifically for elementary - aged students at the fourth grade level. The aerobics instructor was trained by the investigator to ensure that the format and instructions for both groups were the same.

Both groups participated in aerobics for six weeks during their normal physical education schedule. The data collected from both the pre-test and post-test were calculated on the Minitab computer statistical program

The data collected revealed a slight difference in the one-mile run and walk and curl-up in favour of the traditional aerobic fitness instruction group. There was a significant difference in the push-up component of the
fitness programme in the aerobic video instruction group. Both types of instruction illustrated advantages and disadvantages in methods of pedagogy.

In conclusion, the study indicated that there was no significant difference between aerobic video instructional methods for fitness level improvement of either group. The study showed that both types of teaching formats can be beneficial for elementary physical education classes.

**Blessing et al., (1993)** This study compared the physiological alterations that occur in 22 college students aged 18 to 24 years as a result of 10 weeks of aerobic dance. 10 students served as controls. The training group exercised 3 days/week, 45 min/day for 10 weeks at an intensity that represented to 70% to 85% of their age predicted max HR. Maximal oxygen uptake (Vo2max), resting heart rate, blood pressure and body composition were determined before and after the training program. Control group also underwent the same testing procedure. The experimental group improved significantly (p < 0.05) greater, relative to the control group for VE max, VO2 max expressed in L/min-1 or body weight and body composition. Resting heart rate, systolic and diastolic blood pressure, body weight, fat weight, and fat-free weight did not change significantly in either group. These data suggested that aerobic dance exercise was an effective modality for improving cardio respiratory endurance and percent body fat in college females.

**Ogawa and Spina (1993)** This study determined the endurance exercise training increases aerobic exercise capacity (maximal oxygen consumption rate (VO2max) and attenuates the age-related decline in left ventricular (LV) function during exercise in older men. To determine whether similar adaptations occur in older women, 10 subjects (aged 63 +/- 4 years men +/-
SE) were studied before and after 9 to 12 months of endurance exercise training. They exercised 3.85 +/- 0.06 days/week at 81 +/- 0.3% of maximal heart rate. LV function at rest and during supine exercise was assessed by radio nuklde ventriculography. VO2 max was increased by 21% (from 1.40 +/- 0.1 to 1.7 +/- 0.1 liter/min; p < 0.001) in response to training. Maximal heart rate and systolic blood pressure during treadmill exercise were unchanged (161 +/- 5 beats/min before vs 164 +/- 3 beats/min after; p = NS, and 208 +/- 7 mm Hg before vs 214 +/- 8 mm Hg after; p = NS, respectively) after training. LV ejection fraction at rest (70.4 +/- 2% before vs 70+ 1% and during peak exercise (78.6 +/- 2% before vs 79.3+ 2% after) did not change in response to training. Furthermore, the increases in ejection fraction from rest to exercise were similar before and after training (change 8.8 +/- 1 vs 9.1 +/- 1%). Stroke volume and cardiac output at peak exercise also did not change in response to training.

Eckerson and Anderson (1992) conducted a study to determine the heart rate (HR) and oxygen uptake (VO2) measured during water aerobics (WA) and were compared to maximal values obtained during an incremental treadmill test to assess the energy demand and potential cardio respiratory (CR) training effects of water aerobics. Sixteen college females served as subjects (mean +/- SD = 20.4 +/- 1.6 years). Water aerobics elicited a mean HR of 162.6 b min^-1 and a mean VO2 of 18.4 ml. Kg^-1 min^-1 which represented 74 % of HR reserve, 82% of maximal HR, and 48% of VO2 max. Average caloric expenditure was 5.7 kcal.min^-1, HR values for water aerobics were consistent with guidelines established by the American College of Sports Medicine for developing and maintaining cardiorespiratory fitness in healthy adults. However, the VO2 fell just below the recommended minimum threshold level. It was concluded that water aerobics may provide an attractive alternative to traditional modes of exercise for improving cardiorespiratory fitness.
Gaber, McKinney et al., (1992) Compared the physiological effects of an 8 week aerobic dance program to those of a walk-jog exercise training program. 60 male and female university employees ages 24-48 years and they were randomly assigned to an aerobic dance program (N=22), a walk program (N=24), and a sedentary control group (N=15), subjects who had an exercise compliance rate <85% were dropped from the study and others completed the 8 week period. Significant increases in maximal oxygen uptake occurred in both the aerobics and walk-jog group. Peak heart rate decreased significantly in the aerobics and the walk-jog groups but was unchanged in the control group following the treatment period.

Body weight, peak respiratory exchange ratio and peak minute ventilation remained the same in the aerobics, walk-jog and control groups throughout the treatment period. It was concluded that aerobic dance programs can result in similar improvements in aerobic power as a walk-jog program.

Snow, Harter et al., (1992) conducted a study on how regular physical activity benefits the skeleton. An eight month controlled exercise trial in a group of healthy college women (mean age = 19.9 years) who were randomly assigned to a control group or to progressive training in jogging or weight lifting, measured the following variables, bone mineral density (BMD) of the spine (L2-4) and right proximal femur using dual-energy x-ray absorptiometry, dynamic muscle strength using the 1-RM of 31 women completed the 8 month study. For women completing the study, compliance, defined as the percentage of workout sessions attended was 97% for the runners (range 90-100%) and 92% (range 88-100%) for the weight trainers. Body weight increased by approximately 2 kg in all groups (\( p \) less than 0.01) in muscle strength in all muscle groups. Improvement ranged from 10% for the deep back to 54% for the leg. No significant changes in strength scores
were observed in the control or running groups. Aerobic performance improved only in the running group (16%, p, less than 0.01). Lumbar BMD increased (p less than 0.05) in both runners (1.3 +/- 1.6%) and weight trainers (1.2 +/- 1.8%). These results did not differ from each other but were both significantly greater than results in control subjects, in whom bone mineral did not change.

Oslon, Williford and Smith (1992) conducted the study to determine the relationship between heart rate (HR) and oxygen consumption (VO2) for aerobic dance exercise. Therefore, eleven females completed 20 minutes of aerobic dance with continuous monitoring of HR and VO2. These physiological responses were analysed with correlation/regression techniques. The results showed that for aerobic dance to produce a response in excess of 50% of VO2 max, the target HR must be approximately 80% of the age-predicted HR max or greater. In contrast, previously reported data for treadmill running shows that 50% of VO2 max is achieved approximately 65% of age-predicted HR max in females. The maximum heart rate reserve (Karvonen) method was also found to under estimate the actual VO2 of AD. With the Karvonen method, the target heart rate must be approximately 65% of maximum HR reserve in order to elicit a VO2 response which is representative of 50% of VO2 prescriptions derived from treadmill testing may fail to accurately place AD participants in the recommended training zone.

Selvaraja, Sathasivam (1991) conducted a study on effects of aerobic exercise and circuit training on selected physiological variables and motor abilities among school boys. For the purpose of the study ninety subjects were selected randomly between the age of eleven and sixteen years. The subjects were divided into three equal groups each consisting of 30. One was control and the other two were experimental groups. The investigator
selected the variables, such as agility, speed, power, breath holding time, pulse rate. 'F' ratio was used for statistical technique. It was found that circuit training and aerobic exercise had significantly improved speed, power, agility, breath holding and pulse rate.

Hopkins (1990) conducted a study to determine the effect of low - impact aerobic dance on sedentary elderly women (n=53), functional fitness was measured by items from the proposed American Alliance of Health, Physical Education, Recreation and Dance (AAHPERD) fitness test for older adults. After 12 weeks of low - impact aerobic dance, the group improved significantly on all functional fitness components except motor control / coordination, including cardio respiratory endurance, strength/ endurance body agility, flexibility, body fat and balance.

McCord, Nichols et al., (1989) undertook a study to examine the effects of a 12 week program of low impact aerobic dance conditioning on Vo2 max, sub maximal heart rate and body composition of college aged women. 16 women exercised 3 times per week for approximately 45 minutes per session at 75-85% of their heart rate reserve. All testing was conducted with in one week pre and post training. Training sessions consisted of a 5-10 minute warm up 30-35 minute low impact aerobic dance segment and a 5 minute cool down. Post test results revealed a small but significant increase in Vo2 max. Sub maximal heart rates at minutes 2-3, 3-4 and 4-5 of the graded exercise test decreased significantly. Body fat decreased with no post training change in body weight. It was concluded that low-impact aerobic dance was as effective as other endurance training, improved cardiorespiratory fitness and decreased body fat.

Blackman, Hunter et al., (1988) examined the effects of dance team participation on female adolescent physical fitness and self-concept. Eight
Dancers were tested once prior to and once four months after dance team participation. Eight participants from physical education classes, matched for age, weight, height, grade and race, were tested once at the same time as the second dance test. Physiological tests were maximum oxygen uptake, sit-and-reach, one-repetition maximum bench press, skin folds and hydrostatic weighing. The self-concept tests were Cooper smith self-Esteem Inventory, Tennessee self-concept scale, and Body Cathexis Scale. Dependent one-tailed tests were run to determine differences between dance team pre- and post tests and control and dance team post tests. Dance subjects increased maximum oxygen uptake and one-repetition maximum bench press in addition to improving their body composition as evidenced by a significant decrease in total skin folds and a near significant decrease in percent body fat. The dance team had a significantly higher maximum oxygen uptake than did team participants significantly improved physical self and social self on the Tennessee self-concept scale. No other significant differences were seen. Within the limitations of this study, these results indicated that physical fitness, improved as a result of dance team participation.

Gillett and Elsenman (1987) concluded a study on effect of intensity controlled exercise controlled exercise on the aerobic capacity of overweight, middle-aged women. Thirty-eight moderately overweight women, ages 35-57 participated in a 16 -week dance - exercise program. Random assignment was made to and experimental group (n=20) in which intensity of exercise was controlled and prescribed, and control group (n=18) in which exercise was of an intensity typical to commercial aerobic classes. Prior to the onset of training, and at the completion of 16 weeks, the following fitness tests were administered; Aerobic capacity expressed as VO2 max, body composition analysis, blood chemistry, blood pressure, resting heart rate. It was calculated that a significant improvement was found in the physical fitness.
Dowdy (1985) conducted a study on the effect of aerobic dance on physical work capacity, cardiovascular function of body composition of middle aged women. Effects on maximal oxygen uptake, heart rate during sub maximal treadmill walking, resting heart rate and blood pressure and body composition before and after a 10 week aerobic dance conditioning program in 28 women (18 experimental and 10 control), aged 22 to 44 years. During the 10 week treatment period, the experimental subjects participated in 45 minute aerobic dance at 70-85% of the heart rate reserve, three days in a week. Changes in the experimental group were significantly greater than in the control group. Resting systolic and diastolic blood pressure, body weight, percent fat, fat weight and fat-free weight, sum of seven skin folds, sum of seven circumferences did not change significantly in either group. It was concluded that aerobic dance improved physical work capacity and cardiovascular function but without dietary control, does not alter body composition in sedentary middle-aged women.

B. Studies related to Yoga and Exercise Training.

Ray, et al., (2001) conducted a study to observe any beneficial effect of yogic practices during training period on the young trainees. 54 trainees of 20-25 years age group were divided randomly in two groups i.e. yoga and control group. Yoga group (23 males and 5 females) was administrated yogic practices for the first five months of the course while control group (21 males and 5 females) did not perform yogic exercises during this period. From the 6th to 10th month of training both the groups performed the yogic practices. Physiological parameters like heart rate, blood pressure, oral temperature, skin temperature in resting condition, responses to maximal and sub maximal exercise and body flexibility were recorded. Psychological parameters like personality, learning, arithmetic and psychomotor ability,
mental well being were also recorded. Various parameters were taken before and during the 5th and 10th month of training period. Initially there was relatively higher sympathetic activity in both the groups due to the new work/training environment but gradually it subsided. Later on at the 5th and 10th month, yoga group had relatively lower sympathetic activity than the control group. There was improvement in performance at sub-maximal level of exercise and in anaerobic threshold in the yoga group. There was improvement in various psychological parameters like reduction in anxiety and depression and a better mental function after yogic practices.

Ray and Sinha (2001) conducted a study on the effect of yogic exercise on perceived exertion (PE) after maximal exercise. Forty men from the Indian army (aged 19-23 years) were administered maximal exercise on a bicycle ergometer in a graded workload protocol. The oxygen consumption, carbon dioxide output, pulmonary ventilation, respiratory rate, heart rate (HR) at maximal exercise and PE score immediately thereafter were recorded. The subjects were divided into two equal groups. Twelve subjects dropped out during the course of study. One group (yoga, n = 17) practiced hatha yogic exercises for 1 hour every morning (6 days in a week) for six months. The other group (PT, n =11) underwent conventional physical exercise training during the same period. Both groups participated daily in different games for 1 hour in the afternoon. In the 7th month, tests for maximal oxygen consumption (VO2 max increased significantly (P<0.05) in the yoga group after 6 months of training. The PE score after maximal exercise decreased significantly (P<0.001) in the yoga group after 6 month but the PT group showed no change. The practice of hatha yogic exercises along with games helped to improve aerobic capacity and the yoga group performed better than the PT group in terms of lower PE after exhaustive exercise.
Tran, et al., (2001) conducted a study to determine the effects of hatha yoga practice on the health-related aspects of physical fitness, including muscular strength and endurance, flexibility, cardio respiratory fitness, body composition, and pulmonary function. Ten healthy, untrained volunteers (nine females and one male), ranging in age from 18-27 years, were the subjects and they were required to attend a minimum of two yoga classes per week for a total of 8 weeks. Each yoga session consisted of 10 minutes of pranayamas (breath-control exercises), 15 minutes of dynamic warm-up exercises, 50 minutes of asanas (yoga postures), and 10 minutes of supine relaxation in savasana (corpse pose). The subjects were evaluated before and after the 8-week training program. Isokinetic muscular strength for elbow extension, elbow flexion, and knee extension increased by 31%, 19% and 28% (P < 0.05), respectively, whereas isometric muscular endurance for knee flexion increased 57% (P < 0.01). Ankle flexibility, shoulder elevation, trunk extension and trunk flexion increased. These findings indicated that regular hatha yoga practice can elicit improvements in the health-related aspects of physical fitness.

Birkel and Edgren (2000) conducted a study on the vital capacity of the lungs. Vital capacity is an important concern for those with asthma, heart conditions, and lung ailments, those who smoke; and those who have no known lung problems. To determine the affects of yoga postures and breathing exercises on vital capacity. Using the spiropet Spirometer, researchers measured vital capacity. Vital capacity determinants were taken near the beginning and end of two 17-week semesters. No control group was used. Midwestern university yoga classes taken for college credit. A total of 287 college students, 89 men and 198 women. Subjects were taught yoga poses, breathing techniques and relaxation in two 50-minute class meetings for 15 weeks. The study showed a statistically significant (P < 0.001) improvement in vital capacity across all categories over time. It is known
whether these findings were the result of yoga poses, breathing techniques, relaxation or other aspects of exercise in the subjects' life. The subjects' adherence to attending class was 99.96%. These findings are consistent with other research studies reporting the positive effect of yoga on the vital capacity of the lungs.

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

Murugesan, et al., (2000) conducted a study on the basis of medical officers diagnosis, thirty three (N=33) hypertensives, aged between 35 and 65 years, from the Government General Hospital, Pondicherry, were examined with four variables, viz. systolic and diastolic blood pressure, pulse rate and body weight. The subjects were randomly assigned into three groups. The experimental group I underwent selected yoga practices, experimental group II received medical treatment by the physician of the said hospital and the control group did not participate in any of the treatment stimuli. Yoga training was imparted in the morning and in the evening with one hr/session/day for total period of 11 weeks. The result of pre-post test with ANCOVA revealed that both the treatment stimuli, (i.e., Yoga and drug) were effective in controlling the variables of hypertension.

Mutharaj (1998) conducted a study on comparative study of physical fitness programme and selected yogic programme on pulse rate of school students.
For the purpose of the study 91 students whose age ranged from nine to 13 were selected at random and administered the Kraus-Weber tests. The volunteers were restricted to seventy two and they all had failed in Kraus-Weber tests. Then they were divided into three groups. The total number in each group was twenty four. The three groups were physical exercise group, yogic programme group and control group. The investigator selected Kraus-Weber tests, selected asanas and five BX plan. To compare these variable T-ratio technique was employed. It was found that two experimental groups, five BX plan and yogic programme showed considerable improvement in the minimum muscular strength when compared to control group.

Manjunath (1997) conducted a study on how yoga improves perceptual motor skills. This study correlates age, gender, and motivation to learn yoga with the performance in a dexterity task following yoga. Tweezer dexterity was recorded in eighty subjects belonging to four groups. Two groups were given a month of yoga training. One group consisted of subjects who had volunteered to join for the training and the other group was deputed or the training as a part of their job. The two remaining groups did not receive yoga training and were selected to match the respective groups receiving yoga, for age, sex, but not for their motivation to learn yoga. The test involved using a tweezer to place metal pins in evenly spaced holes in the metal plate within four minutes. Yoga increased significantly, where as there is no change in scores of deputed subjects and non yoga groups. Factors such as age and gender did not appear to contribute to the difference in performance.

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

Shankardayalan (1996) conducted a study on effect of yogic exercise on muscular performance and body composition in adult male. He selected fifty male students and divided into two groups of equal number of twenty five subjects each. One group was utilized as control group and the other group as experimental. The experimental period was eight weeks.

The data on aerobic capacity, sit-ups, flexibility and percentage body fat were obtained before (Pre-test) and after (post test) the experimental period. The data were analysed statistically by computing analysis of covariance for all the variables. The obtained ‘F’ ratio were tested for significance at .05 level of confidence. For all the variables such as aerobic capacity, muscular endurance, flexibility and percent body fat in favour of experimental group. He concluded that the aerobic capacity was increased, and the muscular endurance was improved. Flexibility was developed. The significant difference was found in percent body fat of yogasana practice programme.

Tiromourougane (1996) conducted the study on effect of yogic practice on selected physiological variables among athletes and non athletes. He selected
60 boys in which 20 were athletes, 20 were non athletes, and 20 were kept as a control group from the Pondicherry region. The athletic group and the non athletic group were given selected yogic practice. The control group was not allowed to participate in the yoga training during the experimental period of eight weeks. The athletic group and non athletic group and control group were tested prior to and after the experimental period. The data collected from the subjects were statistically analysed to find out the significant difference among athletic group, non athletic group and control group. 'F' ratio (analysis of covariance) was calculated and tested at 0.05 level. He concluded that there was a significant difference among the athletic group, non athletic group and control group in the systolic and diastolic blood pressure, cardio respiratory endurance and vital capacity.

Hanumanthaiyah (1994) conducted a study on static motor performance and it was tested in two groups with 20 subjects in each (age range 17 to 22 years and five females in each group). Tests were carried out at the beginning and end of a ten days period. During the 10 days one group (the yoga group) practiced asanas (physical postures), pranayama (voluntary regulation of breathing), meditation, devotional sensations, and tratakas (visual focusing exercises). The control group followed their usual routine. At the end of 10 days the yoga group showed a significant reduction in numbers of errors (Wilcoxon paired signed ranks test), while control group did not change. It was interesting to note the same degree of plasticity in motor control system in young adults.

Bera and Rajapurkar (1993) studied on yoga in relation to body composition, cardiovascular endurance and anaerobic power with forty male high school students, aged 12-15 years. The SS were placed into two sub-sets viz. yoga group and control group. Body composition, cardiovascular endurance and anaerobic power were measured using standard method. The
duration of the experiment was one year. The result of ANOVA revealed that a significant improvement in ideal body weight, body density, cardiovascular endurance and an aerobic power was observed as a result of yoga training. This study could not show a significant change in body fat (mid auxiliary), skeletal diameters and most of the body circumferences. However, it was evident that some of the fat folds (triceps, subscapular, suprailliac, umbilical, thigh and calf) and body circumferences (waist, umbilical and hip) were reduced significantly.

Moorthy (1992) conducted a study on minimum muscular fitness of school children of the age group of six to eleven years and compared influence of selected yogic exercises and physical exercises on them. 1000 children (517 boys and 439 girls) from second and eleventh standard attended at three schools in Pune. 90 boys and 90 girls from the failure group were randomly allotted to control group Experimental group I (physical exercises) and Experimental group II (Yogic group), underwent the treatment for nine period of six weeks. He concluded that both experimental groups showed significant improvement and also the improvement in the yogic group was found to be greater than in physical exercise group.

Blumenthal, et al., (1991) examined the psychological, behavioural, and cognitive changes associated with upto 14 months of aerobic exercise training. For the first four months of the study, 101 older (greater than 60 years) men and women were randomly assigned to one of three conditions: aerobic exercise, Yoga or a Waiting List control group. Before and following the intervention, all subjects completed a comprehensive assessment battery, including measures of mood and cognitive functioning. A semi-crossover design was employed, following completion of the second assessment. Subjects were given the option of participating in six additional months of supervised aerobic exercise (14 months total), and all subjects, regardless of
their exercise status, completed a fourth assessment. Results indicated that subjects experienced a 10-15% improvement in aerobic capacity. In general, there were relatively few improvements in cognitive performance associated with aerobic exercise, although subjects who maintained their exercise participation for 14 months experienced improvements in some psychiatric symptoms. However, the healthy subjects in this study were functioning at a relatively high level to begin with, and exercise training may produce greater improvements among elderly with concomitant physical or emotional impairments.

Pari (1990) conducted a study on comparative study of physical fitness programme and yogic programme on cardiovascular endurance of school students. For the purpose of the study 90 students whose age ranged from 15 to 17 years were selected at random. They were divided into three groups. The total number in each group was thirty. The three groups were physical fitness programme, yogic programme and control group. After 12 weeks training programme to compare these groups ANOVA was employed. It was found that the physical fitness training programme and yogic training programme were significantly effective on cardiovascular endurance because of training when compared to control group.

Anantharaman (1989) carried out a study on 20 subjects who subsequently underwent hatha yoga training. Their physiological parameters were assessed before the commencement of the training and at the first, third and six months of the period of training. The subjects thus formed their own rigid controls. The anthropometric studies revealed that hatha yoga training in general helped individuals to achieve their optimum weight approximately 59 kg. There was remarkable decrease in subcutaneous fat.
Bera and Ganguly et al., (1988) reviewed various research reports and revealed that yogic practices helped to reduce excess fat, blood cholesterol level and leave a positive effect in developing minimum muscular strength, cardio respiratory endurance, flexibility of joints and physical fitness index. There are also desired qualities of a sportsman of ectomorphic body type having mesomorphic tendency. It was predicted on the basis of yoga research studies that have been reviewed that better performance in yoga exercises may be facilitated by those possessing ectomorphic, mesomorphic body type.

Raju and Vijayakumar et al., (1988) conducted a study on oxygen consumption among obese individuals at Vemana Yoga Research Institute, Hyderabad. One minute incremental, maximal exercise test was carried out on a motorized treadmill in 19 obese individuals (10 men, nine women) for their oxygen consumption. The results indicated that difference in oxygen consumption in relation to their body weight and lean body mass in both the groups during sub maximal exercise. The oxygen consumption VO2 mass in relation to body weight was significantly lower in obese men and women. Lower oxygen consumption in relation to body weight at maximal exercise could be due to lesser percentage of lean body mass (LBM) proportional to body weight.

Raju (1986) conducted a study on effect of yoga on exercise tolerance. Twelve normal healthy volunteers (six males and six females) underwent a yoga training for 90 days. Their ages ranged from 18 to 28 years. The volunteers were taught only Pranayama for the first 20 days and later on yogic asanas were added. Sub-maximal exercise tolerance test was done on a motorized treadmill by using Balke's modified protocol, initially, after 20 days (Phase-I) and after 90 days of yoga training (Phase-II). Pyruvate and lactate in venous blood and blood gases in capillary blood were estimated immediately before and after the exercise. Minute ventilation and oxygen
consumption were estimated before and during the test. Post exercise blood lactate was elevated significantly during initial and Phase-I, but not in Phase-II. There was significant reduction of minute ventilation and oxygen consumption only in males in Phase-I and II at the time when the volunteers reached their 80% of the predicted heart rate. Female volunteers were able to go to higher loads of exercise in Phase-I and II.

Campbell (1985) conducted a study on systematic changes in perceptual reactance induced by physical fitness training and the effect of life-change events on perceptual augmentation-reduction was studied in 72 subjects (40 men, 32 women). In three experiments, the kinesthetic figural after effect was measured prior to and after either a physical fitness program, a course in yoga, or training in transcendental meditation. Each program lasted a minimum of eight weeks. Subjects completing fitness training, all of whom were initially classified as augmenters, became reducers by the end of their program. Subjects enrolled in yoga and meditation courses remained relatively stable in their perceptual tendencies.

C. Studies related to Physical Fitness Variables

Jessup and Horne, et al., (2003) conducted a study on effects of exercise on bone density, balance, strength and self-efficacy in older women. Strength-training exercises on bone mineral density (BMD), balance, strength and self-efficacy were tested in older women. Eighteen women, age 69.2 years, were randomly assigned to an exercise group EG (n=9), a sedentary control group CG (n=9). The EG participated in 32 weeks (three one hour sessions /week) of supervised strength training and walking, stair climbing, and balance exercises while wearing weighted vests. The control group did not exercise. All women took Ca²⁺ and vitamin D during the study period, measures included 10 BMD of the hip and lumbar supine measured
by dual-energy X-ray absorptiometry, 20 strength, 30 balance and 40 scores on a self-efficacy instrument. The exercise group had significant improvements in bone density of the femoral neck and balance and a significant weight loss (p<0.05). There were no changes in self-efficacy in either group.

Ahmed (2002) conducted a study on college women. Students enrolled in a strength training class were evaluated before and after the class using a combination of physical fitness measures, including weights, percentage of body fat, body circumference, and strength measures. Forty nine subjects participated in strength training, twice a week for a total of 12 weeks. Physical results of the study showed a mean weight gain of one lb, as average increase in body fat of 0.9% and a 5-11 lb improvement in maximal lifting ability. In addition, most subjects reported that they felt healthier and more fit and had an improved body image. In this study, exercise using strength training improved strength and body image in women.

Hulens et al., (2002) conducted a study on health related quality of life (HRQL) in women attending an obesity clinic, and to rate of differences in HQRL is those with the highest and lowest levels of physical activity (PA). The sample included 113 sedentary and 101 physically active subjects from a total sample of 375 overweight women 16-65 years, with the body mass index (BMI) > or = 27.5 kg/m (2) consulting at outpatient endocrinology clinic, and 82 lean female volunteers who served as a reference. Weight, height, body composition, physical activity. Physical medical conditions, depression, body image, cognitive - behavioural conceptualization of obesity, eating behaviour, functional status, walking ability, exercise capacity, social functioning, and general health and perceived quality of life were assessed cross-section ally. The prevalence of medical conditions and depression was not statistically different (P < 0.05) in sedentary and active women. In sedentary obese
women, body attitude, walking ability, and aerobic fitness were poorer; the number of people to turn to for social support was smaller; physical attributions about the basis of the subjects' obesity were less pronounced; and eating was more the consequence of external triggers or diffuse emotions than in physically active obese women (P < 0.05). The findings indicated that a higher level of PA in an obese female clinical population was positively associated with diver dimensions of HRQL. However, it was not possible to determine if these favourable aspects of HRQL were the cause or the consequence of a higher PA level.

Tremblay and Chiasson (2002) conducted a study on fitness characteristics of college women and men (N = 427 and 423, respectively) aged 17 to 20 years whose values were compared to the data of the 1981 Canada Fitness Survey (CFS). Muscular fitness as revealed by the maximal number of arm extensions (push ups) was lower in subjects of this study compared to those tested in the 1981 CFS. On the other hand, body weight, waist circumference and the sum of five skin folds were greater in subjects of the present study. These differences between the results of this study and those of the 1981 CFS were particularly pronounced in the upper percentile ranks. The classification of subjects on the basis of the number of grades completed during a step test revealed significant difference in subcutaneous adiposity between fitness subgroups. Reported participation in vigorous physical activities was also predictive of subcutaneous adiposity in men but to a lesser extent than the number of grades completed during a step test. When a number of grades and exercises participation were combined to detect between group morphological differences, large differences in subcutaneous adiposity were observed in both men and women. This suggests that the effect of vigorous activity and aerobic fitness on adiposity may be much greater than what it generally perceived by health professionals and agencies.
Peechattu (2001) studied the effect of training programme on physical fitness variables of physical education trainees. The purpose of the study was to determine the effect of training on selected physical fitness variables on post graduate men physical education trainees. For this study the investigator selected 62 University male students from the Department of Physical Education and Sports, Pondicherry University. The investigator administered the 12 minute run, wall-squat, vertical jump, hexagon agility and block jump to determine the physical fitness profiles of the subjects. After collecting the data the investigator applied the percentile rank to indicate the relative status on the selected physical variables and 't' test was applied for the comparison after training. It was concluded that there was a remarkable improvement in the subjects physical variables in the training programme.

Arunachalam (2000) conducted a study to analyse and compare the selected physical fitness profiles among the sports school boys. Sports school boys in Pondicherry region and Tirunelveli region served as subjects for this study. Thirty school boys all residential were randomly selected from each of these regions. The subjects age ranged from 13 to 16 years and the study was formulated as a status study. The data collected on the related physical fitness variables i.e., bent knee sit – ups, pull- ups, speed, agility and cardio respiratory endurance were statistically analysed by the 't' test. The results revealed that there was a significant mean difference in the favour of the sports school boys in the Pondicherry region.

Gharote (2000) conducted a study on minimum muscular fitness in school children. Two hundred and fifty school boys from Lonavla were randomly selected and tested with Kraus-Weber tests for their minimum muscular fitness. The results revealed that 20.8 per cent boys failed in the tests.
Multiple failures were 4.8 percent while flexibility failures alone were 11.6 percent. Boys at the age of 15 years failed more in flexibility test. Boys at the age of 10 years had the maximum percentage of failures to the extent of 38.5. Inclusion of Yogasanas in the programme of physical activities of the school was suggested for the improvement of the status of the failures.

Venkatesh (2000) conducted a study to compare the selected physical fitness components of weight lifters and power lifters. For this the investigator randomly selected fifteen weight lifters and fifteen power lifters between the age group of 18 to 25 years from the Nellai Kottabomman District. They were tested by the selected test namely the 50 yards dash (speed), vertical jump (explosive power), bent knee-sit-ups (abdominal strength), twelve minutes run/walk (cardio vascular endurance). The data collected through these tests were statistically analysed by using 't' ratio. From the statistical analysis, it was concluded that there was no significant difference between weight lifters and power lifters in the selected physical fitness components.

Satyanarayana (1997) conducted a study to compare the selected physical fitness components of technical school boys and non-technical school boys. For this the investigator randomly selected 20 subjects from technical and 20 subjects from non-technical school boys, the age group was ranged 14 to 17 years from the Pondicherry region. The selected physical fitness variables were abdominal strength, speed, explosive power, agility, and cardio-vascular endurance. To measure these components sit ups, pull-ups, 50 yards dash, standing broad jumps, shuttle run and 12 min run/walk test were administered to all the subjects and the data were collected, the collected data were statistically analysed by using 't' ratio. Results of this study revealed that there were no significant
difference in the selected physical fitness components between the technical and non-technical school boys.

Saldana et al., (1997) conducted a study to examine the maximum heart rate response to intense training. Subjects were nine male cyclists who trained on average of 20 km per week in the past year. During the active rest phase of their training program, only recreational activities were performed. Prior to and following a seven week, intensive cycling programme on a computerised graded cycling test to volitional exhaustion. Coaches who use heart rate to prescribe training intensities for endurance athletes need to take cognizance of the rapid changes in maximum heart rate that develop during de-training and with resumption of intense training.

Michael and Debra (1996) The study examined the strength and flexibility of 21 elders women (x=73 +/- 7 years) following of 16-week Dynaband (R) resistance program of 10-15 reps for eight muscle groups representing the upper and lower body. Pre and post training strength was assessed with Cybes (R) isotonic equipment and flexibility of the shoulder, hip and ankle was measured with a Leighton Flexometer. As expected, all strength measures improved following training. Interestingly, flexibility also improved, with increases in range of motion ranging from 5% (transverse shoulder extension) to 23% (plantar flexion). Of clinical importance were the significant (p < .05) improvements in dorsiflexion (21%; t=2.39) and plantar flexion (23%, t=-4.06). It appears that both muscle strength and flexibility were improved in elderly women with a nontraditional resistance training programme. Since strength and range of motion appear to directly influence functional motion, this prescribed exercise program could potentially reduce the risk for falls in older populations.
Carter (1994) examined the undergraduate students Wellness and fitness programmes for corporate and medical profession. The purpose of this study were as follows:

1. To identify the necessary background for potential wellness and fitness professionals;
2. To examine the course content of undergraduate programmes in wellness and fitness, health promotion, and/or exercise science/physiology; and
3. To identify which professional organization should take precedence in accrediting a core curriculum for programmes that emphasize a career in wellness and fitness and health promotion.

A questionnaire was mailed to 50 wellness and fitness directors of corporate/industrial-based programmes throughout the United States. Twenty-six (52 percent) questionnaires were completed and returned. An identical questionnaire was mailed to 50 wellness and fitness directors of hospital/medical-based programmes throughout mailed to 100 directors of instructions with undergraduate programmes in wellness and fitness, health promotion, and/or exercise science/physiology throughout the United States. Eighty (80 percent) of these questionnaires were completed and returned. The data from the completed questionnaires were recorded with frequencies and percentages computed. The following recommendations were made from the conclusions of the study:

1. Undergraduate programmes should provide additional course work in the areas of programme planning in wellness and fitness, business administration, speech communication, computer science, basic first aid and exercise testing and prescription.
2. Internship / previous job experience was highly regarded for potential employment.

3. A majority of the undergraduate programs supported the future possibility of receiving accreditation by the American College of Sports Medicine. Timed-X was a physical fitness programme which was developed, field tested and implemented for high school use.

It was developed to provide a health-related component for physical education classes that was an equally appropriate and challenging exercises stimulus to participants on all fitness levels. The programme which lasts for between 20-25 minutes (depending on the length of warm-up and cool-down) was based on 10 second bursts of high intensity exercise followed by 10 second periods of rest. Each exercise was performed for three to 10 second periods followed by the selection and starting of another exercise. With only a ten second rest period between changes of exercise, the entire exercise portion of the programme lasted for a recommended 15 minutes and included 15 different exercises. Exercises were rotated between upper, mid and lower body activities to avoid local fatigue. The entire programme, from warm-up through cool-down was contained on an audio cassette tape.

Connor (1994) administered a study on university students on the effectiveness of exercises and behavior changes in physical education classes. The purpose of this study was to determine the effectiveness of cognitive behavior change intervention in university physical education classes in increasing the level of students leisure time physical activity. An additional purpose was to determine whether there was a circumstantial association between self-efficacy and participation in regular physical activity. Subjects for this study were 71 male and female college students enrolled in six beginning racquetball classes offered in the basic physical
education programme at the university of Georgia (UGA). Two intact racquetball classes were randomly assigned to each of two educational interventions. The two interventions were stage-of-change and decision balance. The remaining two classes served as the control group. The instruction of the control group followed course objective for the UGA physical education department. Course objectives for the education intervention groups were similar to those for the control group, but augmented with objectives that reflected educational components related to exercise adherence.

These questionnaires were used to pretest the dependent variables of activity level, state-of-change and exercise self-efficacy variables of activity level, state-of-change and exercise self-efficacy of all subjects. Following nine weeks of instruction all groups were post-tested. An additional post test was conducted six weeks after completion of the course.

Separate 3x3 (Group x Time) ANOVA with repeated measures on the second factor were utilized to determine whether activity level, stage-of-change, and self-efficacy differed significantly between educational intervention groups and the control group. The statistical analyses revealed no significant differences for activity level or for exercise self-efficacy. The male intervention groups significantly improved stage-of-change scores while the control group decreased. Female intervention groups did not change differentially from the female control group.

A Spearman Rho correlation coefficient was used to determine the relationship between self-efficacy and state-of-change and between exercise self-efficacy and activity level. Results indicated that exercise self-efficacy and stage-of-change scores were positively correlated for all
three groups. However, exercise self-efficacy and activity level were found to be positively correlated for females but not for males.

**Wickam and Mark (1993)** conducted a study to determine and appraise the current physical fitness levels of higher education professionals in a selected college population. The 75-member male and female faculty, administration and staff members were measured using the following physiological variables: cardiorespiratory function, percent body fat, total cholesterol level, resting blood pressure, resting heart rate, muscular strength and flexibility. In addition, each subject completed a written, health and well-being questionnaire. All data were reported as means, standard deviations, and percentages on a descriptive basis, using norms and rating from authoritative and respected sources.

The sample population was within normal or average ranges for percent body fat, blood pressure, resting heart rate, and flexibility. The subjects measured below average cardiorespiratory function, fair muscular strength, and borderline - high cholesterol levels. Additionally, the health and well-being self-appraisal scores were in the good range.

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

Rajmohan, Annaiyappa Udayar (1991) conducted a study on comparative effects of physical training programme on selected physical and physiological variables among school students. For the purpose of the study seventy five boys in the age group of 13 to 15 years were selected from Kendriya Vidyalaya, Coimbatore. The subjects were divided into three equal groups consisting of twenty five students each. The groups were randomly assigned as swimming, cycling and control groups. The investigator selected the variables such as muscular endurance, flexibility, pulse rate and vital capacity. ANCOVA was used as statistical technique. It was found that the practice of cycling and swimming improved efficiency significantly in physical variables compared to that of physiological variables such as muscular endurance, flexibility, pulse rate and vital capacity.

Maxey and Ron (1991) conducted a study to determine if physiological changes, related to specific physical fitness parameters, occur in mildly handicapped individuals following participation in six-week karate exercise programme six physical fitness parameters were investigated. (1) Body fat, (2) Flexibility, (3) Static strength (4) Cardio-vascular response, (5) Explosive leg power, and (6) Karate skill.

Forty-two mildly handicapped subjects were placed in either a treatment or control group. The twenty-one subjects in the treatment group participated in a Karate exercise programme while the twenty-one subjects in the control group participated in the regular physical education program conducted at their school.
Statistical analysis indicated that the treatment group made significant (p < 0.05) gains in the means scores in all six areas tested, from pre-test to post test. The control group recorded gains in skin fold, deltoid strength, and the karate skill test. This last increase was small and could have resulted from exposure to the karate skills during pre-test. After adjusted for differences between groups and all control group gains this study clearly indicated that mildly handicapped subjects can receive fitness and skill benefits from participation in a properly supervised karate exercise programme.

Miller (1990) conducted a study on selected physical education activities upon components of health related physical fitness. The purpose of this study was to determine whether or not participation in selected physical education activities effects the health related physical fitness of college students. In addition, it was to determine whether significant differences existed among activities relative to the components of health related physical fitness and to determine whether a significant interaction existed between gender and type of activity.

Subjects consisted of 228 university students enrolled in either aerobic dance, archery, bowling, swimming, tennis/badminton and weight training. The programme manual served as a guide in defining the test components and procedure. Skin fold thicknesses were measured to evaluated body composition. The 20 minute steady state jog evaluated cardio respiratory endurance. The sit and reach test evaluated flexibility through the use of a flexibility measuring apparatus. Muscular strength and endurance was evaluated by means of the bent knee curl up. A correlated t-test was performed to determine whether there were significant difference in pre-test and post-test scores of each item in the test batting for each group. Analysis of covariance was used to determine
whether a significant difference existed among groups on the post-test scores for the four performance variables. Tests of four simple effects were performed to clarify the meaning of significant interactions. A difference was considered significant if it reached the 0.05 level.

Results of the study indicated that a 10 week programme of activity will elicit the following effects: (1) Aerobic dance and weight training elicit significant improvements in flexibility and muscular strength. (2) Volley, bowling, and tennis are not effective in the enhancement of health related physical fitness. (3) Swimming elicits a significant improvement in cardio respiratory endurance, flexibility and muscular strength and endurance. (4) Males can be expected to improve flexibility more than females following a 10 weeks program of swimming. (5) Weight training is the most influential activity in improving flexibility in females. (6) Swimming is the most influential activity in improving flexibility. Based on the results of this study, it was concluded that improvements in the components of health related physical fitness can occur dependent on the selected activity.

Santiago (1990) conducted a study with two groups. Walking (n=16) a study with two groups. Walking (n=16) and control (n=11) group for the 40 week period. Patterns of change were noted in body constitution for both walking and control groups as indicated by decreases in body weight, body mass index, sum of skin folds, and fat weight for walkers and increases in body weight, body mass index, and sums of skin folds for controls. These data suggest that a long term, 12 mile per week walking programme, in sedentary women, substantially increases cardio respiratory fitness and decreases in body fat. In contrast, long term periods of physical inactivity results in an increase in body fat.
D. Studies related to Exercise Identity

Augusto (2002) study examined the relationship between the exercise identity and individual fitness levels data were collected from college undergraduate population. The sample consists of 87 students 51 men (n=51) and 36 women (n=36) enrolled in physical education classes at an urban university. Exercise identity was measured using the nine Likert -scaled items of the Anderson Exercise identity scale (EIS). Fitness levels were assessed using the Gallagher et al.,1996 formula to estimate percentage of body fat (BF%) from body mass index. Height and weight was assessed using the TANITA corporation weight system. The university of Houston Non-exercise test (Jackson et al., 1990) assessed maximal oxygen consumption (VO2 max). A factorial designed analysis of variance revealed no significant (p>.05) differences in the scores of the EIS between gender and ethnicity was found. VO2 max demonstrated no significant (p>.05) differences among ethnic groups; however a significant gender difference was found, F (1.86) = 32.54, p<.05 (observed power = 1.00), where men had a higher VO2max than women. No significant (p>.05) differences were found in BF% among either groups, although women had a significantly greater F(1.86)=9.89, P<.05 (observed power = .87), BF % (=28.82) than the men. Data also indicated that exercise identity was positively correlated with fitness levels among college students (r=.25 p<.05). These results revealed a significant relation between the perceived exercise identity and actual fitness levels in a diverse ethnic population.

John Maltby and Liza Day (2001) reviewed exercise motives to examine the relationship between extrinsic and intrinsic motives for exercise and a number of measures of psychological well-being. Undergraduate students purporting to exercise regularly N = 227; 102 men 125 women were split into two groups those exercising for less than six months and those exercising for
six months or more. The respondents were asked to complete measures of exercise motivation, self esteem, psychological well-being, and stress. Among individuals exercising for less than six months, a number of extrinsic motivations for exercise were significantly related to poorer psychological well-being. Among individuals exercising for six months or more, a number of intrinsic motivations were significantly related to better psychological well-being.

Dean F Anderson (1994) constructed a preliminary Exercise Identity Scale (EIS) norms for three adult samples. Sociological traditions suggest that role identities serve to give meaning and importance to past behaviour as well as provide direction for future behaviour. The exercise identity scale (EIS) was developed to measure the extent to which exercise contributes to an individual's role-identity. This investigation examined age norms on the EIS. Data were collected from three populations including a convenience sample of 203 college students enrolled in three elective health-study course (92% Caucasian and 63% female), 441 of 531 (83%) law enforcement employees in a state department concerned with public safety (98% Caucasian and 96% male), and 1253 of 4000 (32%) randomly selected employee of a large financial services corporation (66% female). Exercise identity was measured by the sum of nine scaled items. To test the overall effects, these three samples were combined (N=1882). ANOVA results revealed statistically significant main effects for both exercise and age group for exercise identity scores and ruled out statistically significant gender differences. Neither the gender and age group interaction were statistically significant. Examination of the means reveals consistent score differences between exercises and non exercises for exercise identity scores of approximately one standard deviation. There was also a trend for higher mean scores at the younger ages. These norms provide comparative information for other researchers who are interested in the use of the EIS in their efforts to study and predict fitness behaviours.
Dishman (1994) conducted a study to measure the extent to which exercise was descriptive of the concept of self \( (a = 0.94) \). Exercise efficacy was assessed by the sum of seven likert-type items designed to measure confidence in one's ability to overcome barriers to exercise participation \( (a = 0.83) \). A MANOVA revealed a statistically significant exercise stage effect, \( F(6,1130) = 46.41, p.001 \), and a statistically significant exercise stage effect, \( F(2,564) = 8.01, p.001 \). No statistically significant stage by gender interaction effect was displayed. Univariate results for exercise stage were significant both exercise identity, \( F(3,565) = 104.48, p.001 \) and exercise efficacy, \( F(1,565) = 16.05, p.001 \), with males showing higher exercise efficacy scores than females. A step wise regression analysis was performed with exercise stage as the dependent variable and exercise identity and exercise efficacy were significantly associated with exercise stage \( (R^2 = 47\%) \). Exercise identity score entered first and explained 44% statistically significant addition of 3%. These data provide insight into the socio psychological process underlying maintenance and expansion of exercise activities. These data suggest that Exercise Identity increases through the change process, peaking in the "maintenance" stage. This is consistent with the theory that the development of this social identity and self-perception of exercise efficacy may combine to sustain and perpetuate behaviour. These data suggest that program efforts directed at developing these self-perceptions may be natural, perhaps even a necessary element in the process of persisting in exercise behaviour.