CHAPTER - II

REVIEW OF RELATED LITERATURE
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"The literature in any field forms the formation upon which all future works will be built"1

Several search reviews on various aspects of physical education and sports have been published. If one or more can be found in the area of research they can be an excellent point for a literature search.

A serious and scholarly attempt has been made by the scholar to go through the related literature and a brief review of the studies related to the present problem is described in this chapter.

Uppal and Tunidan2 studied the comparative effect of different frequencies of endurance training on cardio respiratory endurance. According to their findings the cardio respiratory endurance of secondary school students could be effectively improved by administering a progressive programme of interval training.

Beres3 examined the effect of females participating in a specific sport as part of their socialization process. Specifically, the indirect effect of sports participation on choosing a college major was examined through its direct effect on both sex role identity and achievement motivation. One hundred female

3 Beres and Eileenisa, "The Effect of Participating in a Specific Sport on Choosing a College Major", Dissertation Abstracts California State University, (1992), pp.82.
college students completed a survey including items concerning demographics, sex role identity, sports participation, achievement motives and college major. The results failed to show significant relations between (a) sport and sex role identity, (b) sport and competitive achievement motivation, (c) competitive achievement motivation and college major and (d) sex role identity and college major. A possible explanation for these results is that a third variable, such as mathematical ability, may be involved in these relations. It is suggested that future research utilize a more representative sample to increase generalizability.

Nakao (1995) investigated the effect of a long term weight lifting programme characterised by high intensity, low repetition and long rest period between sets on maximal oxygen consumption (VO\textsubscript{2} max) and to determine the advantage of this programme combined with jogging. 26 male untrained students were involved in weight training for a period of 3 years. The VO\textsubscript{2} max and body composition of the subjects were examined at beginning and 1 years, 2 years (T\textsubscript{2}) and 3 years after (T\textsubscript{3}) the training of the group, 19 subjects performed the same weight lifting programme for 3 years with an additional running programme consisting of 2 miles of jogging once a week during 3rd year (R1-group) and 3 subjects performed the weight lifting, programme during the 1st year and the same combined jogging and weight lifting programme as the R1 group during the 2nd and 3rd years (R2-group). The average VO\textsubscript{2} max relative to their body mass of the W-group decreased significantly during the 1st year followed by an insignificant decrease in the 2nd year and leveling off in the 3rd year. The average VO\textsubscript{2} max of the W-group at T\textsubscript{2} and T\textsubscript{3} was 44.2 and 441.1 ml kg\textsuperscript{-1}, min\textsuperscript{-1}, respectively. The tendency of VO\textsubscript{2} max changes in the R1 and R2 groups was similar to the W-group until they started the jogging programme, after which they recovered significantly to the initial level with in a year of including that programme and they then leveled off during the next year. Lean body

mass estimated from skilfold thickness had increased by about 8% after 3 years of weight lifting. The maximal muscle strength, defined by total Olympic lifts (Snatch and clean and jerk), of these three groups increased significantly and there was no significant different among the amounts of the increase in the three groups.

Yausudha et al. (1994) conducted a study of effect of exercise intensity on the power spectral properties of the periodic oscillation of the skin blood flow which was investigated with respect to the variability of heart rate in 7 healthy male subjects. The skin blood flow (SBF) and heart rate (HR) were measured by a laser. Doppler flow meter on the forehead skin and by an ECG, at rest and during bicycle exercise in three different intensities, unloaded, 50 and 100w. An alcohol ingestion test was additionally performed on two subjects in the resting condition. Power spectral density (PSD) was calculated by means of Fast Fourier transform (FFT). The peak frequency (PF) and integration of PSD (IPSD) of each component was estimated to compare conditions and parameters. In the SBF fluctuation, two major components were usually observed. One synchronous with cardio contraction rhythm (HFF) which shifted to a higher frequency band with exercise the other was located in a lower frequency band (LFF) ranging from about 0.1 + 0.2 Hz and did not shift with exercise. The PF of the LFF in the SBF was significantly different from that of the HR, significantly different from that of the HR, called gayer waves.

The IPSD of the LFF in the SBF increased with increasing intensity of exercise but finally decreased at the highest intensity for which the HFF exhibited a marked increase. The LFF in the SBF disappeared after oval ingestion of alcohol that induced an increase of the SBF. From these spectral analyses, it was proposed that the LFF in the SBF is mainly related to the vasoconstrictor

activity through the skin sympathetic pathway, and that the intensity of exercise
does not modulate the periodically of this fluctuation.

Ramasamy Reddy Perumal⁶ conducted a study on the effect of 5BX physical
fitness plan on selected physical fitness components such as body fat
percent and grip strength among adolescent boys. For the purpose of the
study ninety boys were selected at random aging between 13 to 14 years.
They were divided into three group namely one control and two experimental.
Arm strength, shoulder girdle flexibility, abdominal endurance, cardio respiratory
endurance, explosive leg power, agility, speed, body fat percent and static
strength were selected as variables. To compare this, ANACOVA technique
was employed. It was found out that experimental group 'B' (5BX fitness plan
ing five days a week) and the experimental group 'C' (5BX fitness plan three days
a week) improved the selected physical fitness components.

Thangaraj Radhakrishnan⁷ conducted a study on the effect of super circuit
exercise programme on selected physical and physiological variables among
college men students. For the purpose of the study, 60 undergraduate students
were selected from Thiagarajar College, Madurai as subjects. Their age group
ranged from eighteen to twenty. They were again divided into two equal groups
on random basis in which one was control group and the other was experimental
group. The investigator selected physical variables such as agility, strength
and flexibility and physiological variables such as pulse rate, vital capacity and
breath holding time. To compare the physical and physiological variables
ANACOVA technique was employed. It was found out that super circuit exercise
programme brought out significant improvement in agility, strength, flexibility,

⁶ Ramasamy Reddy Perumal, "Effects of 5BX Physical Fitness Plan on Selected
Physical Fitness Components Body Fat Percent and Grip Strength Among Adolescent

⁷ Thangaraj Radhakrishnan, "Effect of Super Circuit Exercise Programme on Selected
Physical and Physiological Variables Among College Men Students", Unpublished M.Phil.
Dissertation Alagappa University, Karaikudi, 1993.
pulse rate and vital capacity. However, it was also found out that the super circuit exercise programme did not bring any significant improvement on breath holding time.

Sathasivan Selvaraju* conducted a study on effects of circuit training and aerobic exercise 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 the eleven to 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, vital capacity and pulse rate.

Willford9 and others evaluated ten healthy untrained females (age 23 years) to determine the effects of 10 weeks aerobic dance training on plasma lipid and lipoprotein levels. Cardio respiratory function and body composition. A Control group of eight untrained females (mean age 26 years) underwent the same evaluation proceeding as the training group. Fasting blood sample collected pre and post training were arranged for trigly cerides (Tg) total cholesterol (HDLC) maximal treadmill test and body composition were determined by hydrostatic. Trigly ceride, total cholesterol, high density lipoprotein did not significantly greater than the control group for maximum oxygen conception (VO$_2$ Max) (12% VS 2%) and time in a continuous grade incremented treadmill test (11% VS 2%) body composition did not change significantly improve cardiovascular fitness independent of change in serum lipid lipoproteins are body composition.

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Somasundaram Ravi Kumar\textsuperscript{10} conducted a study on effect of circuit training on selected physical and physiological variables. For the purpose of the study sixty boys free from deformities and ailments were selected at random. Thirty boys in control group and thirty boys in circuit training group. The age of the boys were between 13 to 15. The investigator selected physical variables namely speed, strength, agility and power and two physiological variables namely pulse rate and vital capacity. To compare the selected physical and physiological variables ANACOVA technique was employed. It was found out that all the physical and physiological variables were significantly improved through circuit training. When compared with control group there was no significant improvement in speed.

Annaiyappaudayar Rajmohan\textsuperscript{11} 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. ANACOVA was used for 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.


\textsuperscript{11} Annaiyappaudayar Rajmohan, "Comparative Effects of Physical Training Programme on Selected Physical and Physiological Variables Among School Students", Unpublished M.Phil., Dissertation Alagappa University, Karaikudi, 1991.
Chatterjee\textsuperscript{12} conducted a study on "Effect of circuit training, aerobic dancing and XBX plan on selected physical, physiological and haematological variables among college women in varied periods". For the purpose of the study ninety womens students studying in second year and third year graduate course were selected as subjects.

Brown Mathew and Bokacit\textsuperscript{13} conducted a study on the effects of plyometric training on vertical jump performance in high school basketball player. They found that in the plyometric group, 57\% of the vertical jump gain was due to jumping skill improvement and 43\% was due to strength gain. Therefore, plyometric training appears to enhance the co-ordination of the arms with strength development of the legs and provides a convenient in season training method.

Ganesan Mohan\textsuperscript{14} conducted a study on effect of varied packages of physical training on selected physiology variables, motor ability components and long jump performance of school girls. For the purpose of the study sixty girls studying in the age group of fourteen to fifteen were selected at random basis. The subjects were divided into three groups, each consists of 20. One was control and the other two were experimental groups. The investigatory selected the variables such as speed, leg explosive power, pulse rate, breath holding time, and long jump performance. ANACOVA was used for statistical technique. It was found out that package I and package II, weight training programmes showed a significant improvement in the speed, standing broad jump, respiratory rate, breath holding time and long jump performance.


Murugesan\textsuperscript{15} conducted a study on effect of hollow sprints and farther training on selected physiological variables. For the purpose of the study ninety male subjects from Muthiah Alagappa Matriculation Higher Secondary School, Kottaiyur, Sivagangai District, were selected at random. Their age ranging from fourteen to sixteen years. The investigator selected physiological variables such as haemoglobin content, mean arterial blood pressure, pulse rate and breath holding time. To compare the variables ANACOVA technique was employed. It was found out that Farther group when compared in hollow sprints group, Farther training group had a significant improvement in haemoglobin content and hollow sprints group had a significant improvement in breath holding time, pulse rate and mean arterial blood pressure.

Uppal\textsuperscript{16} conducted a study on comparative effects of two duration load methods and interval training method on cardio respiratory endurance and selected physiological variables. For the purpose of the study, eighty untrained subjects were divided into four equal groups. Out of this for groups one group was the control group and other three were called experimental groups. The experimental groups underwent interval training, farther training and slow continuous running for a period of ten weeks. The load was progressively increased. He found that all the three groups had equal training effects on maximal oxygen uptake. Vital capacity, leg strength and positive breath holding time. Slow continuous and farther methods indicated significant improvements in cardiovascular endurance when compared to interval training.

Lee S. Wayne\textsuperscript{17} This study is part of a larger investigation designed to develop task related physical performance standards for combat soldiers in the

\textsuperscript{15} Murugesan, "Effect of Hollow Sprints and Fartlek Training on Selected Physiological Variables", \textit{Unpublished M.Phil., Dissertation} Alagappa University, Karaikudi, July 1990.

\textsuperscript{16} Arun Kumar Uppal, "Comparative Effects of Two Duration Load Methods and Interval Training Method on Cardio Respiratory Endurance and Selected Physiological Variables", \textit{Unpublished Doctoral Dissertation} (Jiwaji University, Gwalior, June 1980).

\textsuperscript{17} Lee S. Wayne, \textit{Task Related Aerobic and Anaerobic Physical Fitness Standards for the Canadian Army (Soldiers)}, Alberta University, Canada, 1992, on 232.
Canadian Army. One hundred and sixteen male infantry soldiers took part in the study and 99 completed all tests. The purpose was to develop standards based on physical requirements of the job and physiological capacity of the soldiers. To achieve this a field and a laboratory test battery were administered to all soldiers. The field test battery consisted of: 1. casualty evacuation, 2. ammunition box lift, 3. maximal effort digging and 4. weight load march. These tasks represented the most difficult and representative common field tasks a soldier was expected to perform. The laboratory test battery consisted of: i. weight load treadmill march test, ii. wingate leg anaerobic power test and iii. wingate arm anaerobic power test.

The reliability coefficients of all tests included in the two test batteries ranged between 0.83 to 0.96. An expert panel of judges was also utilized in the establishment of final standards. Statistical analysis of the data included Pearson Product Moment Correlations, Multiple Stepwise Correlations, Regression equations and Canonical Correlation. These were computed to determine overall.

Ayora Perez, Daniel the purpose of this study was to examine the perception that 389 students (ages 14 - 16) had of their school subject physical education. A factor analysis looked for the relationship among psychological, social, structural and performance variables. Tried to find out the influence of these factors on the adolescent's attitude and motivation towards physical activity and as a result their participation and performance in the subject of physical education. The following scales were used in order to assess the different variables: 'Self-concept' (Musitu, Garcia & Gutierrez, 1991), 'Physical Self-efficiency' (Rickman, 1982), 'Sportive Family Climate', 'Sportive School Climate', 'Peer Climate in Sports Practice' (Escarti and Garcia - Ferriol, 1993), 'Perception of the Physical Education Teacher's Competence' (Escarti 1994). In order to measure the structural factor the 'Scale of Perception of Sports Equipment and Facilities of own school' was created and high reliability indexes were obtained.

The results indicated that a) Students with high Self-concept and high Sport self-efficacy had a higher Motor and Academic performance. b) Students who perceived a high Sportive School Climate (fostering of sports) showed higher motivation towards Physical Education as a subject. c) Students who perceived the Physical Education teacher's 'organisational style' as positive, had better Motor and Academic performances in the subject P.E. d) Student's Motor and Academic performances progressively increased as students accessed high grades. e) Students who perceived the School Sportive Facilities as good, performed better (at both Motor and Academic levels) than their peers. f) Boys performed better at both Motor and Academic levels than girls.

Martin, John Joseph\textsuperscript{19} this study was conducted to measure the differential effects of a Health Enhancement Program (HEP) for Stanford University freshmen, contrasting an information-only program with one combining information and behavioral programs. Six all-freshmen dorms were selected non-randomly, paired by geographic location, and then randomly assigned to control (no program), Treatment 1 (information only), and Treatment 2 (information plus behavioral programs) conditions. A baseline assessment was made during the early weeks of Fall Quarter, 1985. Assessment materials included a questionnaire on health knowledge, attitude, and behaviours, and a series of eleven physical fitness tests. A total of 411 of the 541 students eligible took part in the study.

A total of 127 variables were examined in this study, including measures of health knowledge, attitude, exercise and fitness, diet, stress, and other miscellaneous items such as smiling and sleeping habits. Personal, family background, and study participation measures were also assessed. Six statistically significant treatment changes were observed. Subjects in both

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treatment groups improved their score on the health knowledge test, while controls scored lower on this item at post-test. Treatment 1 subject improved in speed, as measured by time in the 40-yard dash, as compared to both controls and treatment 2 participants. Both treatment groups improved in endurance, as measured by distance run in 12 minutes, as compared to controls. In the area of diet, treatment 2 subjects showed less of a decline in days eating breakfast, as compared to controls. Treatment 2 subjects also showed less of an increase, as compared to controls, in portions of cheese eaten. Finally, both treatment groups showed a greater decline in portions of candy and chocolate consumed, as compared to controls. Other important findings include:

1. The generally good exercise and dietary habits of entering Stanford freshmen persist throughout the freshmen year.
2. The high level of stress reported by entering freshmen remains in evidence at the end of the first year. There was, however, a reduction in self-assessed stress level, thereby indicating a kind of adaptation to a high stress environment.
3. Both men and women gained five to six pounds and about one-half inch of height. Overall, on the 96 evaluative health measures, control subjects showed gains on 51, Treatment 1 subjects on 59, and Treatment 2 subjects on 66.

Kras, John Michael²⁰ the purpose of this study was to determine whether or not cardiovascular endurance, body composition, flexibility, balance, muscular strength, muscular endurance, and leg power had any relationship on how well golfers perform. This study was conducted during University Interscholastic League (UIL) golf competition for a period of six to eight weeks. This study involved the testing of 56 high school golfers participating on Class 5A golf teams in the Dallas Metroplex and North Texas Area. Each golfer was tested for flexibility, balance, cardiovascular endurance, body composition, muscular strength, muscular endurance, and leg power at the beginning of the golf season. The golfers established a stroke average through UIL district competition.

²⁰Kras, John Michael, “A Study of the Relationship of Selected Health-Related and Performance-Related Physical Fitness of Golfers on Golf Scores”, East Texas State University, 1994, pp.120.
The golf score average was then correlated to the fitness test scores using the Pearson Product Moment Correlation. All the fitness scores were also entered into a Stepwise Multiple Regression to determine an equation capable of predicting golfer's scoring potential. The results of this study showed a significant relationship between the laboratory and field task variables. The final performance standards were based on: a) pass - fail performance levels suggested by subject matter experts, b) discriminant analysis of possible cut off performance in selected field tasks, and c) soldiers physiological capabilities to meet job requirements. The recommended physical performance standards were: 1) Casually evacuation in 60 seconds, 2) Ammunition box lift in 300 seconds, 3) Maximal effort digging in 360 seconds, and 4) Weight load march of 13 km in two hours and 26 minutes.

Al-ahmad Ayed F. to examine the effects of a six week plyometric training program on selected physiological and physical fitness parameters, twenty four basketball players (14 - 18 yrs.) were utilized to perform anaerobic power and anaerobic capacity tests. In addition, subjects performed a vertical jump, standing long jump, 40 yard dash and one repetition maximum (1RM) squat. The subjects were randomly placed in an experimental group or control group, and the groups were randomly designated as experimental or control group. Before the treatment was given, a pre-test was conducted for both groups. Following the six week treatment, the subjects were tested once more on the previously mentioned tests. Following treatment the vertical jump (cm) and standing long jump of the plyometric training group increased (p<0.05). Also, after treatment the vertical jump in kilograms meter / seconds was higher for the plyometric group when compared to the control group (130.3 vs 120.0 kgm/s). A significant change was seen in the 1RM squat for both groups

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(p<0.05), with the experimental group increasing from 75.3 to 96.3 kg, while the control group increased from 81.1 to 96.0 kg. No significant effect of plyometric training on 1RM squat was seen. The experimental group decreased in the 40 yard dash time from 5.3 to 5.1 seconds and the control group decreased from 5.3 to 5.2 seconds. However, these changes were not statistically significant. Post - treatment anaerobic power (watts) for both groups was significantly different (p<0.01).

The experimental group increased from 559.3 to 619 watts and the control group increased from 516.9 to 579.7 watts. Also, a significant change was seen in the man anaerobic power (watts/kg) for both groups after treatment (p<0.01) with the experimental group increasing from 7.65 to 8.37 w/kg, while the control group increased from 6.97 to 7.79 w/kg. No significant effects of plyometrics on anaerobic power was observed. Post-treatment anaerobic capacity (w/kg) for both groups was significantly different (p<0.01). After treatment, post anaerobic capacity increased in the experimental group from 466.6 to 501.5 watts and for the control group from 414.3 to 456.2 watts. Also, following treatment there was a significant change in the mean anaerobic capacity (w/kg) for both groups (p<0.05) with the experimental group increasing from 6.4 to 6.8 w/kg, while the control group increased from 5.6 to 6.2 w/kg. No significant plyometrics effect on anaerobic capacity was demonstrated. The results reveal that the plyometric training administered in this investigation can significantly improve the vertical jump and standing long jump abilities. Further more, the findings of this study suggest that plyometric training does not elicit alterations either improving leg muscle strength or in improving power output as measured by the watts compared to the control group.

Templeton, Josephine Hough within a two year time frame, two sets of Starkville City School fourth graders were tested on 20 selected fitness, motor,
and sports measures. The assessment instruments were administered during the 579 children's regular physical education class; the evaluation period lasted six weeks. The subjects were identified by age, gender, height, and weight. The measures included the flexed-arm hang, sit and reach, right hand grip, and left hand grip tests for physical fitness. The 50 yard dash, standing long jump, basketball, shot put, railwalk, stork stand, sidestep, basketball catching, and target throw were included as measures of motor fitness. Sports skills measured included the football kick for distance, soccer dribble, batting-tee for accuracy, batting-tee for distance, thirty-second basketball shooting, basketball dribble, badminton serve for distance, and modified Clevett's golf putting.

A description of the fourth grade students in the Starkville City Schools was compiled. The distribution of gender was approximately equal in the study sample. The wide range of ages, particularly at the pre-pubescent/puberty stage, may have affected the sample means on many of the tests because of growth spurts in the children. The fourth grade students in the Starkville City Schools are older, taller, and heavier than the norm for fourth grade children. As a group they failed to achieve the 50th percentile on established scores for most of the physical fitness and motor fitness measures they attempted. No published norms on sports skills for children under the age of 10 were found to use for comparisons in this study. The males' scores were superior to the females' on most measures. To further describe this difference in the group, multivariate analysis of variance was employed. A factor analysis reduced the 13 reliable variables in the study to four factors. MANOVA indicated that males' scores were significantly superior to the females' on the factors involving sports skills, arm and shoulder strength, and leg power. No significant difference based on gender was found on the factor involving coordination.

Maxey, Ron⁵³ the purpose of this investigation was to determine if physiological changes, related to specific physical fitness parameters, occur in

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Maxey, Ron, Physical Fitness Changes in Mildly Handicapped Individuals Following a Six-Week Karate Instructional Program, Arkansas University, 1989, pp.108.
mildly handicapped individuals following participation in a six week karate exercise program. Six physical fitness parameters were investigated: 1. body fat, 2. flexibility, 3. static strength, 4. cardiovascular 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 program 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 pretest to posttest. The control group recorded gains in skinfold (indicating a possible increase in body fat), deltoid strength, and the karate skills test. This last increase was small and could have resulted from exposure to the karate skills during pretest. After adjusting for differences between groups and the 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 program.

Schneider, Michael Jay24 the purpose of this study was to examine the effect of participation in a middle school physical education program on the fitness components of cardiorespiratory endurance, flexibility, muscular strength and endurance of the abdominal muscles, and muscular strength and endurance of the upper body. The subjects of this study consisted of 173 middle school students who were given fitness tests. The tests used were the mile run, the sit and reach test, the sixty second sit-up test, the pull-up test for males, and the arm hand test for females. The data was used to determine if there were significant difference in the pre-test and post-test scores of each test component. Results of the study indicated that every test group experienced significant

24 Schneider, Michael Jay, "A Study of the Effects of Participation in a Midle School Physical Education Programme Upon Specific Components of Physical Fitness", East Texas State University, 1993, pp.103.
improvements in at least one fitness component. Based on the results of this study it was concluded that participation in a middle school physical education program can cause improvement in specific fitness components.

Kinjsler 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 program. 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 min 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 has 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.

Gaber 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.

Pari\textsuperscript{27} 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.

Ahmed\textsuperscript{28} 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.


Carter 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;

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.

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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 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 objectives 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 state-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-efficiency and activity level were found to be positively correlated for females but not for males.

Maxey$^{31}$ 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$^{32}$ conducted a study on selected physical education activities upon components of health related physical fitness. The purpose of this study was

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$^{32}$ Miller, Lorikay (1990), "A Study of the Effects of Participation in Selected Physical Education Activities upon Components of Health Related Physical Fitness", Dissertation Abstracts International Vol.51, No.11, p.4218-A.
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) Archery, 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.
McCord\textsuperscript{33} undertook a study to examine the effects of a 12 week program of low impact aerobic dance conditioning on VO\textsubscript{2} 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 VO\textsubscript{2} 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.

Kaikkonen\textsuperscript{34} studied the effects of a 12 week low resistance circuit weight training (CWT) on cardio vascular and muscular fitness were studied in 90 healthy sedentary adults. The subjects were randomized into three equally fit groups. CWT, endurance (END) and Control (CON) according to their maximal aerobic power (VO\textsubscript{2} max). Both training groups exercised for 12 weeks 3 days a week in sessions of 40 min, with a heart rate (HR) level of 70.8 percent HR max. The CWT group trained with air resistance machines. Heart rate was controlled by setting the speed of movement. The END group walked, jogged cross-country skied or cycled. The net differences (between pre and post training changes) between the CWT and CON groups was statistically significant for VO\textsubscript{2} max (2.45 mlx min\textsuperscript{-1} reps. cl 0.2, 2.1) and for kneeling (2.25 reps cl 0.01, 4.5). The net difference between pre and post training changes in the END


and CON groups was statistically significant for Vo2 max (2.75 ml·kg⁻¹ ·min⁻¹, 95% CI 0.9, 4.6) and Kneeling (3.0 reps, CI 0.7, 5.3). Low resistance CWT with moderately and HR level has effects comparable to an equal amount of endurance training on the cardio vascular fitness of sedentary adults. The CWT model was beneficial also on muscular fitness. Based on the results this type of exercise can be recommended for beginners because of its multilevel effects.

Vaidhiyanathan35 studied to analyse the effects of circuit training on selected physical and physiological variables, seventy physically fit and untrained boys were selected among 240 of ninth standard. Experimental and control groups consisted of 35 boys in each groups circuit training was given to the experimental group five days a week for a period of 12 weeks. Except routine physical education classes, the control group was restricted participating in any of the training programmes. The result of the study indicated that practice of circuit training after twelve weeks had significant effect for increasing muscular strength, muscular endurance and cardio respiratory endurance. Through circuit training, significant improvement in first six week time and still better improvement after the end of twelve weeks were observed.

Otte36 conducted a study on the effects of isotonic and plyometric training on upper body power of ninth and tenth grade males. The purpose was to determine if any significance difference in power gains existed between weight training programme and weight training programme combined with upper body plyometrics. The subjects (Ss) included 21 male 9th and 10th grade students


from New Madrid Country central and 41 male 9th and 10 grade students from Cape-central school who were randomly assigned to a weight training programme or a weight training programme combined with upper body plyometrics. The subjects were administered the seated medicine ball put to measure upper body power. The subjects participated in 10 weeks of weight training on Mondays, Wednesdays and Fridays. During the weeks 7 to 10 in addition to the routine workouts, they participated in an additional training on Tuesdays and Thursdays. The investigator concluded that the experimental group showed a significant gain in power compared to the control group. The combined cape central groups showed a significant gain in power compared to the New Madrid Country central groups.

Gliuski\textsuperscript{37} studied the effect of Faslek, sprint and interval training on leg strength, speed and cardio vascular endurance. Subjects were 77 freshman college males. Leg strength, speed and cardio vascular endurance were measured by leg dynamometer 60 yard dash, Harvard step test and 880 yard run respectively. It was concluded that the Fartlek, sprint and interval methods of training were equally effective in developing leg strength, the fartlek and interval methods of training are more effective than the sprint method in developing cardio vascular endurance. Progressive physical training of 16-40 minutes per session over an eight weeks period was sufficient for improving the physical fitness items investigated in this study.

Selvi\textsuperscript{38} conducted a study on effect of plyometric circuit and XBX plan on selected physical, physiological, haematological and biochemical variables of Tamilnadu Agricultural university women students. For the purpose of the study


\textsuperscript{38} Kulandaivelu Selvi, “Effect of Plyometric Circuit Training and XBX Plan on Selected Physical, Physiological, Haematological and Biochemical Variables of Tamilnadu Agricultural University Women Students”, \textit{Unpublished Ph.D Thesis} Alagappa University, Karaikudi.
ninety women students studying in second and third year undergraduate course were selected as subjects. The subjects were divided into three groups each group consisting thirty subjects. Group one underwent a treatment for plyometric training. Group two followed circuit training and group three followed XBX plan for a period of twelve weeks. After the experimental treatment of twelve weeks final reading was taken on the above variables. Analysis of co-variance was employed to find out the comparative effect of each training. It was found out that all the physical and physiological variables were significantly improved through circuit training.

Mahamay39 found that the participation in physical education and yogic programme (Asana) bring about anthropometric and physiological changes. Female programme (Asana) bring about anthropometric and physiological changes. Female students from VIII and IX standard of St. Thomas Girl's High School, Culcutta were taken as subjects. One group was given yogic exercises (Asanas) and same physical education programme and the other was given both. Sixteen asanas ad Surya Namaskar were given. The period of training was ten weeks. He found out that combination of yoga (asanas and physical education) produces best results in increasing lean by mass, reduction in fat percentage and reduction in body weight.